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DEVELOPING THE CIRCULAR ECONOMY PROMOTES SUSTAINABLE GROWTH IN THE CONTEXT OF THE FOURTH INDUSTRIAL REVOLUTION

Assoc.Prof.PhD. Nguyen Van Chien*

Abstract: ***Economic development requires natural resources, especially energy sources for input needs of economic activities. In total, dependence on fossil energy sources creates environmental challenges such as rising sea levels, rising global temperatures, negatively affecting human health and growth efficiency. The research results indicated that although fossil energy sources bring positive benefits to growth in the short term, but, the economy should shift to renewable energy consumption, promoting circular supply chains based on the rational use of natural resources to ensure higher growth in the long term. Therefore, developing the circular economy promotes sustainable growth is necessary in the current context.***

• Keywords: *circular economy, fossil energy, renewable energy, sustainability.*

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1. Introduction

Developing circular economy in general and circular supply chains in particular has attracted the attention of some scholars recently through scientific publications on Scopus and Web of Science in recent years, which suggests more in-depth studies on developing circular supply chains for sustainable cities (Anser et al., 2024; Perera et al., 2024; Xu et al., 2025; Montag, 2023). In fact, the world is facing many environmental challenges, especially the increasing environmental pollution that has led to a number of consequences such as rising sea levels, increasing global temperatures, increasing environmental pollution and thus affecting human health and life, increasing business costs and costs for the economy. Faced with this context, countries must harmonize economic development and environmental protection, in which building a green growth strategy and sustainable growth is a necessary goal to both maintain economic growth and achieve long-term growth goals. Therefore, the study focuses on analyzing a case study in Vietnam to clarify the role of circular supply chains for sustainable development.

In that context, promoting a circular economy is one of the solutions to achieve economic growth in the short and long term. A circular economy is an economic model in which design, production and service activities are organized appropriately to minimize negative impacts on the environment. A circular economy aims to reuse, repair, refurbish, recycle and remanufacture products and materials based on basic principles such as preserving and developing nature, using renewable resources, optimizing resource use, reducing waste and pollution and increasing renewable energy consumption.

Vietnam implemented economic reform in 1986 and implemented a strategy of opening up economic activities to the global economy. Vietnam has achieved many successes in socio-economic development with an average income of about 7%/year and Vietnam has achieved an average income per capita of nearly 5,000 USD/person/year in 2025. It can be said that Vietnam is one of the fast-growing countries in Asia with an open economy associated with high FDI attraction and open international trade. However, Vietnam is also facing the problem of environmental pollution that degrades the living environment and increases costs for people and the economy such as costs related to health, longevity, production costs, and costs related to environmental pollution. This raises the urgency of building and developing the economy associated with maintaining environmental protection in Vietnam.

In order to clarify the relationship between sustainable development and economic factors, the objective of this study is to assess the impact of energy use on economic growth in the context of promoting circular supply chains in Vietnam. The research results clarify whether increased energy

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consumption promotes economic growth or not, especially in the context of promoting circular supply chainsin specific and circular economy in particular. Specifically, every year thousands of studies related to circular economy are published in Scopus or the Web of Science, reflecting the level of interest of scholars and researchers in circular economy development and sustainable development goals (Perera et al., 2024).

2. Resource recovery and circular supply chains

As discussed above, the strategy of promoting and developing a circular economy creates a foundation for sustainable growth, maintaining high growth while ensuring a clean environment. In recent times, the world has witnessed rapid economic development with per capita income increasing every year, but the level of pollution has also increased, affecting the global biosphere and increasing challenges to human life. Therefore, developing a circular economy to maintain sustainable growth is necessary. Most studies emphasized the role of developing circular supply chains to promote circular economy and bring benefits to the economy, especially sustainable development in businesses, localities and cities. In the context of increasing environmental pollution, promoting sustainable development becomes necessary and essential.

Given that energy is an essential factor for economic growth and sustainable development, in which energy supply and consumption play a key role in economies. Wei et al. (2025) argued that energy competition makes energy more sustainable and accessible to all. Indeed, global energy consumption has skyrocketed, and driven by rapid industrialization, urbanization, and economic development, especially in the United States, the EU, and China. Conducting a study to assess the spatial-temporal variation and the linkage between global primary energy consumption and economic growth during the period 1965–2000, the study results showed that global energy consumption is heterogeneous and heterogeneous with impressive growth. Regional inequality has decreased and remained stable at high levels over time. The study also found that most countries have an imbalance between non-fossil energy consumption and GDP. Large energy consumers struggle to meet renewable energy consumption targets, following a fossil-to-renewable energy transition path while maintaining economic growth.

Anser et al. (2024) studied the BRICS countries including Brazil, India, China, South Africa and Russia in the context of their increasing importance in the global economy as emerging countries. Specifically, BRICS accounts for a significant proportion of the world's population, GDP and energy consumption. These countries have promoted industrialization, resource use and technological innovation and have contributed greatly to global economic growth. However, BRICS countries also face significant challenges related to balancing economic development with environmental sustainability and efficient resource management. Furthermore, BRICS countries are important players in the global energy market as Brazil and Russia are major energy resource exporters and India, China and South Africa are major energy consumers. This energy consumption has a direct impact on economic growth and environmental sustainability. In addition, BRICS countries showed varying degrees of success in integrating technological advances into the energy sector, especially in how technological innovation affects economic growth and energy use in the context of developing sustainable development strategies in economies.

Perera et al. (2024) argued that many countries develop nuclear energy as their main energy source while the world's second-lowest carbon energy source and only meets 10% of global energy demand. The study examined the relationship between renewable, non-renewable energy sources and growth to clarify how renewable and non-renewable energy consumption interact and influence economic growth. The study results provided evidence of a unidirectional causal relationship running from renewable energy consumption to economic growth and non-renewable energy consumption to economic growth in transition economies. Therefore, implementing global energy efficiency standards, reducing fossil fuel use, and adopting regulatory measures are feasible policies to limit negative environmental impacts and promote economic development.

The rapid growth of the global economy has led to environmental problems such as pollution, resource depletion, creating global economic and political barriers to social existence and development. Li et al. (2024) argued that sustainable development has become an accepted and chosen norm globally, including in China. The Chinese government has implemented new economic strategies to effectively use natural resources. China is known as the fastest growing country in the world, and its participation in international trade is a driving force for growth. In particular, its export-oriented policies have helped China become a global manufacturing hub. However, China still faces vulnerabilities related to environmental degradation, including significant

dependence on coal and fossil fuels, so the efficient exploitation of natural resources is urgent to promote industrial development and infrastructure projects.

3. Urban resource challenge

3.1. Material intensity of cities

Typically, material intensity of cities corresponds to the mass of materials used to construct a building or a structure per unit of floor area. It is measured to assess the resource use and environmental performance of buildings and the larger urban environment. It is understood that material intensity is a fundamental characteristic for material flow management, assessing demolition waste. Celik et al. (2023) indicated that material intensity has a negative impact on the environmental factors, demonstrating the existence of a feasible sustainable consumption and production among the nations. Therefore, reducing material intensity across economic sectors in advanced economies is a good recommendations for maintaining the sustainable development.

3.2. Linear supply chains in urban contexts

Linear supply chains in urban contexts reflect the linear relationship of supply chains in urban areas. Xu et al. (2025) indicated that the frequent occurrence of exogenous events such as natural disasters, extreme weather, and the impact on national governments, therefore the study suggests that supply chain digitization has the potential to promote urban resilience, enhancing cities' ability to withstand and recover from risks. The supply chain promotion effect on urban resilience is stronger in cities with higher development, densely populated areas, or central areas. It is evident that the economy has significantly changed from linear supply chain to circular supply chain as suggested in Figure 1 below:

Figure 1. Trends of supply chain

Source: Authors' compilation

4. Circular supply chains and Resource recovery pathways in urban systems

4.1. Fundarmentals of circular supply chains

Circular supply chain incorporates circular thinking in the supply chain, and has attracted the attention of scholars and countries to optimize supply chain operations. Montag (2023) argues that an efficient supply chain is based on optimizing input and output resources, thereby saving natural resources, the environment, and thereby reducing environmental impact, sustainable development.

4.2. Resource recovery pathways in urban systems

Resource recovery in cities involves extracting valuable resources from waste streams and reusing them, thereby promoting a circular economy and shifting the economy to a resource-light economy. By treating waste as a resource, urban areas can reduce their environmental impact, reduce emissions and thus create greater benefits for the economy. Therefore, a country with resource recovery solutions is a driving force for the economy to optimize the use of resources and create economic efficiency (Meier et al., 1975).

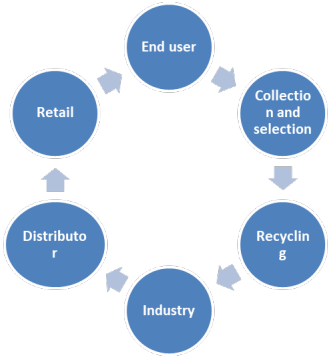
5. Urban infrastructure for resource recovery and case study

5.1. Decentralized recovery facilities

Decentralized recovery facilities in urban areas involve the treatment of wastewater or solid waste instead of transporting them to large centers for treatment, also known as decentralized waste treatment. This approach offers several benefits such as reduced capital costs, infrastructure costs, increased flexibility for resource recovery, and better environmental performance. Indeed, decentralized systems treat on-site and in small clusters, and are suitable for areas with appropriate waste volumes (Qiao et al., 2024).

5.2. Reverse logistics and collection networks

Figure 2. Reverse logistics



Source: Authors' compilation

Reverse logistics is the process of managing goods after they have reached the end consumer. It includes moving products back into the supply chain such as returning, repairing, recycling or discarding. Therefore, it can be understood as the process that includes the physical movement of goods, the organization and administration of managing this process. Or it can be said that reverse logistics aims to move products back into the supply chain and help the economy operate more optimally based

on the perspective of sustainable development and promoting circular supply chain management. Figure 2 indicated that reverse logistics include a circular of industry, distributor, retail, end user, collection and selection, and recycling.

5.3. Digital tools and data for circular flows

Digital tools and data play an important role in promoting circularity through mechanisms for tracking, monitoring and analyzing the efficiency of resources and products in their lifecycles. Specifically, these tools help reuse resources and optimize production processes, ultimately improving supply chains. Another possibility, Celik et al. (2023) indicated that material productivity and material intensity as drives of environmental sustainability, thus promoting the circular economy in the long run and thereby making the economy more efficient.

5.4. A case study

We collected data in Vietnam from 2000 to present. The collected data include: Fossil energy consumption, economic growth, international trade and foreign direct investment. The data source is collected from various sources in local and international.

The proposed regression equation is as follows:

$$GDP = \beta_0 + \beta_1 FOSSIL + \beta_2 FDI + \beta_3 TRADE + \mu$$

In this model, FOSSIL is a variable representing fossil energy consumption, FDI is a variable measuring foreign direct investment attraction, TRADE is a variable measuring the level of international trade, GDP is a variable measuring per capita income, reflecting the level of income improvement or economic growth.

Figure 3 indicates fossil fuel energy consumption and suggests that fossil fuel energy consumption is the main source of energy to meet Vietnam's energy needs in recent times. In 2000, the contribution rate of fossil energy sources was less than 40% compared to energy consumption demand, and correspondingly over 60% of renewable energy sources were capable of meeting energy consumption demand in Vietnam. However, the contribution rate of renewable energy sources has continuously decreased and correspondingly the contribution rate of fossil energy sources to total energy demand has been increasing. This explains why Vietnam's economic development always requires an increase in energy sources. Although Vietnam has invested in renewable energy sources, but the increase is slow due to high investment costs and long payback periods, so fossil energy sources, typically coal and oil, are still the main sources of energy for the country.

Figure 4 describes Vietnam's per capita income in the recent period and shows that Vietnam's per capita income has been continuously improved since 2000. Per capita income was below 500 USD/person/year in 2000, increased to about 1000 USD/person/year in 2006 and 2000 USD/person/year in 2011. By 2024, Vietnam's per capita GDP has increased to 4700 USD/person/year and the country is rapidly entering the upper middle-income group in the near future. This reflects the economy achieving a high growth rate throughout the past period (National Statistics Office, 2025).

Figure 3. Fossil fuel energy consumption (% of total)

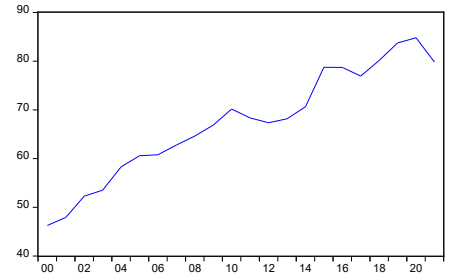
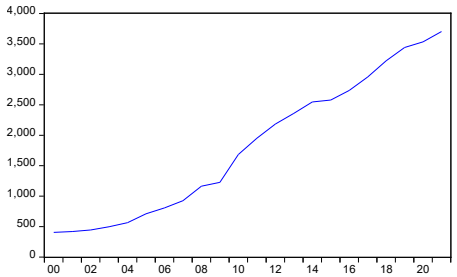


Figure 4. Per capita income (GDP)



5.5. Regression results

Table 1. LS regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FOSSIL	89.24872	10.89077	8.194897	0.0000
FDI	-122.3013	52.58266	-2.325887	0.0319
TRADE	6.257375	6.316033	0.990713	0.3350
C	-4464.085	568.5271	-7.852019	0.0000

Source: Authors' analysis

Table 2. RLS regression results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
FOSSIL	84.74053	12.56141	6.746102	0.0000
FDI	-147.8626	60.64882	-2.438012	0.0148
TRADE	8.639892	7.284910	1.185999	0.2356
C	-4336.408	655.7389	-6.613010	0.0000

Source: Authors' analysis

Table 3. GLM regression results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
FOSSIL	89.24872	10.89077	8.194897	0.0000
FDI	-122.3013	52.58266	-2.325887	0.0200
TRADE	6.257375	6.316033	0.990713	0.3218
C	-4464.085	568.5271	-7.852019	0.0000

Source: Authors' analysis

The regression results in Table 1, Table 2 and Table 3 show that:

The regression coefficient of FOSSIL is positive and statistically significant, this result shows that there is a positive impact of fossil energy consumption on Vietnam's economic growth. Or it can be said that fossil energy consumption brings a positive effect to economic development. In fact, Vietnam's economy is classified as a country with a fast growth rate and therefore requires a large demand for energy consumption. In order to meet that demand, Vietnam still has to depend on fossil energy sources while renewable energy sources cannot contribute significantly to the country's energy consumption demand.

The regression coefficient of FDI is negative and statistically significant, this result shows that there is no positive impact of attracting foreign direct investment and economic growth. This result affirms Vietnam's recent policies, especially policies related to trade liberalization and openness to attract foreign direct investment. However, the effectiveness of attracting FDI will be stronger if Vietnam selectively attracts FDI, especially prioritizing FDI projects with more technology, low energy consumption and green FDI. Indeed, FDI capital is a source of long-term capital for the economy and this capital has the ability to expand investment in technical infrastructure, fixed assets of enterprises and the country, thus having the ability to improve large-scale production activities in the country. The effectiveness of attracting FDI is higher if this capital has the ability to improve labor productivity, skills, and quality of human resources through the learning process.

The regression coefficient of TRADE is positive but not statistically significant, this result shows that international trade does not always bring positive benefits to the economy. International trade is capable of meeting domestic consumption needs when the domestic market cannot produce consumer goods at competitive prices, so international trade may not improve domestic production capacity and economic development, and international trade may bring risks due to trade wars and external shocks spilling over into the economy. Therefore, only when international trade is associated with improving domestic business performance will it bring positive effects to the economy.

6. Conclusion

Economic development has created more environmental challenges, especially increasing environmental pollution, some consequences such as rising sea levels, increasing global temperatures, increasing environmental pollution and affecting human health, life and economic benefits. The research results showed that fossil energy has a positive impact on growth, affirming that fossil energy consumption still brings positive effects to the economy, especially in the short term. However, an economy that depends too much on fossil energy consumption can reduce the efficiency of economic growth in the future. Therefore, the study also recommends that the government should have solutions to prioritize the efficient use of energy sources, reduce dependence on natural resources and transform the growth model based on a more efficient technology platform.

It can be seen that Vietnam needs to harmonize the use of fossil energy sources to meet the requirements of the country's economic development, but at the same time encourage the expansion of renewable energy sources to create long-term sustainable economic development benefits. In the short term, fossil fuels are cheap, making production costs cheaper, but they also create additional environmental burdens, thereby reducing economic growth efficiency. Second, Vietnam needs to take measures to promote circular supply chains, especially an economy that shifts towards saving on the use of natural resources to minimize environmental impacts and promote sustainable development.

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GREEN GROWTH IN THE ERA OF INDUSTRIAL REVOLUTION 4.0 - PROVINCIAL EVIDENCE IN VIETNAM

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Abstract: ***This study analyzes the success of an economy in reducing its emission intensity per unit of economic growth. The Pooled Ordinary Least Squares (POLS) model is used on panel data from nine cities in Northern Vietnam over the period 2015-2021. The empirical results show a statistically significant negative impact between the air quality index and growth, that is, when the economy relies heavily on energy-intensive industries, increased output leads to increased pollution, and a growth slowdown occurs because environmental costs exceed economic benefits. In addition, the results also indicate a positive impact of provincial budget revenue, but no empirical evidence is found on the impact of foreign direct investment as well as digital transformation on provincial economic growth. From here, policy recommendations are proposed towards promoting a green economy, towards sustainable growth by taking advantage of the achievements of the 4th industrial revolution.***

• Keywords: *green economy development, sustainable growth, gross regional domestic product, digital transformation, Vietnam.*

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1. Introduction

The concept of green economy development has emerged as a pivotal paradigm in contemporary economic discourse, aiming to reconcile the imperatives of economic growth with the preservation of environmental integrity and social inclusiveness. It is generally defined as a development model that fosters economic expansion while minimizing ecological degradation, reducing carbon intensity, and promoting resource efficiency. Within this framework, production and consumption patterns are restructured to ensure that growth is not achieved at the expense of environmental sustainability. In other words, green economy development reflects a transformative process in which innovation, technological advancement, and institutional reforms are leveraged to enhance both competitiveness and ecological resilience.

Closely related to this paradigm is the notion of sustainable growth, which extends beyond the traditional objective of maximizing output to encompass long-term stability, intergenerational equity, and balanced progress across economic, environmental, and social dimensions. Sustainable growth is characterized not only by the ability of an economy to expand consistently over time, but also by its capacity to do so without exhausting natural resources, exacerbating inequality, or undermining resilience to shocks. In this sense, sustainable growth constitutes the ultimate policy goal toward which green economy strategies are oriented, as it ensures that the benefits of development are durable, widely shared, and environmentally viable.

The mechanism through which green economy development contributes to sustainable growth can be elucidated through several transmission channels. First, the adoption of cleaner technologies and renewable energy sources reduces pollution and enhances the health and productivity of the labor force, thereby generating long-term economic gains. Second, the promotion of circular economy practices fosters resource efficiency, lowers production costs, and creates new market opportunities in green industries. Third, by incentivizing sustainable investment and innovation, green economy development enhances structural transformation and diversification, which are essential for stable and resilient growth trajectories. These dynamics illustrate that green economy policies do not merely represent environmental constraints but can act as catalysts for new growth drivers, technological upgrading, and competitiveness at both national and sub-national levels.

In the context of the Fourth Industrial Revolution, digital transformation has become an indispensable enabler in strengthening the nexus between green economy development and sustainable growth. Digital technologies such as artificial intelligence, blockchain, and the Internet of Things enhance the capacity to monitor environmental performance, optimize resource allocation, and improve the transparency of

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green supply chains. They also facilitate the design of innovative business models, including smart energy grids, digital platforms for circular consumption, and precision agriculture, which simultaneously reduce environmental footprints and stimulate economic dynamism. Moreover, digital transformation empowers local governments to design evidence-based policies and integrate environmental considerations into development planning, thereby magnifying the effectiveness of green economy strategies.

This study is particularly significant for Vietnam, where provincial economies face the dual challenge of sustaining high growth rates while mitigating the adverse consequences of environmental degradation. By providing empirical evidence at the provincial level, the research offers nuanced insights into the heterogeneity of green economy outcomes and the moderating role of digital transformation in enhancing sustainability. The findings are expected to inform policymakers on how to balance short-term economic imperatives with long-term ecological and social objectives. In doing so, the research contributes not only to the academic debate on the intersection of green growth, digitalization, and sustainable development but also to the practical formulation of policies that promote green competitiveness, enhance local economic resilience, and align Vietnam's development trajectory with global sustainability agendas.

Analysis is organised in a coherent arc. After an opening overview, a synoptic synthesis of antecedent scholarship is furnished to anchor the investigation. Thereafter, procedures for data construction and study architecture are specified with exactitude, emphasising replicability. The subsequent section delineates and explicates econometric evidence, indicating how insights map onto stated aims. In the closing movement, actionable regulatory instruments are articulated, with the claim that judicious implementation would catalyse the country's medium-term expansion under uncertain technological and market conditions ahead.

2. Literature review

The nexus between state budget revenues and local economic growth has been widely examined and continues to draw considerable scholarly interest. Yu & Fang (2021) applied generalized decomposition methodology (GDIM) to examine determinants of energy-related fine particulate (PM2.5) emissions across China. Building upon GDIM outputs, a novel separation metric was developed to evaluate the dissociation between particulate discharges and economic expansion, and the roles of technological and non-technological drivers in shaping that metric were estimated. Additionally, the magnitudes of individual components were numerically ascertained, which permitted cross-period comparison and informed policy interpretation. The principal findings were reported as follows. Among three salient outcomes, one demonstrated that technological influence substantially facilitated the dissociation of emissions from output, although its contribution diminished progressively over time. Conversely, non-technological drivers obstructed the dissociation process, yet their adverse contribution declined during 2000-2014. These patterns retained robustness across provinces.

At city levels, in Hao et al. (2018), city-level panel information from 2013 to 2015 was employed to evaluate the effect of particulate concentrations on income per capita through a simultaneous-equations framework, marking its first application in this context. Temporal and regional dummies were incorporated to address unobserved heterogeneity. Estimates revealed that air pollution exerted a significantly adverse effect on economic performance. Specifically, holding other factors constant, a five-unit increase in PM2.5 was associated with a decline of roughly 2,500 yuan in per capita output by 2015. Moreover, the findings suggested that sustained growth contributed to mitigating pollution, thereby generating reinforcing benefits for development.

Continuing the idea of (2018), Zhang et al. (2020) assessed China's decoupling trajectory between particulate emissions and economic expansion through an investment-oriented perspective. Drawing upon panel information for 30 provinces from 1998 to 2016, decomposition and decoupling approaches were jointly applied to disentangle the influence of conventional drivers and three innovative investment-related variables across the nation and four sub-regions. Results indicated that emissions remained only weakly separated from growth nationally and regionally. At the aggregate level, investment magnitude exerted the strongest effect, while compositional change contributed minimally, and emission intensity emerged as the most significant mitigating factor. Sub-nationally, efficiency improvements supported decoupling, though the expansive investment scale in the western provinces offset these gains. At the provincial level, structural and scale effects in Inner Mongolia and Xinjiang exerted disproportionate influence. Policy implications were advanced to curtail particulate emissions effectively.

Another recent considerable study, Fu et al. (2020) employed the most recent monitoring data from 2015-2017 together with an exposure-response modeling framework to quantify health damages attributable to PM2.5 pollution. Economic losses were evaluated through disease cost, adjusted human capital, and willingness-to-pay approaches. Vulnerable groups, particularly the elderly and infants, were found disproportionately affected. Influenced by growth dynamics, demographic density, and industrial structure, cities such as Heze,

Zhengzhou, Handan, and Liaocheng experienced the most severe impacts. Although health-related damages and associated economic losses displayed a declining trajectory, reflecting the effectiveness of pollution-control measures, the overall burden remained substantial and continued to pose serious challenges.

Recently, Bildirici & Kayıkçı (2024) explored dynamic interactions and causal linkages among energy intensity, output growth, urbanization, energy utilization, foreign direct investment, and PM2.5 concentrations during 1995-2019 for China, India, Germany, Canada, the United States, and the United Kingdom by employing the Panel Fourier Bootstrapping ARDL framework and associated causality procedures. Evidence of long-run equilibrium among variables was identified, with the error-correction parameter estimated at -0.169. Empirical findings revealed bidirectional feedback between economic expansion and particulate emissions, between inward investment and pollution, and between energy intensity and PM2.5. Furthermore, increased economic activity, evolving energy consumption patterns, and accelerating urbanization were observed to exacerbate particulate concentrations, thereby intensifying environmental pressures in these economies.

Srisaringkarn & Aruga (2025) analyzed spatial interdependencies of PM2.5 concentrations among Thai provinces and assessed their association with socio-economic determinants over the period 2012-2022. Empirical outcomes demonstrated that particulate pollution exhibited significant spatial clustering, implying that emissions were not geographically isolated but tended to diffuse across administrative boundaries. In other words, elevated PM2.5 levels in one province generated spillover effects into adjacent areas, underscoring the necessity of coordinated regional strategies rather than fragmented, locality-specific interventions to effectively mitigate the pervasive challenge of air quality deterioration.

A comprehensive review of existing literature revealed that investigating the economic consequences of PM2.5 on local growth dynamics was both theoretically justified and empirically warranted. It was further recognized that prior research had often overlooked the integration of specific contextual determinants. To address this limitation, the present study deliberately incorporated additional independent variables - namely foreign direct investment, the digital transformation environment, and state budget revenues - ensuring analytical novelty while filling substantive empirical gaps and thereby extending the frontier of knowledge on localized growth-environment interactions. The article will use the idea of Hao et al. (2018) with improvements suitable for the reality of Vietnam.

3. Methodology and research data

This study uses annual time series data of nine cities in the North of Vietnam, including Hanoi, Bac Ninh, Quang Ninh, Hung Yên, Cao Bang, Lao Cai, Lang Son, Son La and Phu Tho from 2015 to 2021, including Gross regional domestic product as local economic growth, State budet revenue as fiscal capacity, Foreign direct investment, Turnover of postal service and telecommunication service as proxy of digital transformation and PM25 - measuring the concentration of ultrafine dust particles in the air with a diameter of 2.5 micrometers or less - as an indirect measure of sustainable development or an indicator of the environmental costs of economic growth.

Because the dataset exhibits a panel structure, estimation strategies revolve around pooled ordinary least squares, fixed effects, and random effects specifications. This analytical framework, extensively employed across economics, epidemiology, and broader social inquiry, is designed to interrogate observations containing both temporal and cross-sectional variation. Information is typically accumulated longitudinally for identical entities, permitting regressions that exploit dual dimensions of variability. By contrast, multivariate econometric designs extend coverage across additional axes - commonly individuals, periods, and a supplementary dimension - thereby enabling richer inferential capacity.

Table 1 below reports the description of the variables used in the study.

Table 1. Variables, Measurement and Source

Variables name	Symbols	Variables measurement	Source
Loal economic growth	GRDP	Gross regional domestic product (at current prices, bill. Dongs)	General State Office
Foreign direct investment	FDI	Foreign direct investment (implementation capital (Mill. USD)	
State budet revenue	SBR	State budet revenue (Bill. Dongs)	
Digital Transformation	DIGITAL	Turnover of postal service and telecommunication service (Bill. dongs)	
Air Quality Index	MP25	Average of the concentration of ultrafine dust particles in the air with a diameter of 2.5 micrometers or less (μg/m³)	Center of Environmental Monitoring

Source: Authors' summary.

The empirical model is specified as:

$$\mathrm{GRDP_{it}} = \beta_0 + \beta_1 * FDI_{it} + \beta_2 * SBR_{it} + \beta_3 * \mathrm{DIGITAL}_{it} + \beta_4 * IMP25_{it} + \alpha_i + \mu_t + u_{it},$$

where β_i are the regression coefficients, α_i is a fixed effect in error, μ_t is error over time and u_{it} is the residuals over time and cities.

4. Empirical results

Table 2 below presents the descriptive statistics on mean of all variables used in this study.

Table 2. Descriptive on GRDP of cites

City	Mean	Min	Max	Standard deviation	Number
Bac Ninh	180738.2	128673.4	227614.6	37231.06	7
Cao Bang	15790	10369	19843	3358.511	7
Hanoi	865662.9	599178	1067540	175651.8	7
Hung Yen	83580.69	59006.2	112305.7	19246.54	7
Lang Son	29834.93	23382	37292.6	5391.697	7
Lao Cai	46347.07	31812.5	62703.3	11674.87	7

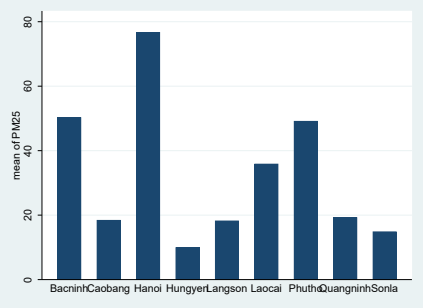
City	Mean	Min	Max	Standard deviation	Number
Phu Tho	62125.67	44550.7	80764	13545.16	7
Quang Ninh	168496.4	104498	238186.3	50472.88	7
Son La	47659.17	36360.6	56685.1	7668.276	7

Source: Summarized by the authors

The descriptive statistics of GRDP across provinces reveal substantial heterogeneity. Hanoi records the highest mean value at 865,662.9, with a wide range from 599,178 to 1,067,540 and a large standard deviation (175,651.8), indicating both economic concentration and significant variation over time. Bac Ninh and Quang Ninh also demonstrate relatively high averages, 180,738.2 and 168,496.4 respectively, accompanied by considerable dispersion. In contrast, Cao Bang shows the lowest mean (15,790) with limited fluctuation. Provinces such as Lang Son, Lao Cai, Phu Tho, and Son La exhibit moderate levels of GRDP with relatively smaller variability, reflecting more stable but less dynamic economic performance.

The visualization of mean of PM25 for all nine cites during the period 2015-2021 serves as an essential analytical tool to provide both descriptive insights and preliminary interpretations of environmental factors in the analysis model affecting green growth as in Figure 1.

Figure 1. Bar graph of PM25 of nine cities during the period of 2015-2021



Source: Executed by the authors

The descriptive statistics of average PM2.5 concentrations demonstrate notable spatial disparities across provinces. Hanoi records the highest mean level at 76.74, pointing to severe air pollution pressures in the capital. Bac Ninh (50.31) and Phu Tho (49.17) also report elevated averages, underscoring the environmental challenges associated with industrial and urban expansion. Lao Cai shows a moderate concentration of 35.90, while Quang Ninh (19.28), Cao Bang (18.45), Lang Son (18.26), and Son La (14.89) register relatively lower levels. Hung Yen reports the lowest mean (9.99), reflecting comparatively cleaner air quality. Overall, the distribution illustrates considerable heterogeneity in PM2.5 exposure across provinces, with urban and industrialized regions facing more acute pollution burdens.

Initially, the stochastic-effects specification was estimated and subjected to a diagnostic procedure to determine the appropriate estimator between pooled ordinary least squares and entity-specific alternatives. The Lagrange-multiplier examination returned a p-value above 0.05, indicating absence of significant between-unit variance; thus pooled ordinary least squares was adopted. The corresponding estimates appear in Table 3 for the provincial dataset under investigation overall.

Table 3. POLS estimation result

GRDP	Coefficient	Standard error	Z	P > |z|	95% confident interval	
FDI	72.88532	73.00347	1.00	0.318	-70.19885	215.9695
SBR	3.35128	.5750756	5.83	0.000	2.224152	4.478407
DIGITAL	1.806627	1.59742	1.13	0.258	-1.324259	4.937513
PM25	-1196.767	709.1473	-1.69	0.091	-2586.67	193.1366
CONSTANT	-6042.394	41848.98	-0.14	0.885	-88064.89	75980.1

Source: Summarized by the authors

After performing the POLS model regression, necessary tests include testing for autocorrelation of the residuals (see Table 4) and testing whether the residuals have heteroscedasticity (see Table 5).

Table 4. Results of autocorrelation test

Test	Statistics	Probability
Random Effects, Two Sided	ALM (Var(u) = 0) = 0.03	Pr > chi2(1) = 0.8610
Random Effects, One Sided	ALM (Var(u) = 0) = - 0.18	Pr > N(0,1) = 0.5695
Serial Correlation	ALM (lambda = 0) = 1.29	Pr > chi2(1) = 0.2560
Joint Test	LM (Var(u) = 0, lambda = 0) = 2.33	Pr > chi2(2) = 0.3125

Source: Summarized by the authors

Probabiity values of tests in Table 4 are all greater than 0.05 indicating that the residual of the model has no autocorrelation.

Table 5. Results of heteroscedasticity test

Statistics	Degree of Freedom	Probability > F
W0 = 0.68285716	df(1, 8)	0.43255722
W50 = 0.18441021	df(1, 8)	0.6789416
W10 = 0.68285716	df(1, 8)	0.43255722

Source: Summarized by the authors

Probabiity values of tests in Table 5 are all greater than 0.05 indicating that the residual of the model has no heteroscedasticity. Therefore, the estimation results in Table 3 can be used in analysis as follows:

$$GRDP_{\mathrm{it}} = -6042.39 + 72.88 * FDI_{it} + 3.35 * SBR_{it} + 1.80 * DIGITAL_{TS_{it}} - 1196.76 * PM25_{\mathrm{it}} + \mathrm{u_{it}}$$

In which, the results show a positive impact of local state budget revenue on local economic growth, as shown by the positive regression coefficient of SBR and statistical significance at the 1% level. The results also show a negative impact of PM25 on local economic growth at the 10% significance level. This result is consistent with the results in Hao et al. (2018) and Fu et al. (2020). However, there is no evidence of the impact of local FDI and digital transformation process on local economic growth at the 5% level.

Public revenue generation exerts a positive influence on local economic growth through several reinforcing mechanisms. Adequate fiscal capacity enables governments to allocate resources toward infrastructure development, human capital formation, and essential public services, thereby enhancing productivity and

regional competitiveness. Stable budgetary inflows also provide room for countercyclical policies and targeted subsidies that stimulate private sector dynamism. Moreover, efficient utilization of tax revenues strengthens institutional credibility, reduces market uncertainty, and fosters an enabling business environment. Collectively, these channels illustrate how sustainable revenue collection underpins long-term local growth trajectories and contributes to balanced and inclusive economic development.

Elevated PM2.5 concentrations exert an adverse impact on local economic growth through multiple detrimental channels. Deteriorating air quality undermines labor productivity by increasing morbidity and reducing workforce efficiency, while simultaneously escalating public health expenditures. High pollution levels also discourage investment, diminish tourism appeal, and erode overall quality of life, thereby constraining regional competitiveness. Furthermore, environmental degradation imposes hidden costs on ecosystems and infrastructure, weakening long-term development prospects. Collectively, these negative externalities demonstrate how persistent exposure to PM2.5 concentrations undermines sustainable growth trajectories and creates structural barriers to achieving resilient and inclusive local economic expansion.

The absence of empirical evidence linking digital transformation to local economic growth may be attributed to several underlying factors. In many regions, digital initiatives remain fragmented, with inadequate infrastructure and limited human capital constraining their effective utilization. Moreover, the productivity gains from digital adoption often materialize only in the long term, creating a temporal lag between investment and measurable outcomes. Institutional weaknesses, uneven policy implementation, and disparities in technological readiness across provinces further dilute potential impacts. Consequently, the expected positive association may not emerge clearly in the data, reflecting structural and contextual limitations rather than theoretical invalidity.

5. Conclusion

The model reveals that air quality index has a significant negative influence on local economic growth during the research period of 2015-2021. Building upon the empirical findings, it becomes imperative to propose targeted policy measures that can promote a green economy, towards sustainable growth by taking advantage of the achievements of the 4th industrial revolution.

Firstly, given the empirical finding that air quality deterioration negatively influences local growth, strengthening environmental governance emerges as a fundamental solution. Leveraging Fourth Industrial Revolution technologies, such as artificial intelligence and the Internet of Things, local authorities can deploy advanced air-quality monitoring systems that provide real-time data for regulatory enforcement. These digital platforms enhance transparency, allow precise identification of pollution hotspots, and enable timely policy interventions. By integrating environmental surveillance with fiscal incentives for green production, such initiatives not only reduce emissions but also create an enabling environment for sustainable industrial development at the provincial level.

Secondly, although digital transformation has not yet demonstrated measurable effects on economic growth, it holds significant latent potential when integrated with green innovation strategies. Local governments should incentivize enterprises to adopt clean technologies and circular production methods, supported by digital solutions such as blockchain-enabled traceability and smart energy management systems. These tools reduce environmental externalities while enhancing operational efficiency, competitiveness, and consumer trust in sustainable goods. By combining technological adoption with research collaboration between universities and firms, provinces can foster an ecosystem where digitalization reinforces green economy development, thus laying the groundwork for sustained and inclusive growth trajectories.

Thirdly, the limited growth impact of digital transformation may stem from insufficient absorptive capacity at the local level. Therefore, a strategic emphasis on human capital development is essential. Training programs should focus on equipping workers, entrepreneurs, and policymakers with the digital and environmental competencies necessary to manage emerging technologies effectively. By aligning vocational education, e-learning platforms, and industry partnerships, provinces can cultivate a workforce capable of utilizing digital tools to implement eco-efficient practices. Such capacity-building not only magnifies the long-term benefits of digital transformation but also ensures that local economies can pursue green growth without compromising sustainability objectives.

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IMPACT OF NATURAL CONDITIONS, CLIMATE CHANGE AND POLITICAL, CULTURAL AND SOCIAL FACTORS ON THE EFFICIENCY OF IRRIGATION DEVELOPMENT INVESTMENT IN THE MEKONG DELTA

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Abstract: ***Irrigation infrastructure plays a particularly important role in the economic development of the Mekong Delta in general and Vietnam in particular. Thanks to the investment in irrigation infrastructure, it will help develop economic sectors, improve labor quality, and improve people's income. This paper focuses on studying the impact of natural conditions, climate change, and political, cultural, and social factors on the efficiency of investment in irrigation development using state budget capital in the Mekong Delta. Through a survey of 348 officials working in project management boards, state management agencies on irrigation in the Mekong Delta, etc., the results have shown that natural conditions and political, cultural, and social factors have the same impact, while climate change has the opposite impact on the efficiency of investment in developing irrigation infrastructure in the region.***

• Keywords: *efficiency, investment development, irrigation.*

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1. Introduction

The Mekong Delta is an area located at the end of the Mekong River, spanning 6 countries and flowing into the East Sea. After more than 30 years of renovation, this is an economic region that contributes more than 33% of the country's agricultural GDP, 56% of rice output, 60% of fruit output, 95% of rice export output, and about 60% of Vietnam's seafood export output (Ministry of Agriculture and Rural Development, 2023).

In recent years, the region's irrigation infrastructure has received attention from the state. Thanks to the investment in irrigation infrastructure, it has contributed to flood control in the region, acidification and alum washing, salt prevention and freshwater retention, expansion of cultivated land area, increased productivity and crop yield, and ensured water for people's daily life (Le Manh Hung, 2015). However, investment in developing irrigation infrastructure from the state budget in the region has not been highly effective; irrigation infrastructure is incomplete, asynchronous, and degraded, and there is overlap in the management and coordination of resources and stakeholders.

There have been many domestic and foreign studies on the effectiveness of investment in developing irrigation infrastructure; however, the authors have only mentioned small irrigation projects, such as Leslie E. Small and Mark Svendsen (1990), Eliakim C. Matekere and Ninatubu M. Lema (2012). In Vietnam, there are many studies on the effectiveness of investment in developing irrigation infrastructure, such as Le Manh Hung (2015), Bui Thi Bong Trang (2017), Nguyen Hong Nhung (2020), mainly focusing on analyzing the current investment status and proposing solutions to improve investment efficiency without quantifying the factors affecting the efficiency of irrigation development.

2. Literature review

Natural conditions

The group of natural conditions is understood as geographical location, climate conditions, hydro-oceanographic conditions, topographic and geological conditions, etc.

Climate conditions: Due to the characteristics of construction works being outdoors, they are affected by climate and weather conditions. If the locality has

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a lot of rain or a lot of sunshine, it can slow down the construction progress of the project, increase investment costs due to prolonging the project implementation time, thereby reducing investment efficiency (Ha Duy Khanh and Nguyen Khanh Duy, 2022).

Geological conditions: including stratigraphy, geological structure, geomorphology, etc., at the project implementation location (Nguyen Hong Duc and Nguyen Viet Minh, 2015). If the geological conditions of the construction site are complex and unpredictable, it will affect the construction investment costs, thereby affecting the efficiency of investment and development (Do Van Chinh, 2020).

Terrain conditions: if the locality has flat terrain, favorable for the construction process, it will reduce investment costs and improve investment efficiency (Cu Thanh Thuy, 2018; Nguyen Van Phuc, 2023).

Hydrological characteristics: factors related to hydrology, abnormal flow will affect the construction process of irrigation works, possibly slowing down progress, prolonging project implementation time, increasing costs for investors, thereby the project is not as effective as expected (Nguyen Huu Hue and Nguyen Van Son, 2020)

Geographical location: If the locality has a preferential geographical location, it will be easier to attract and mobilize capital for investment and development than other localities. On the contrary, in economically disadvantaged areas, poor areas, remote areas, with unfavorable geographical locations, frequent natural disasters, floods, and droughts will increase costs for investors when implementing projects, and may even lead to delays, unfinished investment projects, and ineffectiveness as expected (Pham Minh Hoa, 2017; Cu Thanh Thuy, 2018; Nguyen Van Phuc, 2023).

Climate change

Temperature increase: According to Nguyen Tuan Anh et al (2022), increased temperatures change water demand as well as water resource balance. Therefore, it will affect investment activities in irrigation works and the efficiency of works during the implementation and operation stages.

Changes in rainfall and rainfall intensity: Nguyen Tuan Anh et al (2022) pointed out that changes in rainfall and rainfall intensity cause investors to increase investment costs, and the safety level and service assurance of the project as originally designed are also affected.

Floods, droughts, landslides: Floods, droughts and landslides affect the water intake capacity of irrigation and water supply systems, the drainage capacity of drainage systems, and increase construction, repair, and operation management costs of the project. This is a factor that damages two irrigation works after construction as well as increases construction costs during the implementation of the investment project (Nguyen Tuan Anh et al, 2022).

Storms and tropical depressions: When storms and tropical depressions occur frequently, they will increase construction costs as well as repair and management costs, reducing the level of service assurance and safety of the works, thereby reducing the efficiency of irrigation investment (Nguyen Tuan Anh et al, 2022)

Saltwater intrusion, sea level rise: Rising sea levels and saltwater intrusion increase the scale of irrigation and water supply works, in addition to increasing the management and operation costs of these works (Nguyen Tuan Anh et al, 2022).

Political, cultural, and social factors

Political stability has a close relationship with investment activities (Jovana Trkulja, 2005). Ensuring political security in the country or locality will positively affect the decision to invest in infrastructure development as well as improve the output of development investment activities (Mustajab M, 2009; Pham Van Hung and Nguyen Thi Ai Lien, 2024).

The support of the people where the investment project is located also greatly affects the implementation of the investment project. Only when people trust and support the implementation of the project, especially in the site clearance of the investment project, will the project implementation progress be accelerated, helping the project achieve high efficiency (Cu Thanh Thuy, 2018; Mai Thi Kim Oanh, 2022).

Factors of culture, history, and customs of people living around the project location affect the implementation of the investment project, facilitating or hindering the investment process (Cu Thanh Thuy, 2018; Nguyen Van Phuc, 2023).

3. Research method

Research method

The author uses a combination of qualitative and quantitative research to measure the level of influence of the following factors: Natural conditions, Climate change, Political, cultural, and

social factors on the effectiveness of investment in developing irrigation infrastructure using state budget capital.

The author also uses a 5-level Likert scale to assess the level of influence of the factors on the effectiveness of investment in developing irrigation infrastructure.

Data collection

The author uses a survey form to interview officials directly working at units and state management agencies related to investment in irrigation infrastructure development using state budget capital, including the Ministry of Planning and Investment, the Ministry of Agriculture and Rural Development and affiliated units; staff working at Project Management Boards, construction contractors, consulting contractors, and supervision contractors of irrigation works using State budget capital in the Mekong Delta.

Sample

With a sample size of 348, it is enough to ensure the sampling principle according to Yamane (1967) and Rao (1985). The questionnaire was coded, entered using Excel, and processed using SPSS 20 for analysis.

4. Research results

Scale reliability results

Conducting a reliability test of the scales, the results showed that all factors had Cronbach's Alpha coefficients > 0.7, and the total correlation coefficients were all greater than 0.3. Therefore, the scales of the factors met the reliability requirements.

Table 1: Cronbach's Alpha test results

STT	Factors	Cronbach's Alpha
1	National conditions (DKTN)	0,927
2	Climate change (BDKH)	0,923
3	Politics, culture, society (CTVH)	0,871
4	Efficiency of irrigation development investment (HQ)	0,915

Results of exploratory factor analysis EFA

Table 2: KMO and Bartlett's test with independent variables

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.719
Bartlett's Test of Sphericity	Approx. Chi-Square	5932.315
	Df	78
	Sig.	.000

The results of the EFA exploratory factor analysis with independent variables in the research model gave quite good results. This is shown in the KMO coefficient = 0.719 corresponding to the significance level Sig = 0.000 < 5%. This result indicates that the results of the EFA exploratory factor analysis have high reliability. In addition, the total value of the extracted variance of the third factor and the convergence coefficient of eigenvalues of this factor are 79.539% > 50% and 2.411>1, respectively. In addition, the rotated matrix table of factors shows that the loading factors of the observed variables are all greater than 0.5. Thus, the factors after performing the EFA exploratory factor ensure the ability to represent the original survey data and are eligible to perform multivariate regression. Three factors were extracted after performing EFA analysis including: Natural conditions; Climate change; Politics, culture, society.

Correlation analysis results

Based on the correlation analysis results, we can see that the dependent factor of efficiency in irrigation development investment (HQ) has a positive correlation with the independent factors of natural conditions (DKTN); political, cultural and social factors (CTVH); and has a negative relationship with climate change (BDKH), which is shown by the Pearson correlation coefficient of these relationships being greater than 0. This strong relationship is highly desirable because it is the strong, linear relationships between the variables that explain the influence of the model results. Therefore, these independent variables can be included in the regression analysis to explain the influence on the results of the research model.

Regression analysis

Multiple linear regression results

The results of the model show that the adjusted R^2 is 0.416, which means that 41.6% of the variation in the dependent variable HQ is explained by the independent variables in the model. In addition, the results also show that the F test also gives a very small Sig. value, which proves that the research model is suitable for the data set being surveyed.

On the other hand, the independent variables DKTN, BDKH, CTVH are all statistically significant with a significant level of Sig. < 0.05.

The regression model results also show that the Tolerance coefficient is quite high (0.958 to 0.992), while the VIF variance inflation factor is low (from 1.008 to 1.044) less than 2.

On that basis, we can conclude that the relationship between these independent variables is insignificant and there is no multicollinearity phenomenon.

Table 3: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig. Zero-order	Correlations			Collinearity Statistics
		B	Std. Error	Beta			Partial	Part	Tolerance	VIF
1	Constant	3.067	.237		12.953	.000				
	DKTN	.214	.035	.254	6.053	.000	.365	.310	.248	.958
	BDKH	-.423	.037	-.483	- 11.538	.000	-.548	-.528	-.473	.959
	CTVH	.218	.039	.229	5.555	.000	.278	.287	.228	.992

From the results of the regression model, we can draw a multiple regression equation representing the relationship between the independent variables and the dependent variables as follows:

*HQ = 0.254*DKTN – 0.483*BDKH + 0.229*CTVH*

Multivariate regression model results: Based on the results of the multivariate regression analysis, it shows that there are 3 factors affecting the efficiency of irrigation development investment using state budget capital, including: (1) Natural conditions, (2) Climate change, (3) Political, cultural, and social factors. In which the factor "Climate change" has the greatest impact on the efficiency of irrigation development investment using state budget capital, with a regression coefficient of -0.483.

The results of the regression analysis show that the factors affecting the efficiency of irrigation development investment using state budget capital are as follows:

+ Natural conditions: The results of the regression analysis show a positive correlation between the factor "natural conditions" and "the efficiency of investment in developing irrigation infrastructure using state budget capital". The regression coefficient is 0.254, which means that under the condition that other factors remain unchanged, when the factor "natural conditions" increases by 1 unit, the efficiency of irrigation development investment using state budget capital will increase by 0.254 units.

+ Climate change: The regression analysis results show a positive correlation between the factor "climate change" and "efficiency of irrigation development investment using state budget capital". The regression coefficient is -0.483, which means that under the condition that other factors remain unchanged, when the factor "climate change" increases by 1 unit, the efficiency of irrigation development investment using state budget capital will decrease by 0.483 units.

+ Politics, culture, society: The regression analysis results show a positive correlation between the factor "politics, culture, society" and "efficiency of irrigation development investment using state budget capital". The regression coefficient is 0.229, which means that, assuming other factors remain constant, when the factor "politics, culture, society" increases by 1 unit, efficiency of irrigation development investment using state budget capital will increase by 0.229 units.

5. Conclusion

The article has studied the level of influence of 3 groups of factors: natural conditions; climate change; political, cultural and society factors. The results show that natural conditions and political, cultural, social factors all have a positive impact on the efficiency of irrigation development investment using state budget capital. This result is consistent with a number of previous studies in the field of investment in developing infrastructure (Cu Thanh Thuy, 2018; Nguyen Van Phuc, 2023). Climate change has a negative impact on the efficiency of irrigation development investment using state budget capital. This result is consistent with the study of Nguyen Tuan Anh et al. (2022). In particular, this study has shown that climate change has the strongest impact on the efficiency of irrigation development investment using state budget capital. Therefore, irrigation development investment using state budget capital in the Mekong Delta needs to take into account the impact of climate change and have solutions to respond to climate change in the coming time.

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VOCATIONAL TRAINING FOR WORKERS: A SOLUTION TO PROMOTE SUSTAINABLE RURAL DEVELOPMENT

PhD. Nguyen Thanh Thao*

Abstract: ***This article provides a comprehensive analysis of the current situation, root causes, and proposed solutions to improve the effectiveness of vocational training for workers, particularly in rural areas of Vietnam, in the context of economic restructuring toward sustainability and deeper international integration. The article identifies key shortcomings such as weak linkages between vocational institutions and enterprises, inconsistent training quality, inadequate infrastructure, and limited societal awareness of the role of vocational education. Accordingly, it proposes several core solutions: shifting the training mindset toward employment orientation, enhancing tripartite cooperation among the State, vocational institutions, and enterprises, integrating digital technology, strengthening the capacity of instructors, and prioritizing investment in disadvantaged areas. Vocational training for workers should be regarded as a long-term strategy to develop a comprehensive human resource base, ensure social security, and reduce regional disparities.***

• Keywords: *Vocational training; labor; rural areas; sustainable development; public policy.*

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1. Introduction

In Vietnam's ongoing process of industrialization and modernization, high-quality human resources are a critical determinant of national competitiveness and sustainable economic growth. As the country enters a new development phase driven by digital transformation, innovation, and productivity demands, improving workforce quality particularly in rural areas has become increasingly essential. Although rural workers make up roughly 65% of the national labor force (GSO, 2022), many remain concentrated in traditional agriculture, with limited vocational skills, low technical qualifications, and weak adaptability to labor-market shifts.

These constraints pose significant challenges for rural socio-economic development, contributing to low productivity, unstable incomes, and persistent poverty, while widening the gap between rural and urban regions. At the same time, the structural shift toward industry and services and the growing need for skilled labor further highlight rural workers' disadvantages when they lack appropriate vocational training (MOLISA, 2023).

Against this backdrop, vocational training for rural workers is not merely a short-term social intervention but a strategic, long-term approach to fostering sustainable development, reducing poverty, restructuring the rural economy, and building a more capable and equitable human resource base for Vietnam's future.

2. Current situation of vocational training for rural workers in Vietnam

2.1. Policies and strategic orientation

In the context of global integration and economic restructuring, the Communist Party and the Government of Vietnam identify human resource development particularly in rural areas as a strategic priority essential for new rural construction and sustainable development. To enhance national competitiveness and improve livelihoods, the Government has issued a series of major programs and policies, most notably the "Vocational Training for Rural Workers until 2020" Project under Decision No. 1956/QĐ-TTg (2009). As the first nationwide initiative dedicated to rural labor, Project 1956 sought to expand vocational skills, support sustainable livelihoods, and help workers adapt to a rapidly changing labor market.

Beyond technical training, the project incorporated career guidance, soft skills, and basic entrepreneurship education, contributing to a mindset of self-reliance and job creation within rural communities. According to MOLISA (2023), more than VND 11,000 billion in central funding was allocated during 2010-2020, underscoring strong governmental commitment. The project also established priority mechanisms such as tuition waivers, financial support, and localized or mobile training to ensure equitable access for vulnerable groups including women, the poor, ethnic minorities, persons with disabilities, and unemployed rural youth.

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Vocational training has since been integrated into national target programs on new rural development, sustainable poverty reduction, and ethnic minority advancement, creating positive spillovers for local socio-economic growth. Despite remaining implementation challenges, current policies reflect a long-term vision, a people-centered approach, and a strong orientation toward comprehensive human development in the new era.

2.2. Scale and structure of vocational training fields

Between 2016 and 2022, vocational training for rural workers expanded markedly, with over 5.2 million participants enrolled in programs under Project 1956 and related initiatives (GDVET, 2023). Around 70% pursued non-agricultural occupations such as garment technology, mechanics, electronics, household electricity, motorcycle repair, construction machinery operation, hospitality, tourism, and modern commerce demonstrating a clear shift from traditional production to higher value-added sectors aligned with industrialization and urban development. The remaining 30% received training in agriculture-related fields, including organic farming, bio-secure livestock breeding, aquaculture, seed production, and agricultural processing, highlighting the continued role of vocational training in supporting sustainable agricultural modernization.

Training structures vary by region, shaped by local economic characteristics and provincial development orientations. Delta and peri-urban areas increasingly prioritize non-agricultural training, whereas mountainous, island, or agriculture-dependent provinces focus more on agricultural skills. Recent years have also seen a rise in training in logistics, e-commerce, and community-based tourism, reflecting evolving labor market demands in modern rural contexts.

The Ministry of Labour, Invalids and Social Affairs (2023) notes a gradual shift from low-value traditional occupations toward skill-intensive, high-application fields offering stronger employability, entrepreneurship opportunities, and compatibility with digital transformation. This transition underscores the adaptability of the vocational education system and affirms the growing importance of vocational training in enhancing the competitiveness of rural workers amid a dynamic and rapidly changing labor market.

2.3. Effective local vocational training models

Recent years have seen the emergence of effective vocational training models closely tied to local economic development, marking a shift from supply-driven training to a "training for employment" approach. Several provinces have developed programs tailored to local strengths and labor market needs.

Dong Thap has applied a value chain-based model that combines classroom learning with hands-on training at cooperatives and links directly to product distribution networks. The model is particularly effective in VietGAP/GlobalGAP vegetable, short-term crop, and fruit production, enabling trainees to apply modern techniques and pursue household-based entrepreneurship immediately after training.

Quang Ninh has leveraged its tourism potential by offering training in community tour guiding, traditional food processing, and souvenir production, supported by modules on communication, marketing, and online sales. These programs are jointly implemented by local vocational centers, enterprises, and provincial authorities, ensuring clear employment pathways.

According to MOLISA (2023), these localized training models achieve post-training employment rates of 75-85%, significantly higher than the national average of about 65%. Many trainees have also become small-scale entrepreneurs or been recruited directly by partner enterprises (Nguyen & Tran, 2022). These outcomes demonstrate that when vocational training is aligned with local development strategies and involves multi-stakeholder collaboration, it enhances skills, encourages entrepreneurship, and strengthens rural labor adaptability in a rapidly evolving economy.

2.4. Challenges in disadvantaged areas

Although some localities have successfully aligned vocational training with local economic needs, many poor, remote, and socio-economically disadvantaged regions continue to face substantial constraints in program implementation. According to the General Directorate of Vocational Education and Training (2023), post-training employment rates in these areas remain low around 55-60%, well below the national average. Training courses are often organized based on planned quotas rather than market assessments, resulting in graduates who struggle to find suitable employment or work outside their trained occupations.

A key reason is the limited capacity of district-level vocational institutions, which frequently lack adequate infrastructure, standardized practice equipment, and qualified instructors particularly those able to provide mobile or flexible training suitable for rural residents. Centralized training delivery at district centers also poses travel and accommodation barriers for learners in remote communes, reducing participation even when financial support is offered.

The scarcity of enterprises in disadvantaged regions further weakens training effectiveness. With most businesses located in urban or industrial zones,

mechanisms such as enterprise-based training orders, internships, or post-training job placement are virtually absent. MOLISA (2023) reports that 38% of trainees in disadvantaged regions cannot apply their acquired skills or must shift to unrelated employment.

Regional disparities in investment also reinforce inequalities. Several northern mountainous provinces and Central Highlands districts still lack standard vocational training centers, and only a few have implemented livelihood-linked training models. This contributes to higher risks of post-training poverty relapse. Without targeted investment and stronger coordination among state agencies, enterprises, and social organizations, the gap in vocational training quality and outcomes between developed and disadvantaged regions will continue to widen undermining both educational equity and the efficient use of public resources.

2.5. Quality of training content and curriculum

The quality of training content and curricula remains a critical bottleneck in improving vocational training for rural workers. Many programs have not kept pace with rapid technological change and evolving occupational structures, with curricula still developed using traditional, infrequently updated approaches. As a result, training content is often outdated, overly theoretical, and insufficiently aligned with employer needs limiting learners' practical competencies at a time when the labor market increasingly values soft skills, digital literacy, and independent problem-solving.

MOLISA (2023) reports that 30-35% of vocational graduates work in jobs unrelated to their training, reflecting a persistent mismatch between training design and real-world demand, as well as inefficiencies in public investment. A survey by the Institute of Labour Science and Social Affairs (2022) across 12 provinces further shows that more than 40% of institutions use curricula older than five years, and only 27% involve businesses in program development contributing to significant skills gaps in fast-growing sectors such as high-tech agriculture, precision engineering, logistics, IT, and rural digital services.

In the context of national digital transformation and the transition toward a green economy, vocational programs must integrate new competencies such as smart equipment operation, agricultural management software, e-commerce for farm products, low-emission farming techniques, and sustainable agribusiness start-up skills. However, many institutions lack qualified instructors, updated materials, and flexible financing mechanisms to implement such modernization.

When training fails to reflect labor market needs, learners face reduced employment opportunities, and businesses bear additional retraining costs creating a negative cycle that erodes confidence in the long-term effectiveness of the vocational education system.

2.6. Gender and access to training

Gender inequality in access to vocational education remains a persistent barrier affecting the overall effectiveness of rural training policies. Despite Vietnam's legal commitment to equal educational opportunities, women especially in rural areas continue to participate less in technical and non-traditional fields. UN Women (2021) reports that only 32% of female trainees enroll in highly technical occupations such as industrial electricity, mechanics, IT, or construction, while most remain concentrated in lower-income service-oriented sectors like garment making, beauty care, childcare, and food processing.

This disparity is driven by gender-stereotyped career choices, rigid training schedules incompatible with women's household and caregiving responsibilities, and the limited availability of programs tailored to women's needs particularly those of ethnic minority women. MOLISA (2022) shows that only 38% of rural women join livelihood-support training, nearly 20 percentage points lower than men in the same age group.

Rural youth, who generally possess greater digital adaptability and entrepreneurial aspirations, are also not sufficiently prioritized. Many vocational programs remain generic and do not differentiate by gender, age, information access, or learning readiness. International evidence indicates that when women and youth receive equitable and appropriate access to vocational training, they enhance not only their own productivity but also generate broader community benefits through improved learning behavior, consumption patterns, and participation in local value chains.

The underutilization of women and rural youth thus represents a significant limitation in rural human resource development. This calls for stronger gender mainstreaming and targeted support across all stages of vocational education from curriculum design and program delivery to post-training assistance.

2.7. Social perceptions and attitudes toward vocational training

A major intangible barrier to the effectiveness of vocational training in rural areas is the enduring mindset of "valuing academic degrees over vocational skills." This perception strongest among rural families leads many parents and students to prioritize university pathways, even though many graduates struggle to secure stable or relevant employment. A GDVET (2023) survey shows that 61% of secondary students receive no family encouragement to pursue vocational

training, and about 45% of parents still view vocational qualifications as inferior to university degrees.

Consequently, many rural vocational institutions fail to meet enrollment targets, forcing programs to shrink or close despite incentives such as tuition exemptions, scholarships, or job placement guarantees. In some cases, students enroll only to obtain certificates, rather than genuine interest in skilled occupations. These outdated perceptions are also found among local officials, educators, and employers limiting recognition of vocational education as a legitimate source of skilled labor.

This mindset persists even as the economy shows rising demand for technically skilled workers. Rural areas constitute nearly 65% of the population (GSO, 2022), yet vocational enrollment accounts for only 10-12% of high school graduates annually far below labor market needs (World Bank, 2021). The result is a significant underutilization of rural labor potential.

Such perceptions also weaken local training policies and reduce the attractiveness of enterprise-linked or entrepreneurship-oriented models. Without strong communication strategies, career counseling, and sustained awareness-raising efforts, vocational training is unlikely to achieve its intended impact, regardless of policy design or resource allocation.

3. Underlying causes of existing limitations

Despite notable progress, vocational training for rural workers in Vietnam continues to face significant quantitative and qualitative constraints, rooted in systemic issues ranging from policy gaps to implementation weaknesses and persistent societal biases.

A key limitation is the lack of regional coordination and strategic alignment. Many localities develop training programs in a fragmented, administrative manner rather than based on labor market assessments. The Institute of Labour Science and Social Affairs (2022) indicates that up to 40% of district-level programs are not informed by labor market surveys, resulting in poor alignment between training content and employment opportunities.

Human resource capacity within vocational institutions also remains inadequate. Commune- and district-level centers often lack qualified instructors and maintain outdated facilities that do not meet practical training requirements. According to GDVET (2023), only 37% of district-level vocational and continuing education centers possess practice workshops meeting national standards.

Policy support is likewise fragmented and short-term. Subsidies for learners and institutions lack continuity, while limited and often delayed funding reduces the incentive for centers to upgrade curricula or invest in modern equipment. These financial and administrative bottlenecks impede effective training delivery.

Equally important is the weak coordination among local authorities, training institutions, and enterprises. Although demand-driven and enterprise-linked models are widely promoted, actual collaboration remains limited. The World Bank (2021) reports that only about 25% of Vietnamese enterprises partner with vocational institutions far below the ASEAN middle-income average of 40% leading to weak curriculum relevance and low graduate absorption.

Finally, deeply rooted social perceptions continue to undervalue vocational education. Many families still view university as the primary path to upward mobility, contributing to low enrollment in vocational pathways and a shortage of mid-level skilled workers, while simultaneously placing undue pressure on higher education.

4. Solutions to improve the effectiveness of vocational training for rural workers

In the context of Vietnam's pursuit of sustainable development and deep integration into the global economy, improving the effectiveness of vocational training for rural workers is not merely a social policy but a long-term strategic measure to ensure equity, job creation, and productivity growth. Achieving this goal requires the synchronized and consistent implementation of various solutions concerning institutions, training models, resource investment, and changes in societal perceptions.

First and foremost, there is a need to renew the mindset and approach to vocational training. Training programs should not be limited to equipping learners with basic skills but should aim to prepare them for sustainable employment and enhance their adaptability to the labor market. This calls for the development of training curricula based on thorough labor market assessments tailored to each region, sector, and time period. According to the Ministry of Labour, Invalids and Social Affairs (2023), only about 42% of vocational education institutions conduct regular labor market surveys, resulting in a misalignment between training and recruitment needs.

Second, the "three-house" model Government - Schools - Enterprises needs to be institutionalized and effectively operationalized. Enterprises should play a central role in placing training orders, participating in curriculum development, and offering internship opportunities. Lessons from Germany a country renowned for its dual vocational training model

demonstrate that over 60% of training time is conducted in enterprises, enabling learners to simultaneously study, work, and adapt to real-world environments (GIZ, 2023). In Vietnam, pilot partnerships between vocational schools and garment or mechanical enterprises in provinces like Bac Ninh and Binh Duong have shown initial success and should be scaled up nationwide.

Third, digital technologies should be boldly applied to vocational training, especially in rural, remote, and disadvantaged areas where access to education remains limited. Developing open educational resources, online classes, and blended learning models can help reduce costs, expand access, and enhance flexibility for learners. Particularly for emerging fields such as smart agriculture, agricultural e-commerce, and basic digital literacy, integrating modern content is crucial to prevent rural workers from being left behind in the national digital transformation process.

Fourth, investment in training infrastructure, equipment, and instructor capacity must be treated as a pivotal factor. According to the General Directorate of Vocational Education and Training (2022), nearly 60% of district-level vocational centers lack standard practice labs, while many instructors lack hands-on technical skills and have not been trained in updated teaching methods. Policies are therefore needed to provide retraining, in-depth professional development, and rotational teaching assignments that enhance practical competencies, connect with businesses, and incorporate new technologies.

Last but not least, raising public awareness particularly among rural youth about the practical value of vocational training is essential. Vocational education must be perceived as a legitimate and promising career development path, capable of generating stable and high income, rather than being viewed as a "second-best" option. Communication campaigns should aim to inspire, showcase success stories of vocational graduates, and provide comprehensive information on labor market trends, employment opportunities, and government support mechanisms. A report by UNESCO (2022) also emphasizes that building a positive image of vocational education is a key determinant in increasing enrollment and reducing social prejudice.

5. Conclusion

Vocational training for rural workers plays a pivotal role in the process of agricultural economic restructuring, new rural development, and the promotion of social equity. It is not merely a solution for enhancing technical skills, improving labor productivity, and increasing rural incomes it also serves as a crucial driver that enables Vietnam to achieve its sustainable development goals, narrow regional disparities, and enhance the overall quality of its national human resources. In a society increasingly governed by a modern market economy and influenced by globalization, digital transformation, and automation, equipping rural workers with practical vocational skills and adaptive capacities is a strategic and urgent requirement.

However, the current state of vocational training in rural areas reveals numerous limitations, ranging from policy design to implementation. Training programs often do not align with actual labor market needs, lack effective linkages with enterprises, suffer from inadequate teaching capacity, and remain undervalued in social perception all of which undermine the effectiveness of vocational training efforts. These challenges demand a systematic and learner-centered approach, one that is guided by labor market trends and aims for broader social impact.

Therefore, moving forward, the government must continue to refine vocational education policies toward greater flexibility, efficiency, and equity; significantly increase investment in rural training infrastructure especially in poor districts and disadvantaged communes; encourage enterprise involvement in the training process; and intensify communication efforts to shift societal attitudes about the value of vocational training. Vocational training for rural workers must no longer be viewed as a short-term administrative program, but rather as a long-term human resource development strategy one that is deeply embedded in the economic restructuring process and the broader vision of comprehensive human development in the new era.

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CYBERSECURITY RISKS IN DIGITAL BANKING OPERATIONS IN VIETNAM: CURRENT SITUATION AND SOLUTIONS

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Abstract: ***In the era of Industry 4.0, cyberspace offers limitless potential for global integration and socio-economic development. However, cybersecurity risks have become a primary concern for internet users, particularly in the financial and banking sectors. As banks undergo digital transformation toward a fully digital banking model in the future, the application of digital technology brings numerous opportunities but also significantly increases the risk of cybercrime attacks. Therefore, effectively managing cybersecurity risks in digital banking operations in Vietnam has become an urgent matter. This paper provides a comprehensive overview of cybersecurity risks and their impacts on digital banking activities in Vietnam. It also clarifies the challenges in managing such risks and proposes several groups of solutions based on three main pillars: Processes, Technology, and People, along with compliance solutions related to cybersecurity risk prevention principles.***

• Keywords: *cybersecurity risks, cybercrime, digital banking.*

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1. Introduction

In recent years, cybercrime has escalated both in scale and sophistication. Reports from the FBI and international cybersecurity organizations show that cyberattacks surged sharply during and after the COVID-19 pandemic, with several types of attacks increasing by more than 300% and causing substantial economic losses globally. Cybersecurity Ventures estimates that global damages reached USD 6 trillion in 2021 and may rise to USD 10.5 trillion by 2025 levels comparable to the world's third-largest economy.

Within this landscape, the financial-banking sector remains one of the most attractive targets, as nearly 70% of financial institutions worldwide have experienced cyberattacks. IBM's 2023 Cost of Data Breach Report also ranks banking among the sectors with the highest loss magnitude, reflecting the industry's heavy reliance on digital platforms and continuous exposure to sophisticated threats.

Vietnam faces similar pressures. Although the number of recorded attacks fluctuates, the country consistently ranks among the most targeted in Southeast Asia. Data from the Ministry of Information and Communications show that over 95% of reported online fraud cases in the first half of 2023 were related to banking and finance. The National Cybersecurity Monitoring Center also detected thousands of attacks on information systems, many involving impersonation of banks or the creation of fraudulent websites.

As banks accelerate digital transformation to enhance operational efficiency and customer experience, their exposure to cyber risks deepens. Threats range from data breaches and unauthorized access to scams directly targeting customers through social engineering or falsified online interfaces.

Against this backdrop, this paper examines cybersecurity risks and their implications for digital banking operations in Vietnam. It identifies key shortcomings in current risk-management practices and proposes a set of solutions grounded in three core pillars processes, technology, and people together with recommendations to strengthen governance and compliance in line with cybersecurity risk-prevention principles.

2. Cybersecurity risks and digital banking activities

2.1. Cybersecurity risks

Cybersecurity risks, or cyber risks, refer to threats arising from the operation of information technology (IT) that negatively affect the confidentiality, availability, or integrity of an organization's technology or information systems (Cebula & Young, 2010). In simpler terms, cybersecurity risks are the potential for loss or damage resulting from breaches or attacks on an organization's IT systems, leading to technical infrastructure damage or misuse of digital technologies (Moyo, 2022).

In recent years, cybersecurity risks have garnered increasing attention from organizations worldwide. According to a 2023 survey by DTCC, cybersecurity

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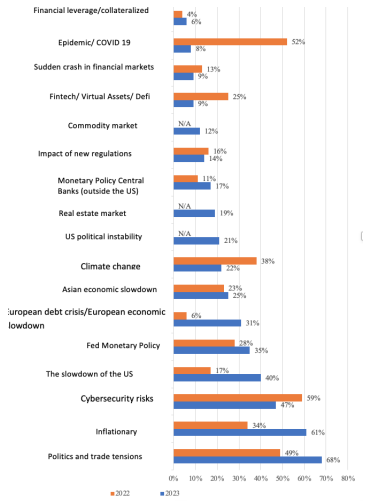
risk ranks among the top concerns threatening global financial system stability second only to political risks and trade tensions, and inflation risks (Figure 1).

Figure 1. Systemic risks affecting global financial system stability



Source: DTCC Survey (2023)

(*Note: Percentage indicates respondents who identified each factor as one of the top 5 systemic risks affecting financial system stability globally*)

2.2. Cybersecurity risks in the financial and banking sector

Due to the nature of the industry, where operations rely heavily on IT infrastructure, the financial and banking sector is one of the most attractive targets for cybercriminals. The number of malware attacks targeting banks and financial institutions surpasses all other industries, and attack methods are becoming increasingly sophisticated (Darem et al., 2023). Examples of major cyberattacks on banks and financial systems include (Aldasoro et al., 2021; Bouveret, 2018; Rojas Rincón et al., 2024):

- *Summer 2014:* Seven of the largest banks in the United States were compromised by four hackers who exploited the Heartbleed vulnerability and distributed advanced malware to infiltrate systems. At JPMorgan alone, the attackers accessed personal data of over 76 million individuals and 7 million businesses, including names, addresses, phone numbers, emails, and internal user-related data.

- March 2016: A hacker group infiltrated the systems of Bangladesh Bank and obtained credentials to execute financial transfers. Nearly 30 fraudulent transfer requests were sent to the Federal Reserve Bank of New York, directing funds from Bangladesh Bank's account to recipients in the Philippines and Sri Lanka. Four of these transfers succeeded, totaling USD 81 million. The fifth was halted due to a typo in the recipient's name.

2.3. Digital banking activities and development trends in Vietnam

Driven by the Fourth Industrial Revolution, digital transformation in banking has accelerated as institutions modernize operations to remain competitive and responsive to rapid technological change. Digital banking, as noted by Skinner (2014) and Sharma & Dubey (2022), represents a model in which core banking activities are carried out on digital platforms, extending far beyond traditional internet banking. It requires strong technological capabilities and the integration of advanced tools such as AI, big data, RegTech, APIs and modern digital infrastructure. In essence, a digital bank functions as a "branchless" institution, operating fully online and providing continuous 24/7 services.

In Vietnam, digital transformation has become a central strategic direction across the banking sector. Banks are simultaneously digitizing customer-facing services and internal processes, adopting technologies such as big data analytics, cloud computing, RPA, AI and blockchain to enhance efficiency and customer experience. Alongside technology investment, core banking systems and IT infrastructure are being upgraded to improve safety, resilience and scalability. Cybersecurity has also become a priority area, given its direct influence on service quality and customer trust.

By the end of 2023, two main models of digital banking development had emerged in Vietnam. The first is the transformation of traditional banks through multi-channel digital platforms, seen at institutions such as BIDV, Vietcombank, Techcombank and MB. The second combines this transformation with the creation of standalone digital banks, exemplified by TPBank's LiveBank and VPBank's digital ecosystems such as Yolo, Cake and VPBank NEO.

2.4. Impacts of cybersecurity risks on digital banking operations in Vietnam

Cybercrime involves illegal activities conducted through intermediary computers in cyberspace. In the banking sector, cybercrimes commonly include illegal access (hacking and cracking) and fraudulent or deceptive activities such as phishing and data theft (Douglas et al., 2000; WALL, 2001).

According to the Asia-Pacific Computer Emergency Response Teams (APCERT), between 2013 and 2022, cyberattacks in Vietnam including phishing, defacement, and malware rose from 6,000 cases in 2013 to a peak of 134,000 in 2016. Although attacks dropped significantly in 2018 (about 10,000 cases) and 2019 (over 5,000), they began to rise again in 2020 and continued increasing in 2022 (APCERT, 2022).

Table 1. Number of cybersecurity incidents in Vietnam (2013-2022)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Incidents	6,214	19,786	15,177	134,375	13,382	9,666	5,176	11,382	10,774	12,694

Source: APCERT Report

Over 50% of cyberattacks in Vietnam target financial institutions (Vietnam Information Security

Association). Data from the Ministry of Information and Communications shows that in the first half of 2023, over 4,000 fraud reports were filed, with over 95% concerning the banking and finance sector.

The deeper banks engage in digital transformation, the higher the cybersecurity risk and associated financial losses (Phuong & Dien, 2021). According to the Ministry of Public Security's Cybersecurity Department, cybersecurity incidents in 2020 caused losses of around VND 100 billion (~USD 4 million), including one targeted bank that lost VND 44 billion (~USD 1.8 million) to hackers.

Attack methods have become increasingly diverse and sophisticated. These include:

(1) Data theft from banks, customer accounts, and credit card information

(2) Email phishing to steal login credentials

(3) Exploiting security loopholes to gain unauthorized administrative access

(4) Attacking databases and hijacking systems to steal funds

With a young population and a high internet penetration rate, Vietnam is well-positioned to promote digital transformation and digital banking (Thanh & Dung, 2022). However, these advantages also come with considerable challenges, particularly in preventing fraud and scams. These include data breaches, defaced or hacked websites, unauthorized transactions causing asset losses, and scams impersonating bank staff or creating fake websites to defraud customers.

In conclusion, digital banks in Vietnam face significant cybersecurity risks. All three key stakeholders banks, partners, and customers are potential targets for cybercriminals. The increasing frequency and sophistication of cyberattacks on Vietnamese banks underscore the urgent need for effective cybersecurity risk management to protect the development of digital banking in the country.

3. Challenges facing banks in cybersecurity risk management

In the financial sector, cyberattacks are six times more frequent than in other sectors, although the average cost per incident tends to be lower. This is largely attributed to tighter regulatory oversight and stronger governance mechanisms to address cyber risks (Aldasoro et al., 2020). For banks, cybersecurity risk accounts for only 0.2% of total operational losses. However, the frequency of such risks is increasing, and the estimated impact on bank revenues may range from 0.2% to 4.2% (Aldasoro et al., 2020; Bouveret, 2019). These figures emphasize the importance of improved system defense and risk mitigation strategies, although banks still face significant challenges in cybersecurity risk management, including:

Procedural challenges

Many banks have yet to establish synchronized and effective cybersecurity risk management processes. In particular, they lack standardized response scenarios for information security incidents and structured procedures to minimize the negative impacts of cyberattacks. Additionally, processes for assisting customers who suffer cybersecurity breaches are often incomplete, leading to a decline in customer trust in digital banking services.

Technological challenges

Despite efforts to invest in IT infrastructure and promote digital transformation toward a comprehensive and secure digital banking model, such investments remain fragmented and outdated. Many banks still rely on legacy systems that lack advanced features for detecting anomalies and preventing cyber incidents. As a result, cyberattacks on the banking sector, particularly on digital banking platforms, continue to rise.

Moreover, cybersecurity risk also arises from how technology is used by external stakeholders, including vendors and customers. Many of the banks' third-party partners do not prioritize cybersecurity. For example, customers may be targeted through promotional emails or SMS messages sent by outsourced marketing service providers. Additionally, many customers are unaware of the importance of protecting their personal information. Such data can be captured through online transactions and subsequently exploited by cybercriminals.

A common vulnerability is the reuse of identical passwords across multiple online services. This practice creates an entry point for hackers to breach multiple accounts and steal sensitive data (Nguyen et al., 2021). Cybercriminals may also use malware embedded in free software or social media platforms to extract private information and commit online fraud, including the illegal sale and exploitation of stolen data.

Human resource challenges

Cybersecurity risk management is inherently complex. It not only requires technical expertise from involved personnel but also necessitates a deep understanding of information security practices. Although many banks have started appointing high-level officers such as Chief Information Security Officers (CISOs) to oversee cybersecurity matters, there remains a significant shortage of qualified professionals in this field.

As technology evolves, cybersecurity strategies and practices must also adapt to proactively identify and address new threats and vulnerabilities. This requires a strong combination of technical knowledge, regulatory compliance, and a commitment to ongoing development of cybersecurity personnel. The goal is not only to defend against threats but to foster

organizational resilience in a constantly evolving digital environment.

4. Solutions to mitigate cybersecurity risks in digital banking operations in Vietnam

Based on the existing challenges in cybersecurity risk management, this section proposes a set of solutions built around three core pillars Processes, Technology, and People along with associated compliance principles, as follows:

Process-Oriented Solutions for Cybersecurity Risk Management

These solutions emphasize the design and implementation of systematic risk management procedures to help banks identify and assess threats, plan prevention strategies, and prepare effective response mechanisms in case of incidents.

According to a global cybersecurity risk management report by Deloitte, only 42% of surveyed respondents rated their organizations as "effective" or "very effective" in managing cyber risks (APCERT, 2022). The report also highlights several common challenges faced by banks and financial institutions, including:

(i) insufficient budgeting for cybersecurity risk management,

(ii) vulnerabilities in legacy core systems and the difficulty of integrating new security tools,

(iii) legal and regulatory constraints regarding information sharing and the lack of standardized cybersecurity risk management frameworks.

Based on these insights, a cybersecurity risk management process may include the following stages (Thuy et al., 2021):

Step 1: Risk Identification

This step involves:

(i) identifying critical assets (information, data) and prioritizing them;

(ii) identifying potential threats to these assets;

(iii) identifying vulnerabilities that may be exploited by such threats.

Step 2: Risk Impact Assessment

Assessing the likelihood and potential consequences of each risk, including cost implications. This assessment informs management decisions on appropriate risk mitigation strategies.

Step 3: Risk Evaluation and Prioritization

Determining whether each risk falls within the bank's acceptable risk tolerance level. This stage involves describing the severity of each risk to determine the level of action required and prioritizing risks to allocate resources efficiently. A combination of qualitative (e.g., low-medium-high levels) and quantitative (e.g., probabilities and potential losses) methods may be used.

Step 4: Risk Response Strategy

Based on the evaluation, banks may choose to:

(1) Mitigate the risk;

(2) Accept the risk;

(3) Avoid the risk;

(4) Transfer the risk (e.g., via insurance or outsourcing).

Step 5: Risk Monitoring

Regularly reviewing control measures to ensure they remain appropriate in the face of evolving cyber threats.

Technology-Oriented Solutions

Technology plays a crucial role in determining the effectiveness of cybersecurity efforts. The use of advanced technologies enables banks to enhance the efficiency of process implementation and compliance monitoring, reduce the time needed to detect risks, and accelerate response times during incidents. Moreover, automation facilitates real-time reaction and remediation of security breaches.

However, investing in advanced cybersecurity technologies requires significant capital, as well as a synchronized approach to IT infrastructure development. Therefore, banks should evaluate and select technologies based on three key criteria:

(1) speed of threat detection,

(2) speed of incident response,

(3) recovery time.

Accenture Security (2022) emphasizes that effective cybersecurity risk management strategies are built on modern security tools and techniques. Two technologies receiving the highest ratings from global banks for cybersecurity investment are:

- Artificial Intelligence (AI)

- Security Orchestration, Automation, and Response (SOAR)

Although Blockchain is often cited as a promising solution due to its distributed structure, consensus-based verification, encrypted data, and transparency, its application must be approached with caution. This is because the technology still carries unpredictable risks, such as software encryption errors or threats arising from external data sources that may open new attack vectors.

Human-Centered Solutions

Regardless of how advanced a bank's technology or security protocols may be, cybersecurity will always be vulnerable to human factors. Therefore, it is critical to strengthen awareness and foster a cybersecurity culture within the organization through the following measures:

Internal Staff Training

Bank employees serve as the first line of defense against cyber threats. Raising staff awareness about data protection and equipping them with knowledge of common cyber risks is essential. Training programs should cover:

(1) responsibilities related to banking data;

(2) documentation and reporting procedures;

(3) password usage and unauthorized software risks;

(4) safe internet and email practices;

(5) social engineering attacks, online fraud, phishing, and safe web browsing.

Customer Education

Banks should actively promote cybersecurity awareness among customers to help them protect personal information. Training and education can be delivered through multiple channels, such as:

(1) official bank websites;

(2) social media platforms;

(3) alerts and safety tips on account protection. These efforts not only reduce the risk of cyber incidents but also increase customer trust in how the bank safeguards their data.

Compliance with Preventive Principles

In addition to the core pillars, commercial banks must strictly adhere to the following preventive principles to ensure comprehensive cybersecurity protection (Kay et al., 2021):

(1) Employ multi-layered security defenses instead of relying on a single security solution

(2) Perform regular data backups to mitigate losses from data breaches or system failures

(3) Continuously update software and systems to patch security vulnerabilities

(4) Integrate biometric authentication into security protocols

(5) Respond promptly to cyberattacks to minimize damages

(6) Raise awareness among employees and customers regarding cybersecurity threats

(7) Routinely review and update the bank's security strategies

(8) Develop a comprehensive incident response plan for cyberattacks

Lastly, as Vietnamese banks aim to become fully digital in the ongoing transformation process, Pearlson et al. (2020), in their case study of C6 Bank in Brazil, proposed a cybersecurity policy framework for digital banks based on five functional groups:

(1) defense group,

(2) technical group,

(3) governance group,

(4) application safety group, and

(5) cybersecurity culture group.

Additionally, cybersecurity risks should be managed under the three-lines-of-defense model, which includes: the operational process layer, the risk control and compliance assurance layer and the internal audit layer.

5. Conclusion

In the context of accelerating digital technology adoption in the Vietnamese banking sector, cybersecurity risk represents one of the most critical challenges to the transformation and development of digital banking. It is considered a vital issue that significantly influences the success of comprehensive digital transformation across Vietnam's banking system. This paper has provided a comprehensive overview of cybersecurity risks, the current landscape of digital banking development in Vietnam, and an analysis of the impacts of cyber risks on digital banking operations. It has also identified major challenges in cybersecurity risk management currently faced by banks. To mitigate these risks, banks must adopt a comprehensive set of solutions focused on three core pillars: processes, technology and people. Furthermore, to operationalize these solutions effectively, banks need to adhere strictly to cybersecurity risk governance principles while simultaneously building a structured cybersecurity risk management process and cultivating a cybersecurity-aware organizational culture. By doing so, banks will be better positioned to prevent and minimize the threats posed by cybersecurity risks in both general banking activities and digital banking operations in particular within Vietnam.

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THE EFFECT OF WORKPLACE FLEXIBILITY ON EMPLOYEE ENGAGEMENT IN THE TOURISM AND HOSPITALITY INDUSTRY THE MODERATING ROLE OF TRANSFORMATIONAL LEADERSHIP

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Abstract: ***The importance of workplace flexibility in fostering employee engagement has gained significant attention, particularly in the dynamic context of the tourism industry's human resource management. This study examines the influence of four dimensions of workplace flexibility (working time flexibility, workspace flexibility, functional flexibility, and operational flexibility) on employee engagement, specifically focusing on the moderating role of transformational leadership. The study utilized a structured online questionnaire, completed by 400 employees from tourism enterprises. Data were analyzed using SPSS 22, employing regression and moderation analyses. The findings indicate that all four dimensions of workplace flexibility exhibit significant positive relationships with employee engagement. Additionally, transformational leadership significantly moderates these relationships, enhancing the positive impact of workplace flexibility on employee engagement. This study offers practical implications for tourism managers seeking to enhance workforce engagement through flexible practices and effective leadership strategies, while providing valuable insights into the scholarly understanding of workplace flexibility and employee engagement in the tourism sector.***

• Keywords: *workplace flexibility, employee engagement, transformational leadership, tourism industry.*

JEL codes: L83, M12, Z32

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1. Introduction

The tourism and hospitality industry relies on workplace flexibility to improve work-life balance, well-being, and job satisfaction (Kossek et al., 2015). Flexibility, encompassing working time, workspace, functional, and operational dimensions, enhances organizational efficiency, particularly during disruptions like pandemics. Flexible arrangements foster autonomy and employee engagement, but mismanaged flexibility, such as excessive remote work, may lead to burnout, disengagement, and turnover, reducing productivity (Lee et al., 2024). Limited research explores flexibility's impact on engagement in this sector, especially under transformational leadership, which promotes motivation, innovation, and goal alignment through inspirational and supportive practices (Ullah et al., 2021). Such leadership mitigates flexibility challenges, like work-life conflicts, via trust and communication, vital in high-pressure service settings (Asad et al., 2021).

This study investigates how four flexibility dimensions affect employee engagement in tourism, moderated by transformational leadership. It aims to guide HR strategies for organizational efficiency and sustainability (Lee et al., 2024). Using Conservation of Resources Theory (Hobfoll, 1989), Transformational Leadership Theory (Bass, 1985), and Social Exchange Theory (Blau, 2017), it explains how leadership enhances resources and employee-employer relations to boost engagement. The study offers empirical insights for tourism, where engagement impacts service quality, and practical recommendations for leveraging leadership to optimize flexibility, ensuring employee well-being and organizational resilience (Davidescu et al., 2020).

2. Literature review

2.1. Theory background

This study examines the influence of workplace flexibility on employee engagement in the tourism and hospitality sector, with transformational leadership serving as a moderator, grounded in Conservation of Resources (COR) Theory (Hobfoll, 1989), Transformational Leadership Theory (Bass, 1985), and Social Exchange Theory (Blau, 2017). COR Theory posits that workplace flexibility, such as adjustable schedules, restores resources like time and energy, reducing stress and enhancing engagement in the high-pressure tourism sector (Beigi et al., 2018). Transformational Leadership Theory suggests that leaders, through inspiration and individualized consideration, align employee goals with organizational objectives, thereby amplifying the benefits of flexibility by fostering autonomy and

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commitment (Krishnan, 2005). Social Exchange Theory suggests that flexibility fosters reciprocal obligations, leading to increased employee support and engagement, which is further strengthened by transformational leadership's trust-building efforts (Blau, 2017). This framework highlights the role of flexibility in enhancing engagement, moderated by transformational leadership in a dynamic industry.

2.2. Employee engagement

Employee engagement (EE), defined by vigor, dedication, and absorption, encompasses job engagement (role dedication) and organizational engagement (organizational commitment) (Saks, 2006). Engaged employees exceed job requirements, driving organizational success (Mercer, 2008). In tourism and hospitality, engagement reflects positive attitudes toward organizational values, enhancing service quality and effectiveness (Bin, 2015). Human resource practices, including training, rewards, and information sharing, foster engagement (Bin, 2015). Supportive work environments, positive relationships, competitive pay, and adequate supervision further enhance engagement, while negative perceptions reduce it (Robbins & Judge, 2013). Factors like gender, age, and education influence engagement levels. Aligning strategies with employee needs is critical for fostering engagement in this sector.

2.3. Hypothesis development

Workplace flexibility is vital for attracting talent, enhancing motivation, productivity, and engagement, and ultimately improving organizational performance in the tourism and hospitality sectors (Govender et al., 2018). Flexible arrangements enable a better work-life balance, reducing turnover and absenteeism while boosting performance during disruptions, such as the COVID-19 pandemic (Davidescu et al., 2020). Flexibility, involving control over work location, timing, and methods, fosters job satisfaction and productivity (Rastogi et al., 2018; Davidescu et al., 2020). This study examines working time, workspace, functional, and operational flexibility.

Working time flexibility, such as flextime and compressed workweeks, reduces commuting time and work-life conflict, thereby decreasing stress and absenteeism in the tourism and hospitality industry (Rastogi et al., 2018). COR Theory suggests it preserves resources like time and energy, enhancing engagement (Hobfoll, 1989).

H1: Working time flexibility positively impacts employee engagement.

Workspace flexibility, including control over personalization and environmental factors (e.g., temperature, lighting), as well as options like flex offices, reduces work-life conflict and enhances engagement (Roskams & Haynes, 2020; Davidescu et al., 2020). COR Theory posits that it provides resources, such as autonomy and comfort, which mitigate stress (Hobfoll, 1989).

H2: Workspace flexibility has a positive impact on employee engagement.

Functional flexibility, involving multi-skilling and task diversification, enables employees to adapt to varied roles, enhancing job variety and engagement (van den Berg & van der Velde, 2005). COR Theory suggests that it provides resources, such as skill development and stress reduction (Hobfoll, 1989).

H3: Functional flexibility positively impacts employee engagement.

Operational flexibility enables autonomous task management, which reduces turnover intentions, work-family conflict, and stress, while improving overall well-being (Greenhaus & Powell, 2006). Social Exchange Theory suggests it fosters reciprocal engagement through trust (Blau, 2017). Result-Only Work Environments prioritize performance, supporting flexibility (Govender et al., 2018). Transformational leadership amplifies the impact of flexibility on engagement (Ullah et al., 2021; Asad et al., 2021).

H4: Operational flexibility positively impacts employee engagement.

Moderating Effect of Transformational Leadership

Working time flexibility, such as flexible hours or compressed workweeks, enhances engagement by improving work-life balance and reducing stress (Hill et al., 2008). Transformational leaders amplify this by inspiring employees to align personal and organizational goals, strengthening engagement (Bakker & Demerouti, 2008). Workspace flexibility, like remote or hybrid work, boosts engagement by offering autonomy and reducing commuting stress (Allen et al., 2013). Transformational leadership moderates this through individualized consideration, preventing isolation and aligning employees with organizational goals (Purvanova & Bono, 2009). Functional flexibility enhances engagement through skill development and job enrichment (Karatepe, 2013). Transformational leadership amplifies this by fostering intellectual stimulation and goal alignment (Avolio et al., 2004). Operational flexibility empowers proactive responses to disruptions, enhancing engagement (Deery & Jago, 2015). Transformational leadership moderates this by framing changes as opportunities for innovation (Bass & Riggio, 2006).

H5: Transformational leadership moderates the relationship between working time flexibility and employee engagement.

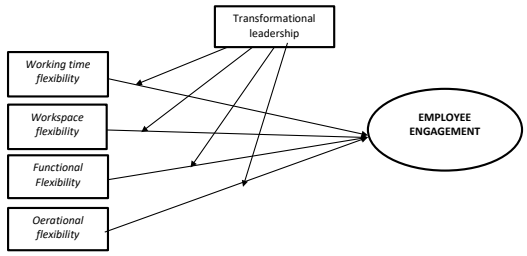
H6: Transformational leadership moderates the relationship between workspace flexibility and employee engagement.

H7: Transformational leadership moderates the relationship between functional flexibility and employee engagement.

H8: Transformational leadership moderates the relationship between operational flexibility and employee engagement.

We present a proposed research model based on the hypotheses above in Figure 1

Figure 1. The proposed research model



3. Research methods and materials

3.1. Sample and data collection

This study on the impact of workplace flexibility on employee engagement in Vietnam's tourism and hospitality industry collected 400 surveys from 450 diverse employees. For this research, the rules of Hoàng & Chu (2008) are applied. The online survey, conducted from March 1 to May 1, 2025, was distributed via email and social media. An online survey was conducted from March 1 to May 1, 2025, and distributed via email, social media, and various communication platforms. Participants completed the questionnaire using a link provided. The collaboration between the researcher and alumni, who assisted in distributing the survey, facilitated the process. The study was further streamlined because many alumni from the Faculty of Tourism and Hotels at the University of Commerce are currently employed in the tourism industry. These alumni consistently supported the research by dedicating time to respond to the survey questions. Ultimately, 400 completed surveys were successfully collected, providing a substantial dataset for analysis with a high response rate.

3.2. Instrument development

The statements regarding the factors of working time flexibility, workspace flexibility, functional flexibility, operational flexibility, and employee engagement were measured using a 5-point Likert scale, ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree." In this study, the measurement scales for these variables were adapted from previous research. Specifically, the independent variables were measured as follows: working time flexibility (3 items), workspace flexibility (6 items), functional flexibility (5 items), operational flexibility (5 items), and employee engagement (9 items). All measurement scales were appropriately adapted from the study by Lee et al. (2024). Additionally, the moderating variable transformational leadership was developed based on the research by Carless et al. (2000), utilizing seven items.

4. Results

4.1. Demographic profile

Table 1: Demographic and organizational characteristics

Category	Subcategory	Frequency	Percentage (%)
Gender	Male	185	46.25
	Female	215	53.75
Years of Experience	< 2 years	60	15
	2–5 years	198	49.5
	> 5 years	142	35.5
Business Establishment	Before 2000	75	18.75
	2000–2010	145	36.25
	After 2010	180	45

Table 1 shows that the sample consists of a slight majority of female respondents (53.75%), indicating a balanced yet slightly female-dominated workforce. Most employees (49.5%) have 2-5 years of experience, suggesting a moderately experienced group, while the majority of businesses (45%) were established after 2010, reflecting a trend toward newer organizations in the sector.

4.2. Reliability and validity of constructs

Table 2: Descriptive statistics and cronbach's alpha

	Cronbach's Alpha	Mean	Standard Deviation
WTF	0.712	3.8633	.61919
WF	0.831	4.0621	.55293
FF	0.849	3.8940	.61049
OF	0.829	3.9855	.58063
TL	0.887	3.9471	.57835
EE	0.898	3.848	.62351

Table 2 indicates that the constructs (WTF, WF, FF, OF, TL, EE) exhibit good to excellent reliability (Cronbach's Alpha ranging from 0.712 to 0.898), with mean values between 3.848 and 4.0621 and low standard deviations (0.55293 to 0.62351), reflecting consistent data and moderate to high evaluations. WF shows the highest mean and lowest variability, while EE demonstrates the highest reliability.

Table 3: Rotated component matrix

	Component			
	1	2	3	4
WF4	.787			
WF1	.742			
WF2	.724			
WF6	.709			
WF3	.700			
WF5	.646			
FF4		.794		
FF5		.793		
FF1		.782		
FF3		.777		
FF2		.714		
OF2			.787	
OF1			.757	
OF4			.750	
OF3			.740	
OF5			.724	
WT1				.803

	Component			
	1	2	3	4
WT2				.761
WT3				.721

Extraction method: Principal component analysis.

Table 3 shows reliability test and EFA. It can be seen that Cronbach's Alpha of all constructs ranged from .646 to .803 (all > 0.6), hence, these constructs were reliable, and factors loadings were loaded into their own constructs.

4.3. Regression Analysis

Table 4: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
		B	Std. Error	Beta			Tolerance
1	(Constant)	.522	.142		3.662	.000	
	OF	.309	.027	.395	11.501	.000	.838
	FF	.230	.025	.309	9.122	.000	.858
	WF	.251	.029	.306	8.682	.000	.793
	WTF	.083	.026	.113	3.237	.001	.814

R Square: 0.610
F: 154.536

Source: SPSS calculation

Table 4 shows that the regression model has a strong fit ($R^2 = 0.610$, $F = 154.536$, $p < .001$), with OF ($\beta = .395$, $p < .001$), FF ($\beta = .309$, $p < .001$), WF ($\beta = .306$, $p < .001$), and WTF ($\beta = .113$, $p = .001$) all significantly predicting the outcome.

4.4. Moderation Analysis

Table 10 summarizes the regression results examining the direct and moderating effects of four flexibility variables (Operational Flexibility, Functional Flexibility, Workspace Flexibility, and Working Time Flexibility) on Employee Engagement, with Transformational Leadership (TL) as a moderator.

Table 5: Moderating effects of transformational leadership on flexibility variables and employee engagement

Model Summary (OF, TL, EE)						
R	R-square	MSE	F	df1	df2	p
.6167	.3803	.1286	81.0061	3.0000	396.0000	.0000
Model						
	Coefficient	SE	t	p	LLCI	ULCI
Constant	3.9905	.0180	221.6960	.0000	3.9551	4.0258
OF	.4612	.0315	14.6627	.0000	.3994	.5231
TL	-.0327	.0312	-1.0453	.2965	-.0941	.0288
Int_1	.1499	.0637	2.3522	.0192	.0246	.2752
Conditional effects of the focal predictor at values of the moderator(s)						
TL	Effect	SE	t	p	LLCI	ULCI
-.5784	.3745	.0523	7.1557	.0000	.2716	.4774
.0000	.4612	.0315	14.6627	.0000	.3994	.5231
.5784	.5479	.0442	12.3898	.0000	.4610	.6349
Model Summary (FF, TL, EE)						
R	R-square	MSE	F	df1	df2	p
.538	.289	.147	53.673	3.000	396.000	.000
Model						
	Coefficient	SE	t	p	LLCI	ULCI
Constant	3.989	.019	207.288	.000	3.952	4.027
FF	.378	.032	11.783	.000	.315	.441
TL	-.040	.033	-1.200	.231	-.106	.026
Int_1	.125	.060	2.084	.038	.007	.243
Conditional effects of the focal predictor at values of the moderator(s)						
TL	Effect	SE	t	p	LLCI	ULCI
-.578	.306	.051	5.945	.000	.205	.407
.000	.378	.032	11.783	.000	.315	.441
.578	.451	.043	10.544	.000	.367	.535
Model Summary (WF, TL, EE)						
R	R-square	MSE	F	df1	df2	p
.551	.304	.144	57.666	3.000	396.000	.000
Model						
	Coefficient	SE	t	p	LLCI	ULCI
Constant	3.992	.019	209.421	.000	3.955	4.029
WF	.393	.036	10.771	.000	.321	.464
TL	-.049	.033	-1.474	.141	-.114	.016
Int_1	.242	.071	3.420	.001	.103	.382
Conditional effects of the focal predictor at values of the moderator(s)						
TL	Effect	SE	t	p	LLCI	ULCI
-.578	.252	.063	4.002	.000	.128	.376
.000	.393	.036	10.771	.000	.321	.464
.578	.533	.045	11.798	.000	.444	.622
Model Summary (WTF, TL, EE)						
R	R-square	MSE	F	df1	df2	p
.436	.191	.168	31.070	3.000	396.000	.000
Model						
	Coefficient	SE	t	p	LLCI	ULCI
Constant	3.995	.021	194.058	.000	3.955	4.036
WTF	.273	.038	8.199	.000	.208	.339
TL	-.035	.036	-.994	.321	-.105	.035
Int_1	.266	.062	4.271	.000	.144	.389
Conditional effects of the focal predictor at values of the moderator(s)						
TL	Effect	SE	t	p	LLCI	ULCI
-.578	.119	.051	2.345	.000	.020	.219
.000	.273	.033	8.199	.000	.208	.339
.578	.427	.048	8.982	.000	.334	.521

Source: SPSS calculation

Table 5 summaries for the models (OF, FF, WF, WTF with TL and EE) show R-square values ranging from 0.191 to 0.380, with significant overall model fits ($F(3, 396)$ from 31.070 to 81.006, $p < .001$). The effects of OF ($B = .461$, $SE = .032$, $t = 14.663$, $p < .001$), FF ($B = .378$, $SE = .032$, $t = 11.783$, $p < .001$), WF ($B = .393$, $SE = .036$, $t = 10.771$, $p < .001$), and WTF ($B = .273$, $SE = .033$, $t = 8.199$, $p < .001$) on the outcome are statistically significant, with positive impacts. Significant interaction effects (Int_1) between each predictor and TL ($p < .05$) indicate that TL moderates these relationships, with conditional effects varying across TL levels. *Thus, all hypotheses (H1, H2, H3, H4, H5, H6. H7, H8) were supported.*

5. Discussion

5.1. General discussion

This study examines the influence of workplace flexibility on Employee Engagement (EE) in the tourism and hospitality industry, with Transformational Leadership (TL) serving as a moderator. Findings reveal that Operational Flexibility (OF), Functional Flexibility (FF), Workspace Flexibility (WF), and Working Time Flexibility (WTF) significantly enhance EE, with OF showing the strongest effect. These findings align with prior research emphasizing the role of flexible work arrangements in improving engagement, autonomy, and well-being in service-oriented sectors (Kossek et al., 2015; Lee et al., 2024). TL significantly moderates these relationships, particularly for WTF, by fostering a supportive culture, aligning employee and organizational goals, and mitigating work-life balance conflicts (Avolio & Bass, 2004; Asad et al., 2021). The regression model explains 60.6% of EE variance, highlighting the

synergistic effect of flexibility dimensions. Hospitality managers should implement flexible policies adaptive operations, role versatility, workspace options, and time management while promoting TL to enhance engagement and organizational resilience.

5.2. Theoretical implications

This research advances human resource management and organizational behavior literature by integrating the Conservation of Resources (COR) Theory, Transformational Leadership Theory, and Social Exchange Theory. COR Theory is extended by demonstrating that flexibility (e.g., adjustable schedules, workspaces) reduces stress and enhances engagement, which is amplified by TL's motivational resources (Hobfoll, 1989). Transformational Leadership Theory is reinforced, as inspirational motivation and individualized consideration strengthen the flexibility-engagement link, fostering commitment and innovation (Bass, 1985). Social Exchange Theory is supported, with flexibility creating reciprocal obligations, enhanced by TL's trust-building, leading to higher engagement (Blau, 2017). Reliable constructs (Cronbach's Alpha > 0.6, KMO > 0.5, variance explained > 50%) provide a robust foundation for future flexibility and leadership research.

5.3. Practical implications

Workplace flexibility boosts EE, with TL as a critical moderator. Hospitality organizations should adopt flexible practices (operational adaptability, role adjustments, workspace designs, and time management) to enhance engagement and productivity. TL development programs, emphasizing inspirational motivation and individualized support, can maximize the benefits of flexibility, particularly for working time arrangements that address work-life balance (Ullah et al., 2021). Managers should train leaders and design tailored, flexible policies to reduce turnover and enhance service quality, thereby fostering a sustainable competitive advantage in the tourism and hospitality sectors.

5.4. Limitations and future research

This study has limitations. Self-reported survey data may introduce common method bias or social desirability effects; future research should use multi-source or longitudinal data (Kossek et al., 2015). Other moderators, such as organizational culture or job autonomy, were unexplored and warrant further investigation. The sample, collected from Vietnam's tourism and hospitality industry (March 1 to May 1, 2025) using a convenience sample of 400 participants via alumni networks, limits generalizability. Online survey distribution may exclude less tech-savvy employees, introducing bias. Future studies should employ diverse, randomized samples across regions and mixed-method designs to enhance robustness.

6. Conclusions

This study highlights the impact of workplace flexibility on Employee Engagement in tourism and hospitality, moderated by Transformational Leadership. Operational, Functional, Workspace, and Working Time Flexibility positively influence EE, explaining 60.6% of its variance, with TL enhancing these effects, particularly for WTF (Avolio & Bass, 2004; Asad et al., 2021). Grounded in COR Theory, Transformational Leadership Theory, and Social Exchange Theory, the findings underscore flexible practices and leadership as key drivers of engagement (Hobfoll, 1989; Bass, 1985; Blau, 2017). Hospitality organizations should invest in flexible policies and TL training to foster an engaged workforce, enhancing service quality, efficiency, and sustainability.

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BRAND AUDIT: A STRATEGIC TOOL FOR ASSESSING BRAND POSITIONING IN THE MARKET

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Abstract: ***Brand audit is a fundamental strategic tool used to evaluate a brand's market position, performance, and perception among consumers. The concept of brand audit has evolved significantly since its early usage in the 20th century, originating as a financial assessment tool before expanding into a comprehensive evaluation framework integrating marketing, consumer perception, and strategic brand management. This paper explores the key components of brand audits, research topics related to them, and how to conduct brand auditing.***

• Keywords: *brand audit, brand management, market position.*

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1. Introduction

A brand audit is a comprehensive diagnostic process that assesses how a brand is perceived in the market, helping organizations identify strengths, weaknesses, and opportunities to enhance brand equity. The formal foundations of brand auditing stem from Aaker's (1991) brand equity framework and Keller's (2001) Customer-Based Brand Equity (CBBE) model, which offer structured approaches to evaluating brand health. Regular brand audits allow firms to adapt their strategies to changing consumer preferences and technological advancements (Keller, 2013).

In the digital era, brand audits have evolved to incorporate advanced analytics, artificial intelligence (AI), social media engagement, and CSR indicators. Digital brand audits help assess online sentiment, user-generated content, and real-time consumer behavior, while CSR and sustainability metrics reflect the growing importance of ethical and responsible branding (Kumar & Christodoulopoulou, 2014). These tools are essential in an environment where brand reputation can shift rapidly due to product issues or public relations crises.

Brand audits also support internal brand alignment by revealing gaps between intended identity and actual image across departments and touchpoints. This is crucial for large organizations or those undergoing restructuring or expansion. Beyond the private sector, educational institutions, nonprofits, and government agencies increasingly conduct brand audits to strengthen stakeholder trust, improve visibility, and guide strategic communication.

Furthermore, brand audits play a strategic role in decisions related to repositioning, brand extensions, and mergers or acquisitions by determining the compatibility of brand equities and identifying risks. With branding now functioning as a two-way interaction between firms and consumers, audits must examine engagement, advocacy, and digital community behavior.

Sustainability and social impact have also become integral components of modern brand audits, reflecting consumer expectations for transparency and ethical practices. Evaluating ESG activities, CSR initiatives, and third-party certifications helps organizations understand whether their values resonate with target audiences.

In sum, a brand audit has transitioned from a periodic marketing exercise to a strategic management tool that integrates internal evaluation, market intelligence, consumer psychology, and digital analytics. This paper explores the theoretical foundations, methodological approaches, and practical applications of brand audits to provide a comprehensive understanding of their role in contemporary brand management.

2. Methodology

This study adopts a scoping review methodology to map and synthesize existing literature on brand auditing. A scoping review is particularly appropriate for broad research areas with diverse methodologies, conceptual definitions, and applications across different contexts (Arksey & O'Malley, 2005; Levac, Colquhoun, & O'Brien, 2010). Given the multidisciplinary nature of brand audits spanning marketing, strategic management, consumer behavior, and digital transformation this methodological approach enables a comprehensive exploration of the field.

2.1. Research design

The review follows the five-step framework proposed by Arksey and O'Malley (2005), refined by Levac et al. (2010).cThe objective is to understand how

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brand audit is conceptualized, which methodologies are employed, and how the practice is evolving in both academic and applied domains.

2.2. Research questions

This review is guided by the following questions:

RQ1: What theoretical frameworks are most commonly used to guide brand audit research?

RQ2: What are the predominant methodological approaches in brand auditing studies?

RQ3: How have brand audits been applied across sectors (e.g., corporate, education, non-profit)?

RQ4: What are the emerging trends in digital and AI-enabled brand audit methodologies?

2.3. Search strategy

An initial exploratory search was conducted in March 2024. The following databases were systematically searched: Google Scholar. The search term included: "brand audit". The search was limited to peer-reviewed journal articles, books, and conference proceedings published between 2021 and 2024 in English.

2.4. Inclusion and exclusion criteria

To ensure quality and relevance, inclusion and exclusion criteria were established. Inclusion criteria: Peer-reviewed articles, book chapters, or conference papers; Publications written in English; Research focused on brand audit frameworks, tools, models, or applications; Studies including methodological descriptions. Exclusion criteria: Trade magazine articles, news sources, or blog content; Publications lacking methodological clarity or without theoretical basis; Duplicates or inaccessible full texts

A total of 56 documents were initially identified. After title and abstract screening, 23 documents were selected for full-text review. Ultimately, 10 studies were retained for structured synthesis based on rigorous application of the above criteria.

2.5. Data extraction and coding

A standardized data extraction form was developed and pilot-tested using a subset of five studies. The form included fields for: Publication year; Author(s); Theoretical framework applied (e.g., Aaker's model, Keller's CBBE); Methodological approach (qualitative, quantitative, mixed-methods); Sectoral application (e.g., corporate, education, nonprofit); Country or region of focus; Key findings and implications

2.6. Synthesis and analysis

The extracted data were analyzed using thematic synthesis, a method suitable for aggregating findings from heterogeneous sources (Thomas & Harden, 2008). Themes were generated both deductively (based on research questions) and inductively (emerging patterns across studies). A final set of four core thematic areas were identified: Theoretical foundations: Dominant branding models used in audits; Audit methodology: Research tools and data collection techniques; Sector-specific implementation: Application contexts and stakeholder perspectives; Digital transformation and innovation: Use of AI, social listening, and data analytics

This thematic organization supports a narrative synthesis that presents trends, gaps, and implications across the literature.

3. Results

3.1. What theoretical frameworks are most commonly used to guide brand audit research?

Brand audit research is primarily guided by classic brand management frameworks from Aaker (1991), Kapferer (2008), and Keller (2001). Aaker's Brand Equity model comprising brand awareness, associations, loyalty, and perceived quality remains widely applied due to its clear structure, although it has been critiqued for limited relevance to digital environments (Christodoulides & de Chernatony, 2010). Kapferer's Brand Identity Prism offers a holistic view of brand identity across six facets but is used more in conceptual analysis than large-scale empirical audits due to its qualitative orientation. Keller's Customer-Based Brand Equity (CBBE) model emphasizes consumer perceptions and brand resonance, making it suitable for audits focused on sentiment and loyalty, though it tends to prioritize emotional aspects over functional or data-driven measures.

Recent studies extend these traditional models by integrating stakeholder theory, institutional branding, and AI-enabled metrics, reflecting a shift toward more dynamic, data-informed audit approaches (Suhardi et al., 2022; Brandão & Sousa, 2022).

A comprehensive brand audit typically includes two components. Brand Inventory examines internal brand elements visual identity, messaging, digital presence, and trademark protection to ensure consistency and strategic alignment. Brand Exploratory evaluates consumer perceptions and brand experiences through surveys, interviews, social media analytics, and emerging techniques such as neuromarketing and sentiment analysis. Together, these components provide a balanced assessment of how brands are communicated and how they are perceived in the marketplace.

3.2. What are the predominant methodological approaches in brand auditing studies?

Brand auditing studies deploy a mix of qualitative, quantitative, and hybrid methodologies depending on the objectives and contexts.

Qualitative methods such as focus groups, in-depth interviews, and thematic content analysis are often used

to explore internal brand understanding and customer perceptions. For instance, cultural and higher education institutions, such as museums or universities, prefer ethnographic methods and stakeholder interviews to evaluate internal coherence (Baumgarth et al., 2016).

Quantitative approaches dominate in corporate brand audits. These include large-scale surveys measuring awareness, loyalty, and perception; statistical tools like Structural Equation Modeling (SEM); and digital tracking metrics. Suhardi et al. (2022) used SEM to evaluate brand salience in an academic program, while Staisch (2007) utilized structured consumer surveys to assess L'Oréal's market position and perception.

Hybrid designs are increasingly favored. Valparaiso University's audit (Pinar et al., 2011) combined survey data, digital engagement metrics, and competitor benchmarking. Similarly, Chandon (2004) outlines mixed-method audit templates combining visual audits, survey data, and managerial interviews.

Moreover, content analysis of user-generated content (e.g., reviews, forums) is gaining traction as an indirect yet rich data source for brand audits especially in digital consumer environments.

3.3. How have brand audits been applied across sectors (e.g., corporate, education, non-profit)?

The purpose of a brand audit is to thoroughly evaluate a brand's health and market position to identify its strengths, weaknesses, and opportunities for growth. A brand audit helps in multiple ways, particularly refining the brand strategy. This diagnostic tool evaluates the brand's performance, identifying areas that require enhancement or change. This allows companies to align their marketing plan with their overall business strategy and objectives, ensuring that every marketing initiative contributes effectively to the brand's growth. Also, a brand audit plays a critical role in increasing brand awareness. This identifies the most effective channels and strategies to reach the target audience, enhancing the brand's visibility and recognition. Incorporating a brand audit into the company culture, external branding, and marketing plan is essential for sustained growth and competitiveness (TMDesign, 2024).

In general, there are a lot of purposes of brand audits. The author compiles purposes of brand audits based on the results of previous studies.

Brand audits have shown high adaptability across sectors, tailored to unique stakeholder needs and brand architectures. Numerous case studies and sectoral applications reinforce the growing importance and adaptability of brand audits in modern strategic management.

In the corporate sector, brand audits typically focus on customer-brand relationships, product-level associations, and competitive positioning. L'Oréal's audit emphasized brand familiarity and emotional connection (Staisch, 2007), while Unilever integrates sustainability and AI-based sentiment analysis to monitor brand performance (INSEAD, 2023).

Table 1: Key purposes of a brand audit

Key purposes	Meanings
Assess brand health	A brand audit provides a comprehensive evaluation of a brand's current position in the market, acting as a tool to gauge its overall health and discover the source of its brand equity.
Identify strengths and weaknesses	It helps a company understand its brand's strengths and weaknesses, which informs where improvements are needed and which elements are working well.
Enhance brand consistency:	By reviewing all brand touchpoints (website, social media, advertising, etc.), an audit ensures the brand's message, values, and visual identity are consistent across all platforms.
Measure and align with the target audience	It determines if the brand resonates with its target audience, ensuring it is aligning with customer needs and values, and can identify if demographics have changed.
Analyze the competition	A brand audit examines competitors' strategies to identify opportunities and ensure the brand remains competitive in the market.
Inform strategic decisions	The insights gained from an audit are used to make data-driven decisions about restructuring marketing strategies, messaging, and brand identity.
Position for growth	It helps identify gaps in the market, new opportunities, and areas for growth, allowing a business to position itself for future success.
Gain customer insights	Audits gather data on customer perception and sentiment, providing a clear view of how the brand is being received and where improvements can be made.

Source: Compiled by the author

In the education sector, brand audits are used to strengthen institutional identity and student engagement. Valparaiso University and Ashesi University conducted multi-stakeholder audits involving students, parents, and alumni to refine positioning strategies and enhance international reach (Pinar et al., 2011; Silantoi Olting'idi, 2017).

In cultural institutions, brand audits help assess visibility, emotional connection, and brand coherence across exhibitions and community engagement. The BAC model (Baumgarth et al., 2016) applied in German museums demonstrated how structured branding assessments can improve donor confidence and visitor loyalty.

In non-profit and public sectors, although fewer in number, brand audits help organizations build credibility and donor trust. These audits typically focus on stakeholder trust, communication clarity, and alignment with mission (Zozul`ov et al., 2022).

The sectoral applications show that while the core audit logic remains consistent evaluating awareness, positioning, and consistency the metrics, stakeholders, and tools vary significantly by context.

Despite these promising developments, brand audits face key challenges. Data complexity and interpretation remain critical issues. Rust et al. (2019) note that without clear frameworks, interpreting large-scale consumer data can lead to misleading conclusions or brand misalignment. Rapid market shifts, driven by technological disruption and evolving consumer

preferences, require continuous auditing rather than one-time evaluations (Gielens & Steenkamp, 2019).

Another concern is subjectivity in stakeholder perception. As noted by Keller (2013), brand identity exists differently in the eyes of customers, employees, and investors thus requiring multi-stakeholder audit designs. Moreover, privacy regulations (e.g., GDPR, CCPA) have narrowed the scope for passive data collection, prompting a rise in consent-based surveys and anonymized AI models to maintain compliance.

In response, many organizations now employ hybrid audit methodologies, combining qualitative and quantitative tools. Brand auditing today involves a diverse set of methodologies that transcend traditional marketing research, incorporating both qualitative depth and quantitative rigor, enhanced by technology-driven innovation.

(1) Qualitative Approaches

In-depth interviews remain one of the most effective tools for understanding how internal and external stakeholders perceive a brand. These interviews, conducted with customers, employees, executives, and even suppliers, uncover rich narratives around brand meaning, trust, and emotional connection (Kapferer, 2008; Baumgarth et al., 2016). For example, in the audit conducted by Baumgarth et al. (2016) on cultural institutions, interviews helped reveal how donors and visitors interpreted the museum's identity differently, leading to improved alignment in future campaigns.

Digital ethnography adds another layer, allowing researchers to observe consumer behaviors and interactions with a brand in natural digital settings. This is especially useful for youth - or lifestyle-driven brands whose identity is co-created by user-generated content (Kozinets, 2020). In academic branding, ethnographic analysis of student social media content revealed how unofficial symbols and memes influenced brand perception more than formal campaigns (Suhardi et al., 2022).

Social listening tools enable passive but rich data collection. These systems monitor forums, social media, blogs, and reviews to uncover public sentiment and brand associations in real time. This method is invaluable for brands managing crisis communication or seeking to track competitor mentions (Gensler et al., 2013). Nike and Tesla are known for using real-time listening to identify shifts in public mood and respond within hours an impossible feat through traditional surveys (Zhao et al., 2023).

(2) Quantitative Approaches

Quantitative methods are essential for measuring brand awareness, perception, and loyalty across large populations. Brand tracking surveys whether administered quarterly or annually provide time-series data on key metrics such as aided/unaided recall, brand preference, and loyalty intent (Chandon, 2004; Aaker, 1991).

The Net Promoter Score (NPS) has become a staple indicator, measuring customers' likelihood to recommend a brand. While simplistic, it serves as a powerful proxy for satisfaction and loyalty, especially when tracked over time across demographic segments (Reichheld, 2003).

Clickstream data analysis is becoming a core method in digital brand audits. By examining user behavior on websites and apps what pages they visit, how long they stay, what paths they follow brands can infer interest, friction points, and emotional reaction (Wedel & Kannan, 2016). When combined with heatmaps and bounce-rate data, clickstream metrics reveal whether the digital brand experience is fulfilling its promise.

For example, INSEAD's case note on brand audit (Chandon, 2004) recommends combining survey data with behavioral metrics such as time spent on product pages or engagement with branded video content, offering a more complete view of brand salience.

(3) Technology-enhanced tools

The frontier of brand audit methodology lies in AI-powered tools and biometric feedback mechanisms.

AI-based emotion recognition uses facial analysis, voice tone, or written language cues to detect user emotions in response to brand content. These tools are now used in focus groups or UX testing, where emotional responses to logos, taglines, or packaging are automatically coded and analyzed (Cambria et al., 2022).

Biometric feedback such as heart rate, skin conductance, and brainwave tracking is used in neuromarketing studies to gauge subconscious reactions (Plassmann et al., 2012). Brands like Pepsi and Unilever have used such tools in limited test environments to optimize ad length, music choice, and color palette based on measured arousal and attention.

Eye-tracking technology provides insight into what visual elements consumers focus on and how quickly they process them. For branding, this helps refine packaging, signage, and even web interfaces to ensure key brand cues are seen and understood (Wedel & Pieters, 2008). For example, eye-tracking studies on in-store shelf displays revealed that some brand elements were consistently overlooked, prompting design repositioning.

The combination of traditional brand theory (Aaker, Kapferer, Keller) with new digital methods represents a synthesis trend across brand audit results. Each brand context corporate, educational, cultural requires tailored frameworks. However, across all contexts, key elements emerge consistently: clarity of

identity, stakeholder alignment, emotional resonance, and digital visibility. These findings affirm that brand audits are no longer static tools but dynamic, data-rich diagnostic systems that empower brands to proactively manage perception, identity, and strategic growth.

3.4. What are the emerging trends in digital and AI-enabled brand audit methodologies?

Recent years have witnessed the rapid integration of AI, machine learning (ML), and real-time analytics into brand audit processes. These technologies expand both the scale and depth of analysis, particularly in dynamic digital environments.

AI-based sentiment analysis tools now allow brands to track customer emotion and polarity across vast amounts of online content. For instance, the Dynamic Brand Topic Model (dBTM) proposed by Zhao et al. (2023) helps brands track how customer concerns and praise evolve over time, with topic-specific sentiment.

Social media listening platforms like Brandwatch, Sprinklr, and Hootsuite have been embedded in brand audits to assess brand mentions, hashtag performance, influencer reach, and public sentiment. Brands like Nike and Tesla rely on real-time dashboards that flag positive or negative spikes in reputation, allowing proactive response.

Blockchain technology is also being employed, especially in luxury sectors. LVMH uses blockchain to verify product authenticity and preserve brand integrity, integrating transparency into the brand narrative and reducing counterfeit-related damage (INSEAD, 2023).

Another major shift is the rise of interactive dashboards for internal brand reporting. Tools like Tableau and Power BI are now customized for brand audit reporting, offering visual summaries of key brand health indicators, often in real time. Digital audits increasingly include sustainability and ESG metrics. For example, Unilever's brand audit incorporates environmental impact assessments and ethical sourcing data into brand health tracking demonstrating a broader shift toward "responsible brand audits. These trends suggest a future where brand audits are not just retrospective evaluations but predictive, AI-powered systems embedded in continuous brand monitoring.

4. Conclusion

For many businesses, its brand is its greatest asset. An effective brand represents a company's vision, mission and personality, and these work together best when they're clear to the customer. An audit helps companies evaluate their internal and external branding through customer surveys, data analytics and competitive review (Indeed, 2025). Brand audits are essential for organizations seeking to strengthen their market positioning and enhance consumer engagement. By integrating traditional methodologies with AI-driven analytics, businesses can gain deeper insights into their brand performance. Companies such as Tesla, Unilever, and LVMH exemplify the benefits of leveraging advanced auditing techniques to maintain competitive advantage. Future research should explore the ethical implications of data-driven brand audits and further refine methodologies to incorporate evolving technological innovations.

5. Limitation

Brand audit, despite its strategic importance, faces several limitations that impact its effectiveness. One major challenge is data complexity and interpretation, as vast amounts of consumer data can be misinterpreted, leading to inaccurate strategic decisions (Rust et al., 2019). Additionally, rapid market evolution makes it difficult to maintain an up-to-date brand audit, requiring continuous monitoring to keep pace with shifting consumer preferences and technological advancements (Gielens & Steenkamp, 2019). Another limitation is the subjectivity in brand perception, as different stakeholders including consumers, management, and competitors often have varied views on a brand, making it challenging to establish a unified brand identity (Keller, 2013).

Furthermore, privacy and ethical concerns pose significant obstacles, with data protection laws such as GDPR and CCPA limiting the scope of digital brand audits, reducing the depth of consumer insights. An overemphasis on digital metrics can also be problematic, as AI-driven analytics may overlook traditional brand engagement and emotional connections with consumers. Lastly, while AI can enhance brand sentiment analysis, it cannot fully replace human expertise, which remains crucial for contextual interpretation. These limitations highlight the need for a balanced approach, integrating AI-driven analytics with qualitative insights to achieve a comprehensive brand audit.

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FACTORS IMPACTING THE IMPLEMENTATION OF ENVIRONMENTAL AUDITING IN VIETNAM

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Abstract: ***This research paper explores the key factors influencing the implementation of environmental audits in a developing economy as Vietnam. By applying stakeholder theory and using semi-structured interviews with 55 participants, the study confirms that both external and internal factors play a significant role in influencing the implementation of environmental audits in Vietnam. Research indicates that the main factors driving environmental audits include: (1) Legal and regulatory pressure, (2) Requirements of international markets and customers, (3) Goals of energy conservation, emission reduction, and operational efficiency, and (4) Reputation, social responsibility, and long-term sustainable development goals. The study emphasizes the need for more detailed guidelines, voluntary incentive mechanisms, and a standardized training system to enhance environmental auditing in Vietnam.***

• Keywords: *environmental auditing, environment.*

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1. Introduction

Human intervention toward the environment has caused a series of tremendous impacts, including the following: air pollution, water contamination, loss of biodiversity, and climate change. Amongst these pressing environmental issues, environmental auditing has become a fundamental tool in assessing and monitoring humanity's impacts toward the environment. Environmental auditing promotes transparency, sustainability, and responsible resource use, supporting economic growth and community wellbeing. Therefore, implementing environmental audits to encounter the effect of environmental challenges, it is important to ensure natural resources preservation and the quality of life (Ferreira et al., 2024).

As a developing country, Vietnam's economic growth heavily depends on industrial production and the exploitation of natural resources and minerals. Vietnam is among the ten countries most severely affected by climate change. Although environmental auditing has been present in Vietnam since 2001, it remains a relatively new issue, primarily conducted by the State Audit Office of Vietnam (SAV). However, the scope of environmental auditing remains limited and lacks comprehensive supervision from higher-level authorities. Businesses often lack guidance, direction, and awareness, and there is a noticeable absence of strong, deterrent penalties.

The objectives of this study are to identify factors impacting the implementation of environmental audit at companies in Vietnam. From there, this paper is also intended to assist Vietnamese lawmakers by providing insights and suggestions to help them gain a more comprehensive perspective to improve and enhance environmental audit in Vietnam.

2. Literature review

2.1. Overview of environmental auditing

The Confederation of British Industry (1990) defines an environmental audit as the systematic examination of the interactions between a business and its environment, including compliance and environmental impact assessment. It represents a comprehensive and strategic approach to evaluating and managing the environmental aspects of an organization's operations. (CBI, 1990 cited in Paramasivan 2002, p. 149).

According to Buckley (1991), environmental auditing serves as management tool, involving systematic, documented, periodic and objective evaluation on performance of the management system with the purpose of: minimizing and preventing waste, ensuring compliance with environmental regulations, supporting managerial oversight of environmental operations, and enhancing the disclosure of environmental information.

The International Chamber of Commerce (ICC) also defines as a structured and impartial process

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involving a systematic, documented, periodic, and objective evaluation of an organization's environmental framework, management, and equipment perform with the primary aim of. This process primarily seeks to support managerial control over environmental practices and assess the organization's adherence to internal policies and legal obligations.

The International Organization for Standardization (ISO) also proposes environmental auditing's definition as: part of the ISO 14000 series on environmental management as: It is a systematic, documented, periodic, and objective review of environmental activities, management systems, or practices, carried out through a rigorous process. This process is intended to collect and evaluate evidence related to specific environmental objectives or claims, determine the extent of compliance with established criteria, and report the findings to the appropriate audience.

ISO 14010 presents general principles applicable to all types of environmental audits, includes: (i) scopes and objectives are being clearly defined; (ii) objectivity, independence, and competence of an auditors; (iii) due diligence; (iv) systematic procedures for conducting audits; (v) use of audit criteria, collection of audit evidence, and documentation of findings; (vi) reliable audit findings and conclusions; and (vii) reports on audit results.

Similarly, ISO 14011/1 introduces procedures for conducting environmental audits. Key components involve defining the audit objective; outlining the roles, responsibilities, and auditor's task, client, and auditee; conducting audit processes; and reporting the results. ISO 14012 outlines necessary qualifications of environmental auditors, including education background and experience, training, skills and contribution, auditing proficiency, professional care, as well as language and communication skills (Roy, 2002).

Middle East Gases Association (2015), environmental audits consists of 3 following ideas: (1) Members of Self-assessment team are selected from the employees within enterprise, operating unit, or specific departments being audited; (2) Internal audit team members are also chosen inside the firm, the operating unit, or the department being audited. However, in some cases, having representatives from the audited unit on the audit team may be beneficial. Therefore, they should not serve as the team leader; (3) External audit team members are recruited from outside the organization, such as consultants. However, the team may be supported by staff from the organization such as enterprise employees, operating unit personnel, or department heads who act as guides and advisors.

In the Vietnam context, Environmental Protection Law 2020 introduced provisions on environmental audit to regulate business establishments' internal audit activities by themselves or through services provided by Independent audit firms. The Law on Environmental Protection 2020 provides a broad and comprehensive definition of environmental auditing for production, business, and service establishments: "a systematic and comprehensive review and evaluation of the effectiveness of environmental management and pollution control at production, business, and service establishments." The main contents include: (1) The use of energy, chemicals, raw materials, and imported scrap as production inputs; (2) The evaluation of pollution control measures and waste management practices

2.2. Stakeholder theory and environmental audit

Stakeholder Theory asserts that organizations have responsibilities not only to their shareholders but also to all parties who are affected by or can influence the organization's actions. These stakeholders have a legitimate right to understand how the company utilizes social and natural resources, and how its operations impact them. Organizations today operate in complex ecosystems where both internal and external stakeholders exert significant influence over corporate behavior, especially in shaping disclosure and accountability practices. These stakeholders, driven by their respective interests and stakes, hold a legitimate right to know how a company utilizes social and natural resources, aligning business operations with broader standards of transparency, sustainability, and ethical responsibility.

Internal Stakeholders

- *Employees and Managers:* As direct participants in business operations, employees depend on the organization's viability for their livelihood. They require transparent communication about resource use, environmental risks, and long-term goals to align their work with strategic and ethical priorities. Managers rely on real-time, accurate data on

social and natural resource consumption to drive operational decisions and meet performance targets.

- *Boards of Directors and Internal Auditors:* Boards, often influenced by shareholders, push for robust accountability mechanisms, such as integrated reporting and sustainability scorecards. Internal auditors support these efforts by monitoring risks and ensuring that environmental and social impacts are disclosed properly. These internal governance mechanisms reflect the board's responsibility to safeguard the interests of all stakeholders, not just shareholders.

External Stakeholders

- *Shareholders and Investors:* Not directly involved in operations but share strong interests in the organization's success. Shareholders whether individuals or institutions have significant power through capital investment and board representation own an investment in the company. They demand standardized, comparable environmental, social, and governance (ESG) disclosures to make informed decisions and assess risk.

- *Financial Institutions (Creditors):* Creditors such as banks provide funding under covenants that often require financial health indicators, including sustainability metrics. Their need for transparent and consistent disclosures directly impacts a firm's capital access and borrowing conditions. Financial institutions are willing to provide financing in return for benefits, such as interest rate.

- *Regulatory Agencies:* Government bodies influence corporate accountability by enforcing mandatory or voluntary reporting standards. These may include compliance with environmental laws, disclosure of potential impacts, and adherence to public health and safety obligations.

- *Customers:* Directly involved in its success, are typically the backbone of an organization's operation. As end-users, customers expect reliable products and ethical practices. They increasingly demand information about product life cycles, environmental footprints, and corporate responsibility, and can shift loyalty based on perceived transparency.

- *Vendors:* Directly involved in the business as they provide goods and services needed for an organization to operate. Vendors are tied to the company's financial health and expect fair treatment, prompt payment, and clarity on future business prospects. A failure in corporate accountability can disrupt supply chains and mutual trust.

- *Communities and NGOs:* Local communities, advocacy groups, and civil society actors monitor corporate actions and demand access to credible, independent data. Their influence often surfaces when environmental or social harm is suspected, and they can mobilize public campaigns or boycotts if left in the dark.

3. Reasearch methods

3.1. Data collection

The study employed semi-structured interviews as the primary method of data collection, supplemented by secondary and archival documents. Semi-structured interviews, commonly used in qualitative research, were conducted using a set of pre-designed open-ended questions while allowing the researcher flexibility to explore emerging issues during conversations.

A total of 55 participants were purposively selected (Marshall, 1996; Robinson, 2014), representing a diverse group including officials from MONRE and DONREs, auditors and senior managers from auditing firms, CFOs and chief accountants from enterprises, and lecturers and researchers in accounting, auditing, and environmental management. Selection was based on expertise, relevance to the research topic, and the following criteria: (i) 35–55 years of age; (ii) at least seven years of professional experience; (iii) minimum of a bachelor's degree; and (iv) involvement in environmental inspection, environmental authorization, auditing, or environmental audit client activities.

Interviews were conducted online between May and June 2025 and lasted 30–60 minutes. Participants received invitation letters, interview guides, and consent forms beforehand. Each session began with an introduction to the study and confirmation of consent. The researcher followed a structured interview protocol including main questions, follow-up questions, and probing techniques to clarify or deepen responses. Notes were taken immediately after each interview, and several participants provided supporting internal documents such as meeting minutes, reports, or environmental management records.

Archival documents from MONRE, MPS, provincial DONREs, and SAV were used to contextualize and validate interview findings. These included legal documents and regulatory guidelines such as the Law on Environmental Protection (2020),

associated decrees, circulars, and enforcement reports. Secondary data from government reports, academic publications, industry studies, and legal texts also contributed to building the theoretical framework and triangulating results, including peer-reviewed research on environmental auditing and relevant laws such as the Environmental Protection Law (2020) and the Independent Audit Law (2011).

3.2. Data analysis

Thematic analysis is an encoding qualitative data process, allows the researcher combining the analysis of different codes frequency with analysis, understanding their meaning within context adds the benefit of capturing the subtle nuances that characterize genuine qualitative analysis (Marks & Yardley, 2003). This research paper utilized thematic analysis approach by combining the personal experience of interviewees and meanings they attached to. A theme can originate from a theory that the researcher brings into the study (deductive), or emerge directly from the raw data (inductive). The combined use of these two thematic frameworks contributes significantly to the robustness of qualitative research (Harper & Thompson, 2012). The research approached the data with preconceived from the stakeholders theory. This research integrated the use of NVIVO software program specifically designed for qualitative data thematic analysis (Mills, Durepos, & Wiebe, 2009). Compared to manually analyzing and coding, this program allows the researcher to address a lot more interviews, assists in grouping codes, classifying them into themes, and grouping codes.

Thematic analysis involves 5 main stages, following Braun & Clarke (2006): (1) Familiarization with the data; (2) Manual and software-based coding; (3) Identifying initial themes; (4) Reviewing and refining themes; and (5) Writing up the thematic narrative linked to theoretical concepts.

4. Findings and discussions

4.1. Legal, Industry-specific Factors and implementation of environmental audit

The Law on Environmental Protection (2020) encourages manufacturing facilities, businesses and services establishments carrying out environmental audits. With a goal in ensuring the practical implementation of environmental audits regulations and providing knowledge and guidance towards businesses.

Research findings indicate that primary factors that drive Vietnamese enterprises to conduct environmental audits are legal requirements and typical industry-related factors. Most Vietnamese enterprises that conduct environmental auditings belong to organizations with high environmental pollution risks. Environmental audits play an important role in helping facilities review and improve compliance with environmental laws, thereby contributing to their environmental and social responsibilities.

100% of interviewees agreed that legal compliance is the main reason enterprises conduct environmental audits. Especially high-risk industries such as chemical production, metallurgy, and mineral exploitation are under greater pressure to comply with regulations. Legal requirements and environmental standards are more stringent for these industries. As a result, the demand for environmental audits to ensure compliance and minimize legal risks increased.

Globally, legal and regulatory compliance is consistently identified as core values that serve as a foundation for the creation of environmental auditing law-related, especially in developing countries such as Vietnam. This was affirmed by studies such as Owusu & Frimpong (2012) and Shamsadini et al. (2022), which identified "legal pressure" and "risk of non-compliance" as major drivers for the adoption of environmental audits. This aligns with global findings, such as those by Bae and Seol (2006), who observed that legal frameworks significantly influence environmental audits adoption in the U.S. Vietnamese industries with high pollution risks (e.g., chemicals, mining, metallurgy) are more likely to conduct audits, which is consistent with the international trend where risk-based regulation guides audit targeting (Prajogo et al., 2016; Shamsadini et al., 2022).

However, in advanced economies, such as the US EPA system and the Canadian CEPA laws, environmental audits are frequently required by law, strictly enforced, and subject to fines for noncompliance. While on the other hand, Vietnam's 2020 Environmental Protection Law only "encourages" voluntary audits, reducing the potential for consistent uptake. Vietnam's enforcement mechanisms are lax, so many firms comply only when legally forced or externally pressurized. This contrasts with established systems where compliance is monitored regularly by independent environmental agencies.

4.2. International Markets, customers requirements and implementation of environmental audit

For export-oriented enterprises, environmental audits are often mandatory to meet international market and customer requirements, serving as proof of compliance with global standards. Businesses with environmental management certifications (ISO 14001) are often motivated conducting such audits to maintain and improve achieved standards.

100% of participants during interviews stated that international market and customer demands are key factors for Vietnamese export companies conducting environmental audits. When enterprises enter international markets especially in sectors such as textiles, seafood, and electronics, environmental and social transparency becomes a necessity.

Markets like the EU, US, and Japan are hard to get in, they often require strict transparent reporting and adherence to ESG standards when exporting goods to these regions. To expand into aforementioned markets, environmental auditing becomes a prerequisite for Vietnamese enterprises.

Results also reveal that businesses are not only pressured by international policies but also by requirements related to funding access, bidding, or collaboration with major foreign financial institutions, where environmental and social responsibility criteria are mandatory. Companies with environmental audit certification are often prioritized in public projects, green bidding processes, or contracts with international partners requiring ESG standards.

The findings of the current research is consistent with Stakeholder theory and international academic studies with global research such as: Prajogo et al., 2016, emphasizes that multinational corporations and export markets increasingly demand environmental compliance as a requirement for participation in supply chains. This trend is mirrored in Vietnamese firms, especially those focused on exports, responding to market and supply chain pressure from foreign buyers such as Walmart, Nike, and Zara. Stakeholder expectations have a significant impact on the implementation of environmental audits, as evidenced by the necessity to adhere to international standards such as ISO 14001.

While international firms often treat environmental audits as part of a long-term sustainability strategy, Vietnamese companies tend to view environmental audits as reactive compliance, conducted only when required to access export markets.

4.3. Energy Saving, reduction of emissions and implementation of environmental audit

Research findings indicate that while external pressures play a significant role, internal factors also drive the adoption of environmental auditing activities of businesses. Many companies recognize the potential cost savings and operational efficiencies that can be achieved through comprehensive environmental audits. This internal motivation enables businesses to initiate and maintain environmental auditing practices.

Environmental audits improve resource efficiency by identifying risks, monitoring waste, and reducing pollution costs. Enterprises with goals to reduce input consumption, emissions, or waste tend to conduct environmental audits to identify weaknesses and find areas for improvement.

4.4. Factors from other organizations and implementation of environmental audit

International organizations offer funding programs to support businesses in improving environmental performance. These incentives are one of the driving forces behind companies doing environmental audits, according to research findings. However, some interviewees argued that the primary source of motivation still comes from international commercial partners, and that incentives provided by these organizations only serve as a supporting element.

4.5. Reputation, Social Responsibility, Long-term sustainability goals and implementation of environmental audit

The results of the study demonstrate that some large enterprises, beyond profit-driven goals, conduct environmental audits to fulfill their environmental responsibilities and send a positive message to the public to enhance their brand image and reputation. Forward-thinking managers with a vision for sustainability tend to proactively implement environmental audits to improve risk management and elevate corporate reputation, reflecting leadership commitment to sustainable development.

As consumers become more concerned about environmental protection and regulatory bodies demand transparency in environmental data, companies tend to conduct audits to meet

expectations and build trust. Businesses that prioritize stability and sustainability frequently keep audit strategies in place to enhance their manufacturing procedures on a constant basis.

5. Conclusions

This study aims to investigate key factors affecting the implementation of environmental audits in Vietnam. It is confirming that both external and internal factors contribute important roles in shaping firm decisions on the auditing of the environment. First and foremost is the affection of Legal and Regulatory pressure with the 2020 Environmental Protection Law going into as a recommendation practice, especially enterprises with high risk of environmental pollution such as chemicals, mining, textile, etc. Even there are big enterprises willing to conduct such audits, but due to the voluntary nature of the law and absence of strict enforcement mechanisms, most firms from high to medium to small scale operations only conduct at a basic level or when they are being forced by higher authorities.

Secondly is because of the demands of foreign markets. Firms with high export-oriented such as seafood, electronics or textiles, are always under the pressure to perform such audits, to satisfy the expectations of international clients. It is necessary to maintain relationships with key markets like the EU, US or Japan with high expectations. Certifications like ISO14001 act as a pass that prove the compliance, help firms to export goods and services.

Thirdly, conducting environmental audits helps to satisfy customers and stakeholders expectations. Companies that aim to enhance their reputation and perform social responsibility will proactively perform such audits.

Last but not least are internal operations factors, such as cost savings, energy efficiency and self-improvement. Environmental audits can help detect any irregularities, inefficiencies, therefore reduce operation costs, and support better waste management.

By applying the Stakeholder theory, the research demonstrates how the pressure from various stakeholders can help shape Vietnamese enterprises' environmental behaviors. Specifically, external stakeholders such as international customers, domestic regulators, foreign markets and the public can impact deeply toward enterprises' decisions. The findings reinforce a claim that firms are more likely to engage in environmental activities, especially audits when faced with external factors, such as foreign clients demanding ISO 14001 certification or government agencies promoting sustainable practices. This study also emphasizes how important internal stakeholders are in the encouragement of conducting such audits. It has been proved that the leader of a company with a long-term vision toward sustainability is the primary condition that can influence environmental audit actions.

For the Vietnamese regulators, the study can offer development of clearer sub-law guidelines, accreditation systems for auditors, and policy tools to incentivize voluntary audits, especially for small and medium enterprises, as the 2020 Environmental Protection Law still lacks detailed guidance, lots of loopholes, and missing enforcement mechanisms.

For enterprises, the research highlights the benefits of approaching environmental audit, not merely just a compliance tool. It can also be understood as a means to help firms improve operational efficiency, reduce risks and enhance reputation with the public. As real challenges have been exposed, this study can provide lessons on how to strengthen internal capacity for environmental governance.

For industry associations, training providers, academic facilities, the study identifies shortcomings in the environmental auditing field's capacity-building and emphasizes the necessity of standardized training programs, technical support, and awareness campaigns aimed at environmental experts and company executives.

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EXPLORING DETERMINANTS OF HIGH SCHOOL STUDENTS' INTENTION TO ENTER UNIVERSITY JOINT PROGRAMS?

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Abstract: ***Understanding what factors influence high school students' intention to enter university joint programs is important to promote internationalization of higher education from the demand side. Applying the structural equation modeling method to examine 207 valid responses from high school students in Vietnam, this study demonstrates the importance of family influence, personal development, and foreign partner's country image in high school students' intention to enter university joint programs. The study also highlights the moderating role of financial capability in shaping high school students' intentions. Based on these results, this study proposes practical recommendations to promote university joint programs in Vietnam.***

• Keywords: *joint program, family influence, personal development, university image, student intentions.*

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1. Introduction

University joint programs (UJPs) at the bachelor's and master's levels have become increasingly popular in developing countries as demand for international-standard education grows (Nguyen et al., 2021; Nghiem-Phu & Nguyen, 2020). UJPs enable students to access globally accredited curricula while studying domestically and at lower cost. Understanding high school students' intentions to pursue UJPs is therefore essential for advancing the internationalization agenda in higher education and developing human capital.

Existing studies point to several determinants of students' program choices, including foreign partner's country image, university reputation, personality traits (Krishnan et al., 2024), opportunities for personal and skill development, and family encouragement (Meerits et al., 2025). Financial capability is also a key factor, particularly in developing contexts where cost remains a significant barrier. However, most prior research focuses on full-time study abroad or domestic programs; empirical evidence on UJPs remains limited. This highlights the need to investigate what shapes students' intentions to enroll in UJPs, especially at the high school level.

Vietnam presents an appropriate context, as UJPs have become an important vehicle for internationalizing higher education. The country currently hosts nearly 500 UJPs with about 140,000 students, mostly in economics and management but increasingly in science and technology. Policy goals toward 2030 include raising the share of UJPs partnered with top-500 global universities, establishing international branch campuses, and strengthening institutional capacity for global integration. Regulatory reforms have also enhanced quality assurance and diversified program offerings to align with labor-market needs, marking a shift from expansion to quality improvement in international higher education.

Using quantitative methods, this study analyzes survey data from 207 high school students to examine factors influencing their intentions to enroll in UJPs. The findings show that family influence, personal development opportunities, and foreign partner's country image significantly shape students' intentions, while financial capability moderates these relationships. Based on the results, the study proposes practical implications to support the promotion and sustainable development of UJPs in Vietnam.

2. Literature review

2.1. Joint programs

According to Knight & Lee (2023), UJPs are a part of cross-border education, which often features joint degrees granted by two or more universities. UJPs are characterized by close cooperation between international and local schools, with a shared responsibility for teaching and assessment (Nguyen et al., 2021). UJPs aim to share resources and improve the quality of education (Khakimovich & Abdullazhanovich, 2021). UJPs are beneficial to students as they are exposed to international education at home. Attending UJPs, students can study flexibly

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in the local and the international schools (Knight & Lee, 2023). UJPs contribute to internationalizing local universities and enhancing their reputation. UJPs are also instruments to foster research collaboration. Nguyen et al. (2021) demonstrate that UJPs meet the needs for sustainable socio-economic development of the host country.

In this study, UJPs are bachelor programs under the cooperation between a Vietnamese university and one or more international universities. Students are allowed to study full-time in Vietnam or partly in Vietnam and partly abroad for a degree granted by international universities.

2.2. Student intentions to engage in UJPs

An individual's intentions is defined as a psychological state that reflects a person's desire, expectation, and ability to perform a particular behavior (Fishbein & Ajzen, 1975). Intentions reflect not only desire but also include the expectation of the ability to perform a behavior, clearly distinguishing it from actual behavior. Intentions are formed from a combination of personal motivation and social factors. The stability of intentions over time influences the relationship between intentions and behavior, particularly when combined with past behavior.

According to the Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (1975), behavioral intentions are determined by two primary factors: attitude toward behavior and subjective norms. TRA emphasizes that positive attitudes and social pressure from others will promote the intention to perform the behavior. This theory was later expanded by Ajzen (1991) by the Theory of Planned Behavior (TPB), with the addition of the factor of perceived behavioral control, to further explain the ability to control and barriers to behavior. According to TPB, intentions will be stronger when individuals have positive attitudes, feel support from social norms, and believe that they are able to overcome obstacles to perform the behavior.

In this study, students' intentions to enter UJPs refer to their desire or plan to enter UJPs. Based on the TRA and TPB, the intentions to enter UJPs is influenced by students' positive attitudes toward global learning opportunities, subjective norms from family and friends supporting international education, and perceptions of behavioral control related to financial ability and language skills. Based on the TPB, this study evaluates the impact of factors including personal personality traits, skill development opportunities, self-development opportunities, foreign partner's country image, university image, family influence, and financial capability on students' intentions to enter UJPs.

2.3. Hypothesis development

According to the Theory of Planned Behavior (Ajzen, 1991), attitudes shaped by personality traits play a central role in forming behavioral intentions. Prior studies show that personality traits, including extroversion, are associated with intentions to participate in educational and training programs (Santoro et al., 2025; Franić et al., 2014). Extroverted students tend to be more open to new environments and international learning opportunities.

H1a: Extroverted personality traits promote students' intentions to enter UJPs.

Skill development enhances confidence, adaptability, and proactive learning behaviors, which in turn strengthen intentions to engage in international education (Franić et al., 2014).

H2a: Skill development promotes students' intentions to enter UJPs.

A country's image particularly its cultural appeal, safety, and education quality has been shown to significantly influence students' study choices (Petzold & Moog, 2018). A positive perception of the foreign partner's country may therefore increase the attractiveness of UJPs.

H3a: The foreign partner's country image promotes students' intentions to enter UJPs.

Personal development opportunities, including self-growth, intercultural exposure and increased self-awareness, are also important motivators for students considering international programs (Chen & Yu, 2020; Esser-Noethlichs et al., 2024). *H4a: Personal development promotes students' intentions to enter UJPs.*

Institutional image such as academic reputation, program quality, and teaching excellence shapes perceptions of program value and influences students' international education decisions (Krishnan et al., 2024; Nghiêm-Phú & Nguyễn, 2020). *H5a: International university image promotes students' intentions to enter UJPs.*

Family remains an important social force shaping attitudes, perceptions, and decisions related to education (Meerits et al., 2025; Wong et al., 2025). In the Vietnamese context, family support may mediate the influence of personal and external factors on UJP

intentions.

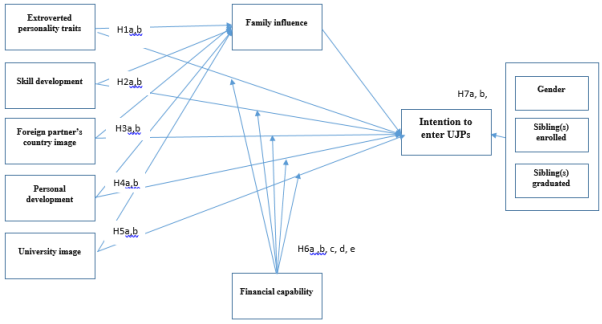
H1b-H5b: Family acts as a mediating factor between personality traits, personal development, skill development, country image, university image and students' intentions to enter UJPs.

Financial capability is a key determinant of participation in international programs, moderating the relationship between attitudes, motivation, and actual intentions (Amed et al., 2025). In UJPs often involving higher tuition financial considerations can either reinforce or weaken the effects of other factors.

H6(a-e): Financial capability moderates the relationships between personal/external factors and students' intentions to enter UJPs.

Based on the above arguments, this study proposes a research model to assess the factors influencing the students' intentions to participate in UJPs (Figure 1).

Fig 1: The proposed theoretical framework



3. Methodology

3.1. Scale of measurement

Based on the literature review, eight constructs were measured using validated scales. Personality traits, skill development and personal development were adapted from Franić et al. (2014); country image and university image from Nghiêm-Phú & Nguyễn (2020); family influence from Petzold & Moog (2018); and financial capability and intention from Wang et al. (2016). Each construct consisted of 2-7 observed items using a five-point Likert scale.

3.2. Sampling and data collection

To collect data for this study, we conducted a survey of 12-grade high school students who are preparing to take the national university entrance exams. This study used the cluster sampling method to ensure representativeness and feasibility of data collection. Specifically, three clusters were identified during university admission counseling programs organized in three regions: North, Central, and South. Convenience sampling was conducted within each cluster to select high school students to participate in the survey based on their willingness and accessibility to the admission counseling programs.

A questionnaire was drafted in early 2025. It was then pre-tested with 35 high school students from three high schools in Northern Vietnam. Based on information collected from this pre-testing survey, we modified the structure and questions in the questionnaire. We also consulted with four experts and professionals who are deans and staff of faculties/ departments of international joint programs at two universities in Northern Vietnam to revise the questionnaire. A finalized questionnaire was then prepared for the official survey.

To conduct the survey in the three regions, 10 enumerators were employed and trained with the same finalized questionnaire. After the training, these enumerators travelled to conduct face-to-face interviews with 312 high school students who came to attend a series of university admission counseling programs organized from April to July 2025. By the end of the survey, 207 valid questionnaires with complete information were collected.

The study employs structural equation modeling (SEM) to examine the factors influencing students' intentions to enter UJPs. Specifically, the PLS-SEM was employed in this study.

4. Results and discussion

4.1. Reliability and validity test

Based on the information collected from the surveyed high school students, Table 2 shows that the proportion of female respondents is higher than that of male respondents (60.9% vs. 39.1%). Most of these respondents study English as their foreign language (74.9%). Their parents are mostly bachelor's degree holders or engineers.

Table 2. The information of the respondents

		(N=207)	%
Gender	**Female**	**81**	**39.1**
	Male	**126**	**60.9**
Sibling(s) currently enrolled in the UJPs	No	141	68.1
	Yes	66	31.9
Sibling(s) have currently graduated from the UJPs	No	128	61.8
	Yes	79	38.2
Foreign language	English	155	74.9
	Chinese	31	15
	Japanese	5	2.4
	French	9	4.3
	German	5	2.4
	Korean	2	1
Father's education	Bachelor/Engineer	112	54.1
	Master	23	11.1
	Doctorate	19	9.2
	Other	53	25.6

		(N=207)	%
Gender	Female	81	39.1
	Male	126	60.9
Mother's education	Bachelor/Engineer	107	57.7
	Master	31	15.0
	Doctorate	12	5.8
	Other	57	27.5

Source: Author's calculation

The results in Table 3 show that Cronbach's Alpha values of the factors range from 0.804 (HAN) to 0.874 (PKN). All of these values exceed the threshold of 0.6, which is recommended by Churchill (1979). Similarly, the Composite Reliability (CR) values of the factors range from 0.866 (HAN) to 0.924 (GDI), which are higher than the threshold of 0.7 recommended by Nunnally & Bernstein (1994). These results confirm the internal consistency and reliability of the scales. In addition, the results show that the AVE values of the factors range from 0.619 (HAN) to 0.858 (GDI). All of these values exceed the threshold of 0.5, which demonstrates the convergent validity of the measurement model.

Table 3: The measurement model evaluation

Items	Loadings	Cronbach's alpha	CR	AVE
Extroverted personality traits (DDT)		0.860	0.905	0.704
DDT1	0.834			
DDT2	0.831			
DDT3	0.861			
DDT4	0.830			
Skill development (PKN)		0.874	0.914	0.727
PKN1	0.784			
PKN2	0.906			
PKN3	0.850			
PKN4	0.866			
Personal development (TCP)		0.836	0.890	0.669
TCP1	0.823			
TCP2	0.866			
TCP3	0.805			
TCP4	0.774			
Foreign partner's country image (HAN)		0.804	0.866	0.619
HAN3	0.869			
HAN4	0.845			
HAN6	0.713			
HAN7	0.708			
University image (TDH)		0.849	0.897	0.685
TDH3	0.812			
TDH4	0.843			
TDH5	0.841			
TDH6	0.814			
Family influence (GDI)		0.836		0.858
GDI1	0.941			
GDI2	0.912			
Financial capability (TCH)		0.805		0.836
TCH2	0.898			
TCH3	0.929			

Source: Author's calculation

The discriminant validity of the measurement model is assessed using the Heterotrait-Monotrait Ratio (HTMT) criterion, to determine the degree of difference between the constructs in the model. According to the HTMT criterion, the HTMT value between the constructs should be less than 0.85 to ensure discriminant validity.

4.2. Hypothesis testing

The results in Table 4 indicate that the intentions to enter UJPs is directly influenced by three factors: extroverted personality traits, the country's image with training links, and opportunities for personal development. The opportunity for personal development is the factor with the greatest impact on the student's intentions to enter UJPs (0.265). Therefore, Hypotheses H1a, H3a, and H4a are accepted. This result is consistent with the studies of Santoro et al. (2025) on the direct impact of extroverted personality traits. It is also consistent with the studies of Petzold & Moog (2018), which asserted that the image of the partner country (in terms of education and culture) positively affects the intentions to participate in UJPs. This result is also consistent with the research of Chen & Yu (2020) and Esser-Noethlichs et al. (2024), who emphasize that self-development, through enhancing personal awareness and motivation, is an important factor promoting the intentions to enter UJPs.

In addition, Table 4 reports that financial capability is a factor that strengthens the relationship between skill development opportunities and students' intentions to enter UJPs. Hence, Hypothesis H6b is accepted. This result is consistent with the literature that economic factors can reduce/increase motivation to participate in international education programs.

Table 4: Total effects

	Hypothesis	Path coefficient	S.D	T-stat	P-value	Result
H1a	Extroverted personality traits -> Intentions	0.155	0.072	2.157	0.031	Accepted
H1b	Extroverted personality traits ->Family influence -> intentions	0.004	0.01	0.375	0.708	Not accepted
H2a	Skill development -> Intentions	0.194	0.108	1.802	0.072	Not accepted
H2b	Skill development -> Family influence -> intentions	-0.006	0.014	0.45	0.653	Not accepted
H3a	Foreign partner's country image -> Intentions	0.183	0.081	2.247	0.025	Accepted
H3b	Foreign partner's country image -> Family influence -> intentions	-0.009	0.017	0.522	0.602	Not accepted
H4a	Personal development -> Intentions	0.265	0.11	2.416	0.016	Accepted
H4b	Personal development -> Family influence -> intentions	0.003	0.015	0.172	0.864	Not accepted
H5a	University image -> Intentions	0.096	0.104	0.914	0.361	Not accepted
H5b	University image -> Family influence -> intention	0.031	0.021	1.442	0.15	Not accepted
H6a	Financial capability -> Extroverted personality traits x Intentions	0.123	0.065	1.905	0.057	Not accepted
H6b	Extroverted personality traits -> Skill development x Intentions	-0.298	0.135	2.213	0.027	Accepted
H6c	Extroverted personality traits -> Foreign partner's country image x Intentions	0.003	0.079	0.032	0.975	Not accepted
H6d	Extroverted personality traits -> Personal development x Intentions	0.244	0.136	1.792	0.074	Not accepted
H6e	Extroverted personality traits -> Foreign partner's country image x Intentions	0.117	0.081	1.456	0.146	Not accepted
	Gender -> Intentions	-0.072	0.059	1.211	0.227	Not accepted
	Sibling(s) currently enrolled in the UJPs -> Intentions	-0.076	0.06	1.263	0.207	Not accepted
	Sibling(s) currently graduated in the UJPs -> Intentions	0.159	0.062	2.552	0.011	Accepted
	Family influence -> Intentions	0.149	0.074	2.009	0.045	Accepted

Source: Author's compilation

Additionally, having a sibling who has graduated from the UJPs enhances the high school student's

intentions to enter UJPs. This finding indicates that family plays a significant role in encouraging and motivating high school students to enter UJPs. The finding that high school students are still influenced by the experience of their siblings in UJPs implies an effective marketing strategy to attract new high school students to the UJPs of universities.

The results in Table 5 show that gender does not have a significant effect on the intentions to study in the UJPs. The effect of skill development on intentions is not statistically significant. This result is partly inconsistent with the literature, which emphasize that skill development, such as communication, promotes the intentions to study internationally. Perhaps, high school students have limited awareness of skill development for their future career. Therefore, they are not prioritizing the development of specific skills. Family influence is not statistically significant in mediating the relationship between the remaining factors and students' intentions to enter UJPs. However, family influence has a direct impact on students' intentions to enter UJPs.

Similarly, the impact of university image on students' intentions to enter UJPs is not statistically significant. This result is contrary to Krishnan et al. (2024), which emphasize the role of the school's reputation and educational quality in shaping the training program. It is likely that Vietnamese high school students do not have sufficient information or a clear understanding of the reputation of international universities. A possible reason could be that local universities have not effectively communicated the image and quality of the partner universities to high school students. This finding suggests universities in Vietnam to change their marketing strategies to effectively attract high school students.

5. Conclusion

This study contributes to literature in three folds. Firstly, it confirms that extroverted personality traits and personal development have an impact on the high school students' intentions to enter UJPs. Perceived behavioral control is influenced by financial factors, especially in the context of UJPs. Secondly, this study contributes to the destination image theory by emphasizing that foreign partner's country image has a greater attraction than the specific reputation of the school or personal skills. Thirdly, this study highlights the importance of family and practical experiences of relatives in shaping high school students' behavioral intentions.

The results from this study contain practical implications to higher education institutions and UJPs in Vietnam. There are several ways to increase students' intentions to enter UJPs. Firstly, it is important to focus on personal factors and national image. Universities should prioritize promoting UJPs as an opportunity for personal development and take advantage of the extroverted personality traits of students through personalized mentoring programs or soft skills building workshops. Additionally, it is important to highlight the image of the foreign country through marketing campaigns or share success stories from students who have participated in the UJPs. Secondly, universities should offer financial support to mitigate the negative impact of financial capability. Thirdly, raising awareness of the university image and the role of the family through increased communication with high school students is essential. Finally, the UJPs should be designed in a flexible structure, focusing on both personal and international benefits, and monitoring feedback from graduates to improve its quality and increase participation rates.

This paper also has some limitations. There may be other factors from the external or internal environment that affect students' intentions to enter UJPs. Future research should supplement those factors in a reasonable and systematic way. Also, this article only examines students' intentions, without investigating specific behaviors such as students' decisions to participate or their willingness to participate. Future research should explore these dimensions.

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DATA ETHICS IN THE DIGITAL ECONOMY: BALANCE BETWEEN PRIVACY AND BUSINESS INTERESTS

PhD. Chu Thi Hong Hai*

Abstract: ***This study analyzes Decree 13/2023/ND-CP and business practices in Vietnam to propose a sustainable data governance model that balances individual privacy and business interests in the digital economy. Employing a qualitative methodology, the results identified three main barriers: technical limitations, organizational culture factors, and data commercialization pressures, along with significant differences in compliance levels across industries. Accordingly, the study proposes four groups of strategic solutions and contributes to the theoretical foundation of data ethics, while also providing effective policy recommendations for Vietnamese businesses.***

• Keywords: *data ethics, privacy, personal data protection, data governance, digital economy.*

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1. Introduction

In the context of the digital economy, personal data is an important asset that fosters innovation and creates competitive advantage, especially in e-commerce and FinTech (OECD, 2021). However, the innovation and competitive advantage of personal data e-commerce and FinTech directly clashes with the right to privacy protected under Article 21 of the 2013 Vietnamese Constitution, and global frameworks like the GDPR, CCPA, and PDPA (European Commission, 2020; California Legislative Information, 2018; PDPC Singapore, 2021). Though Decree 13/2023/ND-CP marks a legal achievement (Government of Vietnam, 2023), gaps in enforcement and oversight fraught with a lack of public trust, a vital component of the resilience in a digital ecosystem, continue to exist (Regulatory Frameworks, 2023; Taylor, 2021). Governance issues resulting from lack of transparency, excessive focus on data monetization, and insufficient investment in security face Vietnamese organizations (Viettel Cyber Security, 2023).

Trust needs to be established and fostered by incorporating data ethics grounded on transparency, equity, accountability, and a right for every human to be treated fairly (OECD, 2021). Ethical data governance that upholds compliance with legal regulation and fosters innovation stands a better chance of performing better internationally (PDPC Singapore, 2021). As Vietnam becomes more involved in global value chains, it is important to make data ethics a regulatory standard and a strategic necessity (Taylor, 2021; Westin, 1967). Privacy should not be treated as absolute; it can be balanced with legitimate data use through ethical adaptive governance reasoning.

2. Literature review

2.1. Theoretical framework

Data Ethics focuses on the principles and values responsible data-handling practices that build trust in society, going beyond compliance with the law (Floridi & Taddeo, 2016). Ethical data governance as proposed by OECD (2021) requires accountability through internal audits, privacy shield via protective technologies such as encryption and AI, and trust transparency in corporate policies. These practices embed trust into corporate strategy, fostering long-term competitiveness.

Institutional Theory (DiMaggio & Powell, 1983) explains organizational actions through the lens of coercive legal mandates (e.g., Decree 13/2023), mimetic pressures from industry leaders, and normative pressures from consumers and civil society. These pressures compel firms to go beyond the minimum regulatory thresholds in order to maintain reputation and stakeholder trust.

Stakeholder Theory (Freeman, 1984) supports engaging all stakeholders, which in this case includes the consumers, regulators, and the general public, as a reason for open engagement that alleviates tension between economic aims and the invasion of privacy. Additionally, Westin (1967) in his "privacy as control" model suggests that by providing the public

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with considerable control over personal information improves the acceptability of data practices.

Enterprise Data Governance based on OECD (2021) applies the ethical and institutional aspects through defined workflows, delineated structures of responsibility, and anticipatory risk mitigation. This consolidated strategy is useful for the organizations because it allows them to turn compliance in to a competitive advantage.

2.2. Literature review

The digital economy is growing quickly, and personal data is now a key factor in how well businesses work and how competitive they are (OECD, 2021). A lot of research has been done on legal and technical security issues, but there has not been much research on data ethics in corporate governance, especially in developing countries like Vietnam. This gap underscores the need for an integrated framework that aligns ethical principles, institutional mandates, and business interests to reconcile privacy protection with effective data utilization.

Data governance is put at risk by security breaches, cybersecurity incidents, and loss of sensitive or confidential information, which in turn erodes consumer trust and has enduring financial ramifications (Cybersecurity Report, 2023). Over 60% of breaches, as explored by Shackelford (2020), stem from internal or human error, and, as Ambore (2021) finds, lack of awareness of data governance frameworks and inconsistent enforcement of organizational policies and set rules are major contributing factors. Therefore, governance involves rigorous legal mechanisms and frameworks, comprehensive compliance policies, policies and procedures, and organizational compliance culture.

Legal instruments with concrete enforcement mechanisms, for example the EU's GDPR (European Commission, 2020), California's CCPA (California Legislative Information, 2018), and Singapore's PDPA (PDPC Singapore, 2021), which demand for accountability and compliance transparency, also impose severe fines. In Vietnam, the legal framework includes the 2015 Civil Code, the 2018 Law on Cyber Security, Decree 13/2023/ND-CP on data safeguarding, the Decision 06/QD-TTg (2022) on population data, and Circular 24/2022/TT-BTTTT on the protection of IT systems. Vietnam, on the other hand, is missing primary governance structures, strong frameworks for data commercialization, or reliable ways to check if organizations are following data ethics (Regulatory Frameworks, 2023).

Scholars are still focusing on the technical and legal aspects of data privacy (Floridi & Taddeo, 2016; Ambore, 2021). There is a lack of thorough research on data privacy ethics in Vietnamese businesses, particularly in relation to compliance with Decree 13/2023. As a result, no one has attempted to apply ethical, institutional, and stakeholder theory along with Westin's (1967) "privacy as control" framework to examine the management and ethical obligation oversight ecosystem of Vietnamese businesses. In addition, while AI and blockchain are esteemed technologies, their adoption is hampered by severe cost and technical capability constraints, as well as reliance on foreign firms for small and medium-sized enterprises (SMEs) in Vietnam.

This paper fills these gaps by analyzing the ethical challenges of data governance in Vietnam, evaluating the regulatory and trust implications of Decree 13/2023, and proposing solutions to enhance privacy protection while facilitating data use. The primary objective is to construct a Vietnamese contextual framework for institutional and digital elements by proposing an adaptable data governance model that is transparent, accountable, and sustainable.

2.3. A comparison among data protection policies of Vietnam and some developed regions

Table 1: A comparison among data protection policies of Vietnam and three developed regions

Criteria	GDPR (EU, 2018)	CCPA (US, 2018)	PDPA (Singapore, 2012; amended 2020)	Decree 13/2023 (Vietnam)
Scope of Application	Entities processing EU citizens' data	Firms with >$25M revenue or handling CA data	All data processors in SG	Entities handling VN citizens' data, domestic or foreign
Individual Rights	Access, correction, erasure, objection, portability	Refuse data sale, access, deletion	Access, correction, consent withdrawal, portability	Access, correction, deletion, restriction, portability
Enforcement Mechanism	Fines up to 4% of global turnover	Fines up to $7,500/ violation	Up to 10% turnover or 1M SGD	Warnings, fines, criminal liability, compensation
Supervisory Authority	EDPB (independent)	California Attorney General	PDPC (independent	Ministry of Public Security (no independent body)
Sensitive data	Strictly defined and protected	Not clearly defined; disclosure required	Clear handling policies	Defined; lacks detailed guidance
Cross-border Transfer	Allowed to GDPR-compliant jurisdictions	No strict limits; transparency required	Risk-based safeguards mandatory	Notification required; adequacy not clearly enforced
Accountability & Registration	DPO, records, compliance proof	Source disclosure, verification mechanisms	DPO, audits, notifications	Internal policies required; limited enforcement

Source: Author's comparative compilation

Compared to the GDPR, CCPA, and PDPA, three key shortcomings of Vietnam's Decree 13/2023/ND-CP remain: (i) the lack of an independent supervisory authority; (ii) weak enforcement and limited sanctions; and (iii) vague regulations on sensitive data and cross-border transfers.

3. Research methods

3.1. Research approach and data collection

To assess data governance and ethics in Vietnamese businesses, this study employed a qualitative

methodology combining document analysis, case studies, and expert interviews. Due to limitations in large-scale survey data, the qualitative approach was chosen to gain deeper insights into stakeholder perspectives and implementation practices.

Data were collected from two primary sources. Secondary materials included industry reports, governmental regulations, and prior academic studies. Primary data were gathered through interviews with ten professionals, each with at least five years of experience in data security or policy, representing sectors such as FinTech, telecommunications, e-commerce, and digital health.

Fifteen businesses with substantial data operations were selected based on their exposure to Decree 13/2023/ND-CP and the presence of either data protection policies or previous data breach incidents. Covering the period from 2020 to 2024, the study explores governance challenges, ethical risks, and compliance behaviors.

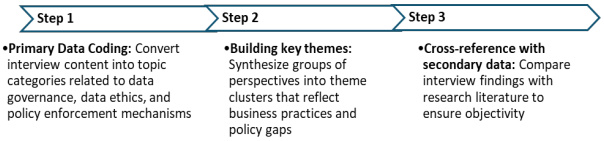
Guided by the OECD data ethics model (2021), a multifaceted analytical lens was applied to examine institutional, ethical, and operational factors. To ensure objectivity, standardized interview protocols, double-coding techniques, and participant validation procedures were implemented.

3.2. Data analysis methods

We used content and topic analysis to look for important themes in the data from expert interviews. Content analysis looked at legal papers, industry reports, and academic studies to find gaps in data ethics norms and policies. Thematic analysis used information from case studies and interviews to find patterns and suggest ways to fix problems. These techniques were based on the OECD's data ethics model (2021) and made sure that the recommendations for sustainable data governance in Vietnam were founded on facts.

The data analysis process consists of three steps:

Figure 3. Data analysis process



The practical assessment framework is based on the OECD Data Ethics Model (2021) and is designed to make simpler to compare and analyze data across different industries. This assists in find solutions that are precisely for Vietnamese businesses.

3.3. Ensuring reliability and objectivity

To ensure objectivity, the study employed three data validation strategies: (1) data triangulation through cross-verification of documents, cases, and interviews; (2) independent expert review of collected data; and (3) transparency in research design, including disclosure of sampling criteria and analytical methods. Additionally, interview tools were standardized, data were transcribed and double-coded, and findings were confirmed with participants to minimize bias and enhance reliability.

4. Research results and discussion

4.1. Results on data governance and data ethics in enterprises in Vietnam

The study notes that compliance with personal data protection regulations in Vietnamese enterprises is currently strongly influenced by three institutional factors according to the theory of DiMaggio & Powell (1983): coercive pressure (from the state), imitative pressure (from pioneering enterprises) and normative pressure (from social expectations). Although Decree 13/2023/ND-CP has laid a relatively clear legal foundation, implementation still varies widely across industries and enterprise sizes, reflecting differences in ethical awareness, internal capacity and the level of commitment to data culture.

Compliance levels and industry differences

A sector-by-sector examination shows that different industries have very different levels of compliance with data protection laws. In telecommunications and FinTech, companies follow the rules very closely. This is mostly because government agencies like the State Bank and the Ministry of Information and Communications are quite strict about following the rules. Many companies in these fields have started using international standards like ISO/IEC 27001, AI to keep an eye on data, and frequent internal audits (IBM Security, 2022).

On the other hand, the e-commerce industry is less stable. Major platforms like Shopee, Tiki, and Lazada have created formal data protection policies. However, most small and medium-sized businesses (SMEs) don't have the resources to do this, so they just copy what the big companies do, which means that compliance is mostly superficial (Viettel Cyber Security, 2023).

The digital health sector has the lowest levels of compliance. This is because there are no standardized data governance procedures or industry-specific norms. Only 25% of private healthcare providers have explicit privacy policies.

Generally, more than half of Vietnamese businesses still don't have a separate department for data security. This disparity makes enforcement measures far less effective and makes accountability weaker, which is one of the main parts of good data governance (OECD, 2021).

The challenge of balancing privacy and business interests

Utilizing the OECD Data Ethics Model (2021), the study indicates that organizations with robust data governance exhibit several essential traits. This encompasses a dedication to information transparency, robust accountability procedures, and significant investment in modern security technologies elements that strongly correspond with the theoretical foundations of the study. Nonetheless, substantial obstacles persist in hindering the wider implementation of ethical data governance in Vietnam.

Financial limitations constitute a significant obstacle, especially for small and medium-sized firms (SMEs), who frequently find it challenging to adopt expensive technology like AI and blockchain. Conversely, huge organizations such as Viettel or Momo might provide annual budgets between USD 500,000 and over one million for data protection systems. The ongoing lack of openness in data management is also concerning: over 60% of companies fail to grant users the ability to access, modify, or delete their data, which clearly contravenes Westin's (1967) "Privacy as Control" paradigm.

Moreover, the financial impetus to capitalize on data has compelled some companies to transgress the limits of user consent, frequently disseminating personal data to third parties without explicit agreement. This compromises data ethics standards and diminishes public trust (Floridi & Taddeo, 2016). The lack of independent oversight and robust sanctions promotes reactive compliance tactics instead of fostering substantial ethical frameworks.

4.2. Solutions to balance privacy and business interests

Improving the legal framework and enforcement mechanism

Although Decree 13/2023/ND-CP has laid the groundwork for personal data protection in Vietnam, substantial regulatory gaps remain when compared to more mature frameworks such as the GDPR in the European Union and the PDPA in Singapore (European Commission, 2020; PDPC Singapore, 2021). These deficiencies limit the effectiveness of current legislation and weaken incentives for compliance.

To strengthen enforcement and foster a culture of accountability, a set of institutional and regulatory enhancements is imperative. First, the establishment of an independent supervisory authority, such as a National Data Protection Commission. This body would be responsible for monitoring compliance, conducting audits, issuing guidance, and imposing sanctions (OECD, 2021). Second, sanction mechanisms must be reinforced through the introduction of administrative fines proportional to enterprise revenue, following deterrent models embedded in the GDPR and PDPA. Such measures would elevate the cost of non-compliance and provide concrete incentives for proactive data protection. Third, the regulatory framework should clearly define sensitive data categories, particularly financial, medical, and biometric information, and mandate enhanced security safeguards to mitigate risks associated with misuse or breaches. Finally, to regulate international data transfers, Vietnam should adopt an adequacy-based approach aligned with GDPR principles, permitting cross-border flows only to jurisdictions with comparable levels of data protection. This would ensure the integrity of outbound data streams and facilitate greater international trust in Vietnam's digital ecosystem.

KPI to evaluate effectiveness: $\geq$ 60% of businesses issue clear security policies by 2027.

Strengthen data monitoring and auditing

A robust legal framework must be supported by a comprehensive monitoring and auditing system to ensure that compliance transcends mere adherence to regulations. To accomplish this, it is recommended that some policy modifications be implemented to enhance institutional efficacy and public trust.

First, big companies that work with a lot of data, like FinTech, telecoms, and e-commerce, should have to have annual data audits, like financial audits, to find weaknesses and make sure security requirements are followed. Secondly, corporations must to publicly provide compliance reports detailing their methods for collecting, utilizing, and safeguarding personal data. This strategy enhances organizational accountability while also fostering greater confidence and trust in digital services among individuals. Third, enhancing international collaboration through participation in multilateral agreements and treaties that safeguard

data is essential. This level of engagement facilitates the adoption of global best practices and enables collaborative efforts across borders to investigate and address data privacy issues.

KPI to evaluate effectiveness: ≥ 40% of FinTech and e-commerce businesses audit data annually.

Improving security capabilities in enterprises

Most Vietnamese businesses, especially SMEs, have limited resources and data security expertise. Focusing only on sanctions without supporting policies can lead to reactive responses, reducing overall effectiveness. Solutions that need to be implemented include:

Solution	Describe	Implementing unit
Tax incentives	Tax breaks for businesses that invest in data security.	Ministry of Finance
Human resource training	Organize in-depth training courses on data management.	Ministry of Information and Communications & Business Associations
Technology application support	Support businesses to access AI, Blockchain, MFA to enhance security.	Ministry of Industry and Trade & Ministry of Science and Technology

KPI for evaluating effectiveness: ≥ 50 security training courses organized/year by 2027.

Controlling the commercialization of personal data

The collection, use, sharing and sale of personal data are not yet strictly controlled, potentially posing a risk of privacy infringement and damaging social trust (Floridi & Taddeo, 2016). Proposed groups of solutions:

Solution	Describe	Implementing unit
Empowering individuals to opt-out of personal data sales	Enterprises must provide users with the option to refuse the sharing of their personal data	Data Protection Authority, Ministry of Information and Communications
Enhancing transparency in data collection processes	Enterprises are required to publicly disclose how personal data is collected and used	Ministry of Industry and Trade, Ministry of Information and Communications
Periodic audits of data usage	Mandatory audits must be onducted to assess the level of corporate compliance with data protection regulations	Data Protection Authority

KPI to evaluate effectiveness: ≥ 70% of businesses provide an "opt-out" feature for users in 2027.

Building a sustainable data governance ecosystem

Creating a long-lasting data governance ecosystem based on confidence from society and supported by the integration of legal, technological, and educational elements is necessary for good data security. The effectiveness of this type of ecosystem depends on a number of aspects that are all linked together. For governance solutions to work in the real world and last, policy, technology, and education must all be in sync. Second, building strong ties between the public and private sectors is important for effective implementation because it makes compliance and flexibility easier when the government, businesses, and other stakeholders work together. Third, policy frameworks need to be flexible and fit the situation in Vietnam, rather than just copying international models without making any changes. It is suggested that at least 50% of large firms perform annual social trust assessments to provide a standard for measuring how well ethical data governance practices are working and how mature they are.

5. Conclusion

This paper investigates the conflict between privacy and commercial interests in the context of Vietnam's digital economy focusing on the implementation of Decree 13/2023. Aside from the legal developments made, there still exist three previously discussed barriers that continue to hinder the creation of a sustainable ethics framework for data in Vietnam.

This research enhances theoretical understanding and practical application by refining the conceptual framework of data governance in developing environments and providing pragmatic policy recommendations for Vietnamese regulators and enterprises. When applied cohesively, proposed solutions can cultivate a reliable and competitive digital ecosystem, in accordance with global data governance standards.

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JOB SATISFACTION: WHAT REALLY MATTERS TO VIETNAM FEMALE LECTURES?

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Abstract: ***This study aims to identify factors affecting the job satisfaction of female university lecturers. Based on the Job Descriptive Index (JDI) model, the study examines the role of career achievement factors such as education level, job position, experience, and income, along with factors of work-family conflict and support from colleagues. The results of the analysis of 457 survey questionnaires at 22 public universities in the field of economics and business showed that there was no significant difference in job satisfaction among groups of lecturers with different education levels, experience, and income. However, job position had a statistically significant effect on satisfaction. In particular, work-family conflict had a significant negative impact, while support from colleagues played a positive role in enhancing job satisfaction. This finding has important implications for higher education management, suggesting that universities should focus on building a supportive work environment and developing policies to help women faculty members balance work and family.***

• Keywords: *education, income, job position, job satisfaction, lecturer, university, work-family conflict.*

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1. Introduction

Lecturers are an important resource in higher education institutions because they play an important role in achieving the goals and successes of universities (Sharma and Jvoti, 2009). Job satisfaction of lecturers is one of the factors contributing to improving the quality and learning outcomes of students (Waqas et al., 2012). Besides that, job satisfaction is said to be one of the key concepts that show employees' responses to their work, which is also a sign of their commitment to the organization (De Cuyper et al., 2009). Higher education always requires the dedication and commitment of the lecturers' organization, so managers need to understand why lecturers remain consistent in their careers or leave the organization (Marston and Brunetti, 2009). Therefore, it is necessary to research and identify factors that increase job satisfaction. Job satisfaction of female academics is influenced by various factors, including career development, work-life balance, and organizational support. Understanding these determinants is important to improve their overall satisfaction with their work.

Among the major determinants of job satisfaction, work-family balance plays an important role. Handayani et al., (2023) found that work-family balance and work engagement significantly influenced job satisfaction, explaining 67.8% of the variation in satisfaction levels of female academics. In addition, job characteristics such as job role, recognition, and development opportunities were also important factors. According to Bui (2019), job characteristics had the strongest impact on satisfaction, while salary and benefits had insignificant effects. Regarding the environment and organizational support, Trung et al. (2024) found that a positive work environment, including relationships with colleagues and recognition, plays an important role in job satisfaction. To contribute, this study applies the JDI Model, which assesses employee job satisfaction based on simultaneously 5 key factors: The nature of the job, Training and advancement opportunities, Leadership, Colleagues, and Income. Specifically, we describe the nature of the job in the JDI model primarily in terms of actual job content and the level of job challenge and variety, but measured through the lens of work-family conflict.

2. Literature review

2.1. Job satisfaction

The theoretical schools of job satisfaction have developed over many periods with different perspectives. Besides the needs school and value school, the job characteristics school approaches the issue from the perspective of job design, pointing out that job characteristics such as the level of autonomy, task variety, and skill development opportunities are key factors affecting employee satisfaction.

The job characteristics school in the study of job satisfaction has notable strengths and limitations. In terms of advantages, this school demonstrates high practicality and applicability by providing specific criteria for job evaluation and design, easy to apply in management practice with clear measurement

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tools (Hackman and Oldham, 1976). At the same time, this school is comprehensive when considering multidimensional aspects of work, evaluating both objective factors, such as job characteristics, and subjective factors, such as psychological experiences, thereby connecting the relationship between job design and job outcomes. In addition, this school is verified through many empirical studies, showing high reliability in different contexts, and is widely recognized in the academic community (Morgeson and Humphrey, 2006).

Accordingly, measuring the job satisfaction effect can be used as a job description index scale (JDI); The Job Satisfaction Survey (JSS); A job satisfaction scale based on facial expressions; and the Minnesota Job Satisfaction Questionnaire (MSQ). Among these, the Job Descriptive Index (JDI) model has many significant advantages in assessing job satisfaction. First of all, the model has a solid theoretical foundation when it was developed by Smith et al. (1987) and is based on the theory of Smith et al. (1969), and its reliability has been verified in practice (Spector, 1997) and is widely used in the research community. The JDI allows for a comprehensive assessment of aspects of job satisfaction through five core factors, including the nature of the job, training and promotion opportunities, leadership, colleagues, and income.

Another outstanding advantage of the JDI model is the ability to measure both intrinsic and extrinsic factors. Regarding intrinsic factors, studies by Malik et al. (2010) and Na et al. (2011) show that the model is effective in assessing aspects such as the job itself, recognition, and promotion opportunities. Regarding extrinsic factors, a study by Krieg et al. (2013) has demonstrated the model's ability to assess factors such as salary, supervision, and administrative policies.

In particular, in the context of assessing faculty job satisfaction, the JDI has shown high effectiveness in not only reflecting factors related to job performance but also measuring important aspects such as education level, experience, and job position (Qayyum, 2013). The model's flexibility allows for adaptation to different industries and contexts, and allows for further study of field-specific factors. From a management perspective, the JDI model provides detailed information on areas that need improvement, thereby helping managers prioritize how to effectively improve employee satisfaction.

The factors used in job satisfaction in this article include:

1) Professional improvement (income, position of work, education and training, experience)

2) Factors belong to work and the work environment.

Applying the scale of Hackman and Oldham (1975); Cammann et al. (1979), Job satisfaction (JS) in this paper is measured through 5 criteria.

2.2. Professional improvement factors

Studies on job satisfaction of university faculty using the JDI model have shown mixed results among influencing factors. Professional qualifications have mixed effects: some studies suggest that faculty with a doctorate are more satisfied due to higher status and income (Eyupoglu & Saner, 2009), while others note that they are less satisfied due to pressure and high expectations (McGuinness & Wood, 2009; Green & Zhu, 2010). Job position has a significant effect on satisfaction due to different challenges and opportunities at each level (Kwiek & Antonowicz, 2014). Work experience often improves time management and reduces stress, thereby increasing satisfaction (Lu et al., 2017), although some studies do not find a significant relationship. Finally, although income is an important factor (Hagedorn, 2000), this relationship is still strongly influenced by intrinsic motivation and career development opportunities (Machado-Taylor et al., 2016). Therefore, faculty job satisfaction is the result of a complex interaction between many individual and organizational factors.

2.3. Work and work environment factors

Work-family conflict

Measuring the nature of work in the JDI model through work-family conflict is theoretically sound and offers many practical advantages. This variable directly reflects the pressure, flexibility, and intrusion of work into personal life - prominent features of the university teaching profession (Kinman & Jones, 2008). This approach allows for a more comprehensive assessment of the impact of work on mental health, emotional exhaustion, and overall satisfaction (Allen et al., 2000). Recent studies continue to confirm that work-family conflict has a strong negative impact on lecturers' job satisfaction and turnover intention (Wang et al., 2020), especially in the context of post-Covid-19 remote working, which has blurred the boundaries between the two domains (Carnevale & Hatak, 2020). Conversely, support from the organization and colleagues can significantly mitigate this impact and enhance satisfaction (Zhao et al., 2019). Therefore, including work-family conflict in the study not only increases the explanatory power of the JDI model but also brings high application value to policies supporting work-life balance for Vietnamese university lecturers.

The role of colleagues in job satisfaction

Relationships with colleagues are one of the five core factors of the JDI model and play an important role in determining job satisfaction, especially in the academic environment. Lacy and Sheehan's (1997)

study showed that relationships with colleagues are one of the strongest predictors of job satisfaction among university lecturers. Chiaburu and Harrison (2008) through meta-analysis confirmed the positive impact of support from colleagues on job performance and organizational commitment.

For female lecturers, support from colleagues becomes even more important in the context of work-family balance. According to Grzywacz and Marks (2000), support networks from colleagues can help reduce work-family conflict and increase job satisfaction. In particular, a culture of mutual support in the workplace can help female lecturers cope better with work pressure and family responsibilities (Thompson et al., 1999).

Based on the theoretical overview and previous studies on job satisfaction of lecturers, this study focuses on two main questions:

1. What factors affect (positively or negatively) the job satisfaction of female university lecturers?

2. How do career achievement variables affect job satisfaction?

From there, the study proposes the following six hypotheses:

H1: Female lecturers with a doctorate degree have higher job satisfaction than those with lower education.

H2: Female lecturers with 15 years of experience or more have higher job satisfaction than those with less experience.

H3: Female lecturers with an income of 15 million VND or more per month have higher job satisfaction than those with lower incomes.

H4: Female lecturers with the position of senior lecturer or concurrently holding a managerial position have a higher level of job satisfaction than other position groups.

H5: Work-family conflict has a negative impact on female lecturers' job satisfaction through increased pressure.

H6: Support from colleagues has a positive impact on female lecturers' job satisfaction.

This research framework allows for a systematic examination of both professional achievement factors and work environment factors affecting female university lecturers' job satisfaction. The hypotheses are built on the theoretical basis of the JDI model, while taking into account the characteristics of the teaching profession and the research context in Vietnam.

3. Research methods

3.1. Measurement

In this study, the Job Descriptive Index (JDI) model was adapted to the research context. Overall job satisfaction was measured using the scale of Cammann et al. (1979), which assesses the individual's overall satisfaction or dissatisfaction with work. Based on the core elements of the JDI model, the study developed observation variables for each specific aspect.

The nature of work was measured through work-family conflict (WFC) using the multidimensional scale of Carlson et al. (2000). Specifically, conflict was assessed in two directions: work interference with family (WIF) and family interference with work (FIW). Each direction was considered through three types of conflict: time, stress and behavior. This 6-dimensional model includes 24 observed variables, with each dimension having 4 variables, measured on a 5-point Likert scale from 1 (completely disagree) to 5 (completely agree). The training and promotion factor is assessed through the achievements that lecturers have in terms of educational level, job position, work experience and income level. For the colleague factor, the study focuses on assessing the level of support and relationships with colleagues at work. Adjusting the JDI model and designing these observed variables aims to ensure comprehensiveness in assessing the job satisfaction of female lecturers, while being consistent with the characteristics of the profession and the research context.

3.2. Research sample

The quantitative survey was conducted in two forms: in person and online. The selection of the research subjects was based on the theoretical foundations of work-family conflict. The author focuses on a group of female lecturers who are married, have at least one child, and are teaching at autonomous public universities, representing many different fields in Vietnam.

Regarding sample size, the questionnaire was sent to 518 female lecturers via email and live broadcast. The results obtained 457 valid responses (76%) from 22 public universities. The sample selection was carried out using a purposive sampling method combined with stratified random sampling, ensuring representativeness for different age groups, fields of expertise, and work positions.

4. Research results

The exploratory factor analysis and the measurement scale reliability analysis

Job satisfaction

The results of the job satisfaction scale test presented in Table 1 show some important findings. First, in terms of the unidimensionality of the scale, the eigenvalue of the first factor (3.27) is significantly larger than that of the next factor (0.56). At the same time, the first factor explains 65.47% of the total variance (greater than

the required 50%), which confirms that the observed variables in the scale are unidimensional.

Second, in terms of the reliability of the scale, the factor loading coefficients of all observed variables are greater than 0.6, ranging from 0.813 to 0.856, far exceeding the usual acceptance threshold of 0.5. The Cronbach's Alpha coefficient of the scale reached 0.867, much higher than the 0.7 level - the accepted threshold in social science research. The total item correlation coefficient of the observed variables ranged from 0.623 to 0.792, all greater than 0.3, indicating that the observed variables had high internal consistency. Third, regarding the suitability of exploratory factor analysis (EFA), the KMO index reached 0.816 (greater than 0.5) and the Bartlett test was statistically significant ($p < 0.001$), demonstrating that the data were suitable for factor analysis. Combined with the above indicators, it can be concluded that the job satisfaction scale fully meets the requirements of reliability and validity, suitable for use in subsequent analyses.

Table 1: Measure scale of job satisfaction

Variable	Loading factor	Correlation factor of total variables	Cronbach's Alpha
	Job Satisfaction (JS)		
JS1	0.856	0.623	0.867
JS2	0.813	0.792	
JS3	0.832	0.721	
JS4	0.842	0.682	
JS5	0.853	0.636	
Eigenvalue for 1st factor: 3.273			
Variance extracted (%): 65.470			
KMO = 0.816 > 0.5 and Bartlet's Test of statistical significance (p<0.001) *Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.861*			

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Work-Family Conflict

The results of the Total Variance Explained analysis show important findings about the factor structure of the work-family conflict scale. The eigenvalues of the first six factors (greater than 0.99) are all larger than the next factor (0.27), meeting the Kaiser criterion for factor extraction. At the same time, these six factors explain 61.4% of the total variance (exceeding the required 50%), confirming the unidimensionality of the components in the scale.

Regarding the indicators assessing the suitability of factor analysis, the results show that the factor loading coefficients of all observed variables are greater than 0.6, meeting the convergence requirement. The KMO index reached 0.858, far exceeding the threshold of 0.5, combined with the statistically significant Bartlett test ($p < 0.005$), showing that the data is completely suitable for factor analysis.

The analysis results show that the observed variables form 6 main factors as presented in Table 2. Of which, there are two notable adjustments: the 3rd component (WIF_B - behavior conflict from work to family) is cut to WIF_B4 and the 4th component (FIW_T - time conflict from family to work) is cut to FIW_T4. This adjustment is based on statistical indicators and ensures the unidimensionality and reliability of the scale.

Table 2: Results of findings analysis

Variable	Loading factor					
	factor 1	factor 2	factor 3	factor 4	factor 5	factor 6
WIF_T1	.778					
WIF_T2	.772					
WIF_T3	.778					
WIF_T4	.781					
WIF_S1		.725				
WIF_S2		.775				
WIF_S3		.767				
WIF_S4		.819				
WIF_B1			.882			
WIF_B2			.842			
WIF_B3			.856			
FIW_T1				.861		
FIW_T2				.892		
FIW_T3				.877		
FIW _S1					.787	
FIW_S2					.770	
WIF_S3					.778	
WIF_S4					.854	
FIW _B1						.795
FIW_B2						.846
FIW _B3						.784
FIW _B4						.883

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

The results of testing the reliability of work - family conflict variables show that the Cronbach's Alpha factor is greater than 0.8, the higher the score, the more reliable the generated scale is. The Corrected item-total

Correlation of component variables is greater than 0.6. The smallest is the WIF_S3 variable of the Work-Family Conflict factor in the level equal to 0.638 (Table 3). This shows that the research concepts built from the observed variables all have intrinsic consistency and are well-measured.

Table 3: The results of testing the reliability of factors scale that reflect the work-family conflict

Variable	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. Time-based work-to-family conflict (WIF_T). N=4. α=0.868		
WIF_T1	.721	.831
WIF_T2	.732	.827
WIF_T3	.719	.832
WIF_T4	.705	.837
2. Strain-based work-to-family conflict (WIF_S). N=4. α=0.859		
WIF_S1	.712	.818
WIF_S2	.721	.814
WIF_S3	.638	.848
WIF_S4	.749	.802
3. Behavior-based work-to-family conflict (WIF_B). N=3. α=0.902		
WIF_B1	.813	.855
WIF_B2	.797	.868
WIF_B3	.814	.857
4. Time-based family-to-work conflict (WIF_T). N=3. α=0.902		
FIW_T1	.756	.858
FIW_T2	.807	.816
FIW_T3	.774	.835
5. Strain-based family-to-work conflict (WIF_B). N=4. α=0.897		
FIW_B1	.748	.876
FIW_B2	.787	.861
FIW_B3	.732	.885
FIW_B4	.827	.848
6. Behavior-based family-to-work conflict (WIF_B). N=4. α=0.833		
FIW_S1	.641	.798
FIW_S2	.644	.796
FIW_S3	.631	.802
FIW_S4	.732	.756

Normality distribution test

The results of the normality distribution test mentioned in Table 3 show the level of satisfaction according to the non-normal distribution (P-value for each feature of the control variable is <0.05) (see Table 4).

Table 4: Kolmogorov - Smirnov test for normality distribution

Control variable	Statistic	Df	Sig.
Degree			
Bachelor	.368	33	.000
Master	.253	320	.000
Doctor	.261	104	.000
Work position			
Manager	.286	10	.020
Both lecturer and manager	.290	68	.000
Permanent lecturer	.250	340	.000
Temporary lecturer	.312	39	.000
Experience			
Less than 5 years	.290	56	.000
5-10 years	.222	160	.000
10-15 years	.269	125	.000
More than 15 years	.322	116	.000
Income			
Less than 5 million Vietnamese Dong (VND)	.460	12	.000
5-10 million VND	.237	241	.000
10-15 million VND	.281	131	.000
More than 15 million VND	.292	73	.000

Conducting the Mann-Whitneym, Kruskal-Wallis tests to evaluate the difference in job satisfaction levels according to the characteristics reflecting job achievement.

Table 5: Summary of tests (Mann-Whitney, Kruskal -Wallis) differences in average satisfaction of job achievement

Control variable	Mann-Whitney/Chi-square Kruskal -Wallis	Sig.
Degree		
Bachelor	12.485	.002
Master		
Doctor		
Work position		
Manager	9.440	.024
Both lecturer and manager		
Permanent lecturer		
Temporary lecturer		
Experience		
Less than 5 years	7.949	.047
5-10 years		
10-15 years		
More than 15 years		
Income		
Less than 5 million VND	15.517	.001
5-10 million VND		
10-15 million VND		
More than 15 million VND		

The p-value <0.05, so it can be concluded that there is a difference in satisfaction level among female lecturers and the characteristics in each group reflect the work achievement.

Analysis of regression models and testing of research hypotheses

The analysis results show that the regression model has high suitability and statistical significance. The adjusted R square coefficient reflects the level of influence of independent variables on the dependent variable. Specifically in this study, the independent variables explain nearly 80% of the change in the dependent variable (job satisfaction), the remaining 20% is due to variables outside the model and random errors.

Table 6: Estimated results of the regression function

Variable	Satisfaction		
	Model 1	Model 2	Model 3
Doctorate	.067	.027	-.037
Experience over 15 years	-.141(*)	-.099	-.030
Income over VND 15 million a month ≈ USD 650 a month	.114	.132 (*)	.036
The position as permanent lecturer or both lecturer and manager	.136	.219 (***)	.205 (***)
Family-to-work Conflict		-.394 (***)	-.121 (***)
Work-to-family Conflict		-.508 (***)	-.812 (***)
The support of colleagues			.498 (***)
R Square	**0.013**	**0.368**	**0.795**
Adjusted R Square	**0.005**	**0.356**	**0.793**

** p<0.1; **p<0.05; ***p<0.01.*

To test the suitability of the model, the study uses the Durbin-Watson test and the F test in ANOVA. The Durbin-Watson test result is 1.880, showing that there is no first-order autocorrelation in the model (model 3). The F test is used to examine the generalizability of the regression model. The results show that the sig

value of the F test is 0.000 < 0.5 for both Model 2 and Model 3, confirming that the linear regression model is statistically significant and suitable for the population.

The research results show some important findings on factors affecting the job satisfaction of female university lecturers. Regarding factors reflecting professional achievements, the study found no evidence of a statistically significant difference in job satisfaction between the group of lecturers with a doctorate degree and the group with a master's or university degree. This finding is consistent with the study by Eyupoglu and Saner (2009) that educational level does not increase job satisfaction. Similarly, work experience and income (over 15 million VND/month) also did not make a significant difference in the level of satisfaction, reaffirming the results of previous studies (Schroder, 2008; Castillo and Cano, 2004).

Meanwhile, job position showed a statistically significant effect on the satisfaction of lecturer groups in different positions (H4). In particular, the study confirmed the important role of work-family conflict, especially work-family conflict (H5), reflecting the stressful nature of university. To minimize these pressures, support from colleagues plays a key role (H6) in enhancing the job satisfaction of female lecturers.

These findings have important implications for policy making in managing and developing the teaching staff. Instead of focusing on factors such as education level, experience or income, universities should focus on building a supportive working environment and policies to help balance work and family for female lecturers.

5. Conclusion

This study aims to analyze the role of factors reflecting professional performance, working environment, and job satisfaction of female university lecturers. The results of the study show that the influence of job performance factors on the career satisfaction of female lecturers is not uniform. It is worth noting that while the job position factor has a significant impact (positive regression coefficient .205 with p<0.01), factors such as education level (coefficient -.037, not statistically significant), work experience (coefficient -.030, not statistically significant) and income level (coefficient .036, not statistically significant) do not show a clear influence on their job satisfaction. This finding has important implications for the practice of managing the higher education environment. According to the research results from the regression model, work pressure and role conflict are the main challenges that negatively affect the career satisfaction of lecturers in general and female lecturers in particular, as shown by the coefficients of work interference with family (-.812, p<0.01) and family interference with work (-.121, p<0.01). In particular, for female lecturers, colleague support plays a key role in helping them balance work and family, thereby reducing pressure and improving job satisfaction (regression coefficient .498, p<0.01). The research model achieved high reliability with an adjusted R^2 of 0.793, showing that the independent variables explained 79.3% of the variation in job satisfaction. Based on the research results, several policy recommendations are made to improve the effectiveness of the management and development of female lecturers:

- Build a supportive and flexible working environment, creating conditions for female lecturers to balance work-family responsibilities.

- Develop mentoring and networking programs to enhance connections and support among female lecturers.

- Establish fair evaluation and promotion policies that focus on actual capacity and achievements.

- Invest in professional development and leadership programs specifically for female lecturers.

Understanding the factors that influence female lecturers' job satisfaction is meaningful to them and helps managers have a multi-dimensional view in policy making. This will contribute to creating an equal, professional, and effective working environment in higher education while promoting the sustainable development of female lecturers in the future.

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DIGITAL TRANSFORMATION IN THE RETAIL SUPPLY CHAIN - BARRIERS TO CONSIDER

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Abstract: ***In the context of the Fourth Industrial Revolution (Industry 4.0) and the post-Covid-19 era, many retail companies are reassessing their supply chains to ensure long-term survival and sustainable development. For this purpose, digital transformation in the supply chain or the digital supply chain has emerged as a critical concept receiving growing attention from managers. Digital transformation in the supply chain can enhance the resilience of supply chain operations by providing greater tools for visibility, control, and demand forecasting. This paper aims to clarify the requirements for digital transformation in the retail supply chain, identify the fundamental barriers influencing the decision to implement a digital supply chain, and describe several emerging technologies that are currently being widely adopted in supply chain management.***

• Keywords: *digital transformation, supply chain, retail.*

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1. Introduction

In today's volatile global business environment combined with the impacts of the post-Covid-19 era, several vulnerabilities in global supply chains have been exposed, placing significant pressure on enterprises to find solutions that enhance supply chain network resilience while striving to improve competitiveness. In this context, digital supply chain transformation is considered a promising solution to effectively manage risks. At the same time, the rapid development and widespread adoption of digital technologies clearly underline the need for businesses to digitally transform their operations. Moreover, these digital technologies can help optimize cost structures through tools such as blockchain, the Internet of Things (IoT), and virtual assistant platforms, while also improving operations and reducing supply chain costs. The benefits of digital transformation in the retail supply chain are undeniable. However, it is crucial that all stakeholders involved in supply chain recognize the potential advantages of adopting new technologies and digitizing their supply chain operations.

This paper highlights the essential requirements for digital transformation in supply chains and explores the key barriers affecting the adoption of digital supply chains in the retail environment.

2. Digital transformation in the supply chain

Digitization, digitalization and digital transformation are terms that frequently appear among the top priorities of today's business leaders. Although often used interchangeably, these concepts have distinct meanings and require entirely different approaches. According to Verhoef et al. (2019), these represent three stages of digital transformation. Specifically, digitization refers to the conversion of information, data, and documents from physical or analog formats into digital form. Digitalization involves the use of this digitized data and documents to improve or modify operational processes, workflows, and business activities. Digital transformation, in contrast, goes beyond digitization and digitalization by driving a comprehensive shift in a company's overall business strategy. Vial (2019) defines digital transformation as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies".

Within the context of supply chain management, digital transformation begins by integrating all processes and data into a unified platform, automating core functions, and applying advanced technologies to analyze large-scale datasets for the purpose of identifying, predicting, and mitigating potential disruptions. This paradigm shift has given rise to the concept of the Digital Supply Chain (DSC), which emphasizes a digitally driven approach to managing and optimizing supply chain operations. Büyüközkan and Göçer (2018) conceptualize the DSC as an intelligent technological system that leverages big data capabilities and facilitates seamless collaboration and

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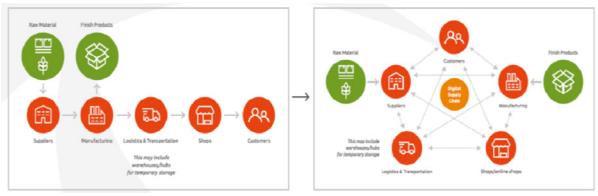
communication through the integration of hardware, software, and digital networks. The DSC aims to enhance value creation, improve accessibility, reduce costs, and ensure operational consistency, flexibility, and efficiency. Similarly, Kinnet (2015) describes the DSC as a value-based, intelligent network that harnesses emerging technologies to enable new business models. According to Bhargava, Ranchal, and Ben Othmane (2013), the DSC is grounded in technological infrastructures, including software, hardware, and communication networks, that support interaction among globally distributed entities and coordinate the key activities of supply chain partners, including procurement, production, warehousing, transportation, and distribution.

The distinction between traditional supply chains and digital supply chains is illustrated in Figure 1. Fundamentally, the core processes and values delivered by traditional supply chains and digital supply chains are similar. However, the key differentiating factor lies in the approach adopted for supply chain operations in practice.

Figure 1. Traditional supply chain vs digital supply chain



Source: De Souza et al, 2021

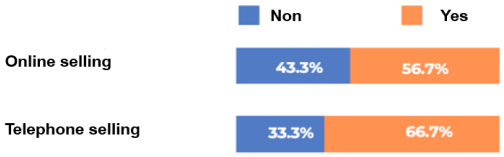
The traditional supply chain is a complex system in which raw materials are transformed into finished goods and subsequently distributed to end users. This supply chain structure encompasses multiple entities, such as suppliers, processing centers, warehouses, distribution hubs, and retail outlets. Traditional supply chains are typically designed based on the assumption of stable input supply and predictable output distribution. Processes are specifically planned and handled separately to ensure a continuous flow of product supply and information. However, the traditional supply chain model suffers from limited connectivity, primarily due to a lack of coordination among its various components. This lack of integration often results in suboptimal overall performance and restricted adaptability in dynamic environments.

In contrast, the digital supply chain leverages advanced technological processes to optimize operations and adapt to rapidly changing conditions. These supply chains operate in real time and are inherently predictive, allowing for the early identification of potential disruptions or inefficiencies. By integrating cutting-edge technologies such as artificial intelligence (AI), robotics, the Internet of Things (IoT), and other digital innovations, digital supply chains enable enterprises to enhance operational efficiency, reduce costs, and achieve superior visibility across the entire value network. The advantages of digital supply chains include increased speed, flexibility, global connectivity, real-time management, transparency, scalability, innovation, proactivity, and environmental sustainability.

3. The rise of e-commerce in retail supply chains

E-commerce and online shopping are no longer unfamiliar concepts to today's consumers. As a sector that heavily depends on consumer behavior and purchasing power, retail has been significantly influenced by recent shifts in consumption habits. Particularly in 2020, the Covid-19 pandemic served as a major catalyst for the accelerated growth of e-commerce, driven by the increasing demand for online shopping during periods of social distancing and mobility restrictions. In addition, the advancement of digital technologies and widespread internet accessibility have given rise to new consumer expectations and increased demands on suppliers. These developments have also established a new retail channel, online platforms, which retailers can leverage to better serve evolving customer needs.

Figure 2. The business's sales model



Source: Ministry of Planning and Investmen, 2022

The results of a survey conducted with 1,000 enterprises, presented in the 2022 Annual Report on Digital Transformation in Enterprises by the Ministry of Planning and Investment, indicate that in addition to two traditional sales methods, namely in-store and telephone-based sales, online sales have become significantly more prevalent. This growth is largely attributed to the active involvement of various online sales platforms (e.g., Shopee, Lazada, Tiki) and social media channels (e.g., Facebook, Instagram, Zalo, and more recently, TikTok), with the majority of businesses adopting a multichannel sales strategy (Figure 2). The surge in business activity on e-commerce platforms and social networks became a defining feature of Vietnam's e-commerce

landscape in 2022 and the first quarter of 2023. According to the Vietnam E-commerce Association (VECOM), 65% of surveyed enterprises reported conducting business on social platforms such as Zalo, WhatsApp, Viber, Facebook Messenger, and TikTok Shop. Meanwhile, business activity on e-commerce platforms continued to grow steadily, with 23% of enterprises selling products on such platforms in 2022 (VECOM, 2023). This trend has persisted into subsequent years. Specifically, in 2024, VECOM estimated that the size of Vietnam's e-commerce market reached USD 32 billion, with a growth rate of 27%. Of this, online retail sales accounted for USD 22.5 billion, representing a 30% increase compared to the previous year. Consequently, e-commerce contributed approximately 12% to the country's total retail sales of goods and consumer services, higher than the 10% level in 2023. Notably, the proportion of online retail sales to total retail sales of goods reached 11%, compared to 8.8% in 2023 (VECOM, 2025).

To further assess the adoption of e-commerce by businesses, VECOM conducted a nationwide survey of over 5,000 enterprises in 2025. The findings reveal that the most commonly used e-commerce formats include company websites, social media platforms, e-commerce platforms, and mobile platforms (Table 1). Specifically, 46% of surveyed enterprises reported operating a dedicated website for promotional and commercial purposes. Among those with websites, 56% had integrated online ordering functionalities, while 75% had embedded customer interaction tools (e.g., Zalo, Facebook) directly into their websites. Regarding social media (Facebook, Zalo, Instagram, etc.), 52% of businesses indicated using these channels for commercial purposes, although this percentage reflects a slight decline compared to 2021, 2022, and 2023. Participation in e-commerce platforms has also received growing attention, with 26% of surveyed enterprises reporting active business operations on these platforms in 2024 - particularly in the latter half of the year, where marketplace engagement became a strategic priority for many firms. Among all online business formats, mobile platform-based commerce had the lowest adoption rate. Only 15% of surveyed enterprises reported developing e-commerce applications (apps) for mobile devices, a noticeable decline from previous years. Among those adopting mobile platforms, 46% allowed customers to complete the entire shopping process through the app, while 18% implemented promotional programs exclusively for customers using mobile applications. As mobile app usage has become more widespread, the level of business prioritization aimed at driving mobile commerce has declined significantly over the past two years.

Table 1. Percentage of enterprises adopting different E-commerce model

	2021	2022	2023	2024
Website	43%	44%	44%	46%
Social media platforms	57%	65%	58%	52%
E-commerce platforms	22%	23%	24%	26%
Mobile platforms	17%	22%	20%	15%

Source: Vietnam E-commerce Association, 2025

Digital transformation yields benefits across all operational dimensions of enterprises - from strategic management to daily operations. The most observable advantages include reduced operational costs, expanded customer reach within shorter timeframes, and improved decision-making speed and accuracy through timely reporting systems. In addition, it enhances labor productivity, thereby increasing both operational efficiency and competitiveness. As businesses undertake digital transformation, disruptive technologies are employed to provide more accurate and real-time insights into the market. Technology further assists enterprises in collecting, processing, and analyzing market data, generating deeper understanding of customer trends and sentiment, while also enabling the design of more effective customer experiences and operational processes. Today's consumers increasingly demand more convenient shopping experiences, broader product choices, easier access, simpler interfaces, and a wider array of supplementary services. Consequently, businesses that are able to effectively leverage customer data can take proactive measures to strengthen their competitive advantages. This is precisely what digital transformation delivers - it enables firms and their supply chains to meet the diverse demands of customers while responding agilely to continuously evolving market conditions.

4. Barriers to digital transformation in retail supply chain

To assess the barriers that affect the digital transformation capabilities of enterprises within the retail supply chain, this study adopts the Technology–Organization–Environment (TOE) framework. Originally proposed by Tornatzky and Fleischer (1990), the TOE framework is a theoretical model that explains how technological, organizational, and environmental factors influence the adoption and implementation of new technologies in organizations.

4.1. Technological factors

According to the TOE framework, technological factors play a pivotal role in determining the success

of digital transformation initiatives. These encompass both internal and external technologies available for organizational use. Technological attributes such as complexity, usability, and learnability directly influence the likelihood of adoption. In the context of the Fourth Industrial Revolution, companies are rapidly transitioning to digital platforms that leverage technologies such as SMAC (Social, Mobile, Big Data Analytics, and Cloud Computing). However, if customers and stakeholders perceive these technologies as overly complex, a lack of trust may become a significant barrier to the adoption of digital supply chains. Another notable barrier in the retail sector is financial capability. According to Harvard Business Review (2015), some retail companies may abandon technology deployment due to high investment costs. While digital supply chains can reduce inventory-related operational and management expenses, transitioning from traditional (paper-based) systems to digital systems often requires substantial upfront investment including infrastructure installation, procurement of new technological resources, and deployment costs. As such, technological costs may represent a considerable hindrance to adoption, particularly in the retail context. Additionally, cybersecurity concerns continue to present challenges especially in developing countries where infrastructure and data protection tools are often insufficient. The growing frequency of cyberattacks acts as a deterrent to the adoption of digital supply chains. Nevertheless, partnerships with cybersecurity providers can enhance protection capabilities and mitigate these risks. The concept of relative advantage is another crucial determinant of adoption. As noted by Rogers (2003), relative advantage refers to the extent to which an innovation is perceived as superior to the idea it supersedes. Organizations are more likely to adopt new technologies when they perceive these innovations as offering substantial benefits beyond current methods. Moreover, the concept of compatibility must be considered: a new technology is more readily accepted when it aligns with the organization's existing values, processes, and IT infrastructure. When these compatibility conditions are met, the likelihood of technology adoption increases significantly.

Clearly, the success of digital transformation initiatives is largely dependent on the accessibility, affordability, and suitability of the technology being adopted. In the retail sector where customers are at the center user experience and the ability to learn and adapt become even more important. Therefore, to foster effective digital transformation, firms must not only invest in appropriate technologies but also consider internal capabilities, employee readiness, and customer trust. When implemented effectively, digital transformation can enhance inventory management and demand forecasting while simultaneously generating sustainable competitive advantage for the organization (Daniels & Jokonya, 2020).

- Organizational factors

According to the TOE framework, organizational characteristics such as size and structure significantly influence the adoption of new technologies. For a digital transformation to be effective, it requires clear leadership from top management. These leaders must not only articulate a digital vision but also align it with the strategic objectives of the entire organization. To overcome barriers such as the complexity of emerging technologies like the Internet of Things (IoT), change management programs must be implemented to address the fear and uncertainty associated with digital disruptions in the retail sector. Wade and Marchant (2014) emphasize that, in the absence of human resource mechanisms that create added value for stakeholders during the digital transformation process, the adoption of digital supply chains may be negatively impacted and could encounter resistance from employees. Moreover, managerial competence and employees' technological skills are considered key factors in the successful adoption of digital supply chains. Successful managers, such as at Amazon, have demonstrated the critical role of collaborative planning and forecasting in production. In contrast, when managers fail to analyze inventory and distribution data streams effectively, digitalization may backfire and produce unintended outcomes. Furthermore, technical expertise particularly in data science is essential for leveraging advanced analytics tools that are integral to digital transformation. Many retail firms, especially those in developing countries, face a shortage of in-house IT professionals, which limits their ability to analyze and use data effectively, while also increasing internal resistance to digital initiatives. Implementing digital transformation initiatives requires personnel who possess both technological expertise and domain-specific knowledge in supply chain management. Firm size may also influence the adoption of technological innovations within supply chains. Typically, larger organizations are more capable of adopting innovations due to their greater financial resources, which support implementation efforts and reduce

the risks associated with transformation (Daniels & Jokonya, 2020).

- Environmental factors

Environmental factors play a critical role in shaping a firm's decision to adopt digital technologies, particularly in the retail sector. These include industry structure, regulatory conditions, the presence of IT service providers, customer expectations, and competitor actions. Firms are more likely to adopt digital supply chains if they believe they will receive adequate technical support from IT providers throughout implementation and operations. This confidence in technical collaboration mitigates the perceived risks of technological innovation. Competitive pressure is another major driver. When firms perceive that failing to adopt new technologies could result in a loss of competitive advantage or customer base, they are more inclined to pursue early adoption. In addition, trust-based relationships with customers can further motivate innovation, as customer expectations regarding service speed and personalization continue to rise. At the same time, national policies and regulations governing information technology affect how data is shared and utilized within enterprises. Digital transformation fosters innovation by enabling firms to make effective use of data across domains such as sales, inventory management, and logistics. The OECD (2017) highlights that data serves as the foundation of digital trade, enabling firms to coordinate global production through complex value chains. Therefore, appropriate data governance policies must be established to ensure smooth data flows while safeguarding privacy and cybersecurity. Trade policies should also foster a digital environment that is open yet secure, balancing public interest with individual privacy rights. Ultimately, the essence of any business is to serve its customers. This fundamental purpose compels organizations to innovate continuously even when such innovations are reactive or not cost-optimized. Growing customer expectations have emerged as a key pressure point, compelling businesses to adopt new technologies at an accelerated pace. In the digital era, failure to innovate may equate to a loss of market share (Daniels & Jokonya, 2020).

5. Orientation for digital transformation of vietnam's retail supply chain

Pham Thi Huyen (2022) argues that digital transformation is likely to be a costly and complex journey, especially considering that the majority of Vietnamese retail companies are small and medium-sized, and have long operated using traditional methods. Therefore, digital transformation should be approached step by step, beginning with digitization, then progressing to digitalization in order to optimize inefficient operational areas, and finally culminating in digital transformation.

The first step involves transferring information, workflows, tasks, and data into digital environments. This step requires proactive efforts to change habitual behaviors among all members of the supply chain, and must also include procedures to ensure the quality and accuracy of digitized data.

The second step is process digitalization. This involves increasing the level of automation in supply chain operations through the application of digital technologies. It enables supply chains to more quickly detect inefficiencies and identify areas for optimization.

Finally, digital transformation refers to transitioning toward a new business model and a novel operational paradigm. For example, if the data reveals that online shoppers significantly outnumber in-store customers, the enterprise may choose to shift entirely to an online business model and enhance customer experience through the use of virtual reality technology and electronic payment systems.

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FACTORS INFLUENCING THE BRAND IMAGE OF TEA ENTERPRISES: EVIDENCE FROM CLUSTERED DATA IN THAI NGUYEN PROVINCE

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Abstract: ***This study aims to identify factors affecting brand image in the specialty tea industry in Thai Nguyen Province. Data was collected from 320 customers of 40 tea enterprises and analyzed using SEM model with two-level cluster data to improve the reliability of the estimates. Five factors were considered: Perceived Quality (PQ), Brand Trust (BT), Perceived Value (PV), Digital Communication (DC) and Distribution Channel Experience (CE), with Brand Image (BI) as the dependent variable. The results show that PQ, PV, BT and DC have positive and statistically significant effects on BI, while CE has no significant impact. The model explains 54% of the variation in BI, indicating a high level of relevance. The study contributes to expanding empirical evidence on branding in the specialty agricultural sector and provides managerial implications related to quality improvement, trust building and digital communication enhancement.***

• Keywords: *brand image, perceived quality, brand trust, perceived value, digital media, SEM, cluster data, Thai Nguyen.*

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1. Introduction

The Vietnamese tea industry, especially in Thai Nguyen Province, plays an important role in the specialty agricultural value chain, contributing to local economic growth and farmers' income. As a leading region for high-quality green and hill tea, Thai Nguyen has strong potential for brand positioning. However, increasing competition from domestic and foreign tea brands and rising consumer expectations for quality and experience have made brand image building more challenging for local enterprises.

Brand image reflects consumers' perceptions and associations with a brand, influencing their attitudes and purchasing decisions. A strong image enhances trust, loyalty, and market competitiveness. According to Keller (2013), managing brand image involves not only tangible attributes but also consumer experience, perceived value, and credibility—factors that become critical under intense competition. Prior research shows that perceived quality, brand trust, perceived value, digital communication, and channel experience significantly shape brand image (Aaker, 1991; Keller, 2013; An, Nguyen & Nguyen, 2025; Phan et al., 2024). Yet, most studies focus on FMCG or service industries, while specialty agricultural products particularly Thai Nguyen tea—lack systematic investigation, leaving an important research gap.

This study aims to analyze how the five factors (PQ, BT, PV, DC, CE) influence the brand image (BI) of Thai Nguyen tea enterprises. Data were collected from 320 customers across 40 representative enterprises (8 customers per enterprise), allowing the use of SEM with a two-level cluster design to control sampling error and improve estimation accuracy.

The findings are expected to enrich branding theory in specialty agricultural products and provide practical implications for tea enterprises to strengthen competitiveness and enhance brand image in domestic and international markets.

2. Literature review

2.1. Perceived Quality (PQ)

Perceived quality is understood as the consumer's subjective perception of the superior quality of a product or service compared to alternatives (Zeithaml, 1988). This is a core factor that forms trust and positive attitudes towards a brand. Many studies show that perceived quality has a direct and strong influence on brand image (Aaker, 1991; Keller, 2013; Tran & Vo, 2022). In the specialty agricultural products industry such as tea, where customers often do not have full technical information, perceived quality plays a decisive role in forming brand impressions and recognition.

2.2. Brand Trust and Authenticity (BT)

Brand trust is the degree to which consumers are willing to believe in the promises and values that a brand delivers (Chaudhuri & Holbrook, 2001). When customers trust a brand, they tend to evaluate it positively and engage in a long-term relationship, thereby strengthening the brand image. In the context

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of tea products associated with origin, provenance and production methods, authenticity further increases trust, thereby enhancing the brand image (An et al., 2025).

2.3. Perceived Value (PV)

Perceived value reflects the customer's overall assessment of the benefits that a product brings compared to the costs they have to pay (Sweeney & Soutar, 2001). When customers perceive high value, they tend to form positive evaluations, leading to a strengthened brand image. In the tea industry, perceived value is not only about taste and price, but also includes cultural experiences, beliefs about origin and sustainability (Tran & Vo, 2022).

2.4. Digital Communication (DC)

Digital communication includes promotional activities, interactions, product and brand introductions through online platforms such as social networks, websites, e-commerce (Kaplan & Haenlein, 2010). Effective digital communication activities help increase recognition, build trust and emotional attachment, thereby enhancing brand image. In the context of digital transformation of agriculture in Vietnam, digital communication is gradually becoming the main channel to connect local tea products with consumers (Phan et al., 2024).

2.5. Channel Experience (CE)

Channel experience refers to how customers perceive and evaluate the touchpoints in the purchase process including physical stores, product displays, and e-commerce platforms (Verhoef et al., 2009). A good channel experience makes it easier for customers to access the product, increasing satisfaction and positive emotions toward the brand. In the tea industry, this is a key factor in strengthening brand recognition and engagement.

2.6. Brand Image (BI)

Brand image is the set of beliefs, emotions, impressions, and experiences that consumers associate with a particular brand (Keller, 2013). A strong brand image not only enhances recognition but also creates a sustainable competitive advantage. Empirical studies have shown that PQ, BT, PV, DC, and CE all have positive and statistically significant impacts on brand image in various industry contexts (Nguyen & Ngo, 2021; An et al., 2025). However, in the specialty tea industry in Vietnam, this relationship has not been systematically tested, especially with enterprise-scale cluster data.

2.7. Proposed research model and hypotheses

Based on the theoretical basis and the overview of empirical studies, the research model is proposed as follows. The model is illustrated in Figure 1.

Based on the theoretical foundation and empirical evidence, the research hypotheses are developed as follows:

H1: Perceived quality (PQ) has a positive impact on brand image (BI).

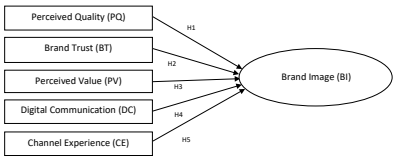
H2: Brand trust (BT) has a positive impact on brand image (BI).

H3: Perceived value (PV) has a positive impact on brand image (BI).

H4: Digital communication (DC) has a positive impact on brand image (BI).

H5: Distribution channel experience (CE) has a positive impact on brand image (BI).

Figure 1: Proposed research model



3. Research methodology

3.1. Research design

The study was conducted using a quantitative method to determine and test the influence of five independent factors - Perceived Quality (PQ), Brand Trust (BT), Perceived Value (PV), Digital Communication (DC) and Distribution Channel Experience (CE) - on the dependent variable Brand Image (BI) in the tea industry in Thai Nguyen Province. The research design followed the Structural Equation Modeling (SEM) approach with two-level cluster data, in which customers are the observation unit (level 1) and tea enterprises are the cluster unit (level 2). This method allows controlling errors due to dependence between observations in the same cluster (due to sharing the same characteristics of corporate brands), thereby increasing the accuracy of estimates and hypothesis testing..

3.2. Measurement instrument

The scale of latent variables is built based on inheritance and adjustment from prestigious international studies, ensuring reliability and suitability to the context of the tea industry in Vietnam.

Table 1: Constructs, number of items and sources of measurement

Factor/Code	No of items	Description	Sources of Measurement
Perceived Quality (PQ)	4	Customer perception of product quality (freshness, taste, reliability, stability).	Alhaddad (2015)
Brand Trust (BT)	4	Level of trust in the brand regarding commitment, transparency and credibility.	Alhaddad (2015)
Perceived Value (PV)	4	Overall assessment of benefits and costs, including intangible values such as emotions and sustainability commitment.	Zhang et al. (2024)
Digital Communication (DC)	4	Online communication activities: interactivity, content consistency, multi-channel presence.	Ibrahim et al. (2024)
Channel Experience (CE)	4	Customer experience across physical and online channels (convenience, transparency, good service).	Balbin et al. (2024); Herzig et al. (2025)
Brand Image (BI)	3	Overall perceptions, emotions, and impressions associated with a brand.	Zhang et al. (2024); Ibrahim et al. (2024)

Source: Compiled by the author based on prior studies

3.3. Sample and data collection

The study used a purposive sampling method combined with random sampling to ensure both suitability with the research objectives and to enhance representativeness. First, 40 representative tea enterprises were selected with the support of the Tea Association and local management agencies, based on the following criteria: (i) stable operation for at least 3 years, (ii) having an official distribution channel, (iii) having a stable customer base, and (iv) having a clear brand identity.

At each enterprise, 8 customers were randomly selected at direct points of sale or online distribution channels to reflect the diversity of the consumer group. The total sample size was 320 customers (40 clusters) consistent with a two-level cluster data design.

Data were collected using a structured questionnaire, including demographic information and items measuring 6 latent variables. The questionnaire was distributed in two forms: a direct survey at the point of sale and a controlled online survey. Before the official survey, the study conducted a pilot survey with 30 customers to calibrate the content. The data collection period was from March to July 2025. Invalid questionnaires were removed to ensure data reliability..

3.4. Data analysis methods

The data analysis process is carried out in three main steps, to ensure the reliability of the scale, the value of the measurement model and the testing of the research hypothesis:

Step 1. Testing the reliability and value of the scale: The data is initially processed using SPSS to test the reliability of the observed variables through the Cronbach's Alpha coefficient and the item-total correlation coefficient. Variables with coefficients < 0.3 will be eliminated. Then, exploratory factor analysis (EFA) is performed to assess the latent structure and the preliminary convergence of the scale.

Step 2. Confirmatory factor analysis (CFA): Next, the measurement model is tested using AMOS. The model fit indices used include GFI, CFI, TLI and RMSEA. Convergent validity is tested through AVE and CR, while discriminant validity is assessed using HTMT and the Fornell-Larcker criterion. Only the scales that meet the requirements are included in the structural model.

Step 3. Structural model analysis SEM cluster data: Finally, the structural equation model is estimated using R with the packages lavaan and lavaan.survey. This method allows for adjusting the variance and standard error by cluster (enterprise), helping to accurately test the hypotheses H1-H5. The standardized regression coefficients (β) and statistical significance levels are used to conclude the hypothesis.

The statistical significance level applied is 5% ($p < 0.05$). In addition, the R^2 index of the dependent variable BI is reported to assess the explanatory power of the model. All analysis steps are performed sequentially and strictly controlled to ensure the reliability and scientific value of the research results.

4. Results

4.1. Descriptive statistics of respondents

The total survey sample consisted of 320 customers, evenly distributed among business clusters, ensuring representativeness of tea consumers in Thai Nguyen Province and other localities.

Men accounted for 71.3% - reflecting the fact that the main customer group is middle-aged men in hospitality and entertainment activities. The 30-50 age group accounted for the highest proportion (46.3%), followed by over 50 years old (30%) and under 30 years old (23.8%), consistent with the traditional tea consumption characteristics of the middle-aged and elderly groups.

Regarding place of residence: 57.5% of customers live in Thai Nguyen, 33.8% from other provinces, 8.8% international - showing potential for market expansion. Regarding frequency of use: 40.9% use tea daily, 34.1% use regularly.

Education level: 59.7% high school degree or below, 35.3% college-university, 5% post-graduate - reflecting the characteristics of the customer group that mainly consumes traditional agricultural products.

Regarding the level of brand attachment: 49.1% use for more than 3 years, 36.3% from 1-3 years. In general, the survey sample shows the characteristics of core customers: male, middle-aged, regular tea users, long-term attachment, which is an important basis for analyzing factors affecting brand image.

4.2. Descriptive analysis of factors

Table 2: Descriptive statistics and correlation matrix

Factor	Mean (M)	Std. (SD)	PQ	BT	PV	DC	CE	BI
PQ	3.527	0.712	1					
BT	3.528	0.717	.248**	1				
PV	3.331	0.747	.099	.470**	1			
DC	3.462	0.645	.191**	.293**	.367**	1		
CE	3.424	0.717	.079	.169**	.235**	.359**	1	
BI	3.547	0.561	.377**	.514**	.519**	.428**	.355**	1

*Note: *p < .01*

Source: Compiled by the author

The results of descriptive analysis show that the factors in the model all have mean values ranging from 3.33 to 3.55, reflecting the relatively high level of agreement of respondents with the statements in the scale. Specifically, BI (M = 3.547) and BT (M = 3.528) have the highest mean values, indicating that customers generally have positive assessments of the image and level of trust in the tea brand. Meanwhile, PV (M = 3.331) has the lowest mean, implying that

the perceived value of the product still has room for improvement.

The Pearson correlation coefficients are all positive and statistically significant at $p < 0.01$, indicating a positive linear relationship between the variables. Notably, BI had the strongest correlation with PV ($r = 0.519$) and BT ($r = 0.514$), followed by PQ ($r = 0.377$) and DC ($r = 0.428$), suggesting that these may be important factors influencing brand image. CE also had a positive correlation but at a lower level ($r = 0.355$).

This result provides preliminary evidence in support of hypotheses H1-H5 in the research model, and is the basis for the CFA and cluster SEM analysis steps in the next section.

4.3. Reliability and convergent validity of constructs

Table 3: Reliability and convergent validity

Factors	No. of Items	Cronbach's Alpha	CR	AVE
PQ	4	0.844	0.844	0.575
BT	4	0.873	0.873	0.633
PV	4	0.892	0.892	0.675
DC	4	0.858	0.858	0.603
CE	4	0.876	0.876	0.641
BI	3	0.954	0.954	0.873

Note: CR > 0.7, AVE > 0.5 → Requirements met

Source: Compiled by the author

The results in Table 4 show that all scales achieved Cronbach's Alpha from 0.844 to 0.954, higher than the threshold of 0.7, demonstrating good internal reliability. The CR (0.844-0.954) and AVE (0.575-0.873) indices both exceeded the recommended threshold (CR > 0.7; AVE > 0.5), indicating that the scales had high composite reliability and satisfactory convergent validity. Notably, the BI variable had the highest CR and AVE, reflecting the stable and focused measurement level of this scale.

4.4. Discriminant validity (Fornell-Larcker Criterion)

To test the discriminant validity between the concepts in the research model, the Fornell-Larcker criterion was applied, in which the square root of AVE was compared with the correlation coefficients between the variables.

Table 4: Discriminant validity

	BI	BT	CE	DC	PQ	PV
BI	-					
BT	0.405	-				
CE	0.471	0.184	-			
DC	0.376	0.076	0.370	-		
PQ	0.559	0.101	0.435	0.244	-	
PV	0.562	0.257	0.355	0.202	0.531	-

Note: All HTMT values < 0.85 → Discriminant validity established

Source: Compiled by the author

The results of Table 5 show that all HTMT values are less than 0.85, meeting the criteria of Henseler et al. (2015), thereby confirming that the scales have discriminant validity. The pairs of variables with the highest correlation are BI-PV (0.562) and BI-PQ (0.559) but still within the allowable threshold, proving that the research concepts are relatively independent, suitable for inclusion in the SEM model to test the hypothesis.

4.5. Goodness-of-fit indices for confirmatory factor analysis

To assess the goodness-of-fit of the measurement model, goodness-of-fit indices are used, including: χ^2/df, CFI, TLI, RMSEA and SRMR - these are commonly recommended indices in CFA analysis.

Table 5: Model fit indices for CFA and SEM

Fit Index	Value	Recommended Threshold	Evaluation
Robust CFI	0.977	> 0.95	Excellent
Robust TLI	0.973	> 0.95	Excellent
Robust RMSEA	0.039	< 0.05	Excellent
SRMR	0.035	< 0.08	Excellent
P-value of RMSEA	0.981	> 0.05	Accepted

Source: Compiled by the author

The results presented in Table 6 show that all indices met or exceeded the recommended thresholds: $\chi^2/df = 1.069$ (< 3.0), CFI = 1.000, TLI = 1.008 (> 0.95), RMSEA = 0.000 (< 0.06) and SRMR = 0.033 (< 0.08). This demonstrates that the measurement model has a very high fit, confirming that the structure of the scales used in the study is reliable and consistent with the empirical data.

4.6. Structural model and hypotheses testing

After confirming the reliability and validity of the measurement model, structural equation modeling (SEM) was used to test hypotheses H1-H4 to assess the impact of independent variables (CDO, ACO, PJU, POS) on the dependent variable (SLO). The standardized path coefficients (β), standard errors (S.E.) and p-values are presented in Table 7.

Table 6: Structural path coefficients and hypothesis testing

Hypothesis	Relationship	β Coefficient	S.E.	p-value	Conclusion
H1	BT → BI	0.272	0.034	0.000	Supported
H2	PV → BI	0.249	0.050	0.000	Supported
H3	PQ → BI	0.296	0.038	0.000	Supported
H4	CE → BI	0.137	0.074	0.106	Not Supported
H5	DC → BI	0.181	0.029	0.000	Supported

Note: R^2 for SLO = 0.54, indicating that the four independent variables (BT, PV, PQ, CE, DC) jointly explain 54% of the variance in employee loyalty.

Source: Compiled by the authors

The results of the cluster data SEM test show that 4 out of 5 hypotheses (H1, H2, H3, H5) are accepted with statistical significance level $p < 0.05$. Specifically, PQ ($\beta = 0.296$; $p = 0.000$) has the strongest impact on brand image (BI), followed by BT ($\beta = 0.272$), PV ($\beta = 0.249$) and DC ($\beta = 0.181$). These results confirm the prominent role of perceived quality, brand trust and perceived value in forming tea brand image, consistent with previous studies on consumer behavior in the agricultural and FMCG industries.

Meanwhile, CE ($\beta = 0.137$; $p = 0.106$) did not reach statistical significance, so H4 was not supported,

indicating that although distribution channel experience has a positive relationship with BI, it is not strong enough to become a decisive factor in the context of this study. This may stem from the characteristics of tea consumption behavior — regular customers mainly focus on product quality and brand reputation rather than sales channel experience.

The R^2 value = 0.54 shows that the research model explains 54% of the variation in brand image, demonstrating that the model has a fairly good level of explanation. This result reinforces the theoretical assumption that the factors BT, PV, PQ and DC play an important role in building tea brand image in Thai Nguyen Province.

Figure 2 below presents the structural equation model (SEM) constructed to test the research hypotheses.

Figure 2: Structural equation model with standardized path coefficients

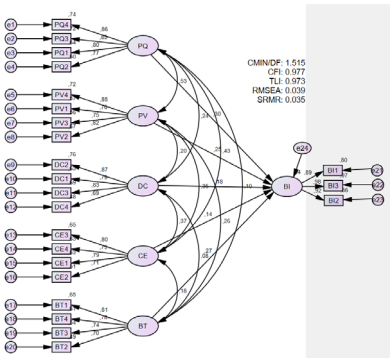


Figure 2 presents the structural equation model (SEM) with standardized path coefficients between 5 independent variables (PQ, PV, DC, CE, BT) and the dependent variable BI. The model fit indices meet the requirements: CMIN/DF = 1.515 (< 3), CFI = 0.977, TLI = 0.973, RMSEA = 0.039 (< 0.08) and SRMR = 0.035 (< 0.08). This confirms that the model has a very good fit with the survey data.

The paths from PQ, PV, DC and BT to BI are all statistically significant ($p < 0.05$), while CE has a positive coefficient but does not reach the significance level, consistent with the hypothesis testing results in Table 7. The measurement weights of the observed variables range from 0.69 to 0.89, exceeding the recommended threshold of 0.5, demonstrating that the scales have good convergence and clearly reflect the latent construct.

This model provides solid empirical evidence for the relationship between perceived quality, perceived value, digital communication, brand trust and tea brand image in Thai Nguyen Province, and shows a high level of explanation ($R^2 = 0.54$) of the proposed model.

5. Discussion

The results of the SEM model testing show that the four factors PQ, PV, DC and BT have a positive and statistically significant impact on brand image, while CE has no significant impact. This is an important finding, reflecting the characteristics of the tea industry in Thai Nguyen Province.

First of all, the results confirm the prominent role of perceived quality (PQ) - the factor with the strongest impact coefficient. This is consistent with previous studies such as Alhaddad (2015) and Zhang et al. (2024), emphasizing that in the traditional industry, perceived quality plays a fundamental role in forming brand image. Consumers often make direct assessments based on the perception of taste, freshness, authenticity and stability of the product.

Second, perceived value (PV) and brand trust (BT) also have a significant impact on BI. This result is similar to the works of Ibrahim et al. (2024) and studies in the FMCG sector, confirm that customers tend to stick with brands when they perceive real benefits and trust in the quality commitment. In the context of Thai Nguyen tea, perceived value is also associated with cultural factors, origin and tradition, contributing to creating competitive advantage.

Third, digital media (DC) shows a positive impact, reflecting the trend of digital marketing playing an increasingly important role in enhancing brand recognition and strengthening brand image. This result is consistent with the study of Ibrahim et al. (2024), which shows that digital media channels help agricultural enterprises reach non-local and international customer groups more effectively.

In contrast, distribution channel experience (CE) does not have a significant impact on brand image, unlike some results recorded in the FMCG industry (Balbín Buckley et al., 2024). The reason may stem from the characteristics of tea consumption behavior - the target customer group is loyal, often buys at familiar points of sale, focuses on product quality rather than channel experience. In addition, most tea businesses today still use traditional distribution channels, invest little in multi-channel experiences, leading to the CE factor not becoming a driving force in building brand image.

Finally, $R^2 = 0.54$ shows that the model is capable of explaining well the variation of brand image. This reinforces the argument that perceived quality, perceived value, trust and digital communication are the four main pillars in building local agricultural product brand image.

6. Conclusion and implications

6.1. Summary of findings

This study tested the SEM model based on cluster data from 40 tea enterprises with 320 customers to identify factors affecting brand image in the tea industry in Thai Nguyen Province. The results showed that four factors including perceived quality (PQ), perceived value (PV), brand trust (BT) and digital communication (DC) have

positive and statistically significant impacts on brand image. In contrast, distribution channel experience (CE) has no significant impact. The research model explains 54% of the variation in brand image, demonstrating a high level of relevance and practical value.

6.2. Theoretical contributions

The research results have expanded the empirical evidence on factors affecting brand image in the specialty agricultural products sector, which is still limited compared to studies in the FMCG and service industries. Using SEM analysis of two-level cluster data helps to better reflect the relationship between business characteristics and customer behavior, contributing to improving the reliability and generalizability of the model. The study also strengthens the central role of perceived quality and brand trust in the context of traditional products.

6.3. Managerial and policy implications

The research results provide an important practical basis for businesses and management agencies to strengthen the brand image of Thai Nguyen tea. There are three main groups of implications:

1) Improve perceived quality - the foundation of brand image

Invest in clean, standardized planting and processing processes (ISO, HACCP, VietGAP, GlobalGAP), traceability.

Tightly control flavor, freshness, hygiene, authenticity to retain loyal customers and attract new customers.

Establish an internal inspection system, publicize results to strengthen brand reputation.

2) Optimize perceived value to increase competitive advantage

Integrate cultural - geographical - craft village factors in brand stories to increase emotional value.

Differentiate brand positioning based on high quality, specialty origin, develop ecological packaging and organic products targeting high-end and international segments.

3) Develop digital media to amplify the brand

Build a multi-channel media strategy (website, social network, e-commerce platform) with synchronized content and images.

Increase product introduction through livestream, video, minigame to reach young and international customers.

Create direct interactions, build a community of loyal customers, spread brand value..

(4) Build and strengthen brand trust as a long-term commitment

Brand trust (BT) is a key factor in maintaining a sustainable relationship between customers and businesses. To strengthen BT, it is necessary to:

Be transparent about product information, production processes, quality standards and related certifications.

Establish clear return, exchange and customer care policies, increasing the level of trust.

Participate in collective brand certification programs, electronic traceability stamps, geographical indications, etc. to affirm your position in the market.

(5) Upgrade distribution channel experience - a strategic step for the expansion phase

Although CE has not had a significant impact in the current model, this is an important potential factor in the long-term strategy, especially when the market is moving towards non-provincial and international segments. Recommendations include:

Standardize traditional points of sale in a modern, friendly and localized direction.

Enhance consistent experiences between direct and online channels (omnichannel).

Train sales teams and customer care staff in a professional direction, improving the overall experience.

6.4. Limitations and future research

The study has certain limitations. First, the survey scope focused on one locality - Thai Nguyen Province - so the ability to generalize the results nationwide is limited. Second, the current model does not consider mediating or moderating factors (e.g., brand attachment, emotional value, repurchase behavior). Third, the data collected at one point in time (cross-sectional) does not reflect changes over time.

Further studies can: (i) expand the survey to many other tea regions to increase representativeness, (ii) consider mediating and moderating variables to clarify the impact mechanism, and (iii) use longitudinal data to evaluate brand image dynamics.

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THE IMPACT OF ATM SERVICE QUALITY ON CUSTOMER SATISFACTION: A SEM-BASED EMPIRICAL STUDY OF COMMERCIAL BANKS IN THAI NGUYEN PROVINCE

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Abstract: ***This study analyzes the impact of ATM service quality on customer satisfaction at commercial banks in Thai Nguyen province, Vietnam. Based on the ES-QUAL model and Expectancy - Disconfirmation Theory, the research examines five dimensions: tangibles, convenience, security, responsiveness and reliability. Data were collected from 300 ATM users across six commercial banks and analyzed using Structural Equation Modeling (SEM). The results indicate that all factors positively influence customer satisfaction, with convenience and security being the most influential. The study contributes to the theoretical foundation of electronic service quality and provides managerial implications for improving ATM accessibility, security and interface design.***

• Keywords: *ATM service quality, customer satisfaction, ES-QUAL, Thai Nguyen.*

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1. Introduction

In the digital transformation era, commercial banks are investing more in self-service technologies to enhance access, reduce costs and improve efficiency. Among these, Automated Teller Machines (ATMs) still play an important role, especially in developing economies where digital banking systems are not yet fully developed. In Vietnam, although e-banking and mobile applications have grown rapidly, ATMs remain essential for providing 24/7 financial services, particularly in rural and mountainous areas (Nguyen, Ho & Ngo, 2024).

Customer satisfaction with ATM services is a key priority for commercial banks because factors such as reliability, ease of use, cash availability and security directly affect satisfaction and loyalty (Elifineh, Goulap & Girma, 2023; Hoque, Uddin & Begum, 2024). However, ATM services in many provinces still face challenges, including low usage rates, frequent technical problems, cash shortages and security concerns. These issues negatively impact user experience and reduce trust in banks.

Thai Nguyen province is an economic and educational hub in Northern Vietnam with more than 20 commercial banks currently operating. Although the ATM network has expanded, service quality still does not fully meet customer expectations, especially in rural and remote areas. Research on ATM service quality in provincial settings remains limited. Therefore, this study focuses on six major banks including BIDV, Vietcombank, VietinBank, Agribank, MB Bank and Techcombank to assess the impact of ATM service quality on customer satisfaction. Using Structural Equation Modeling (SEM), the study identifies the key service quality factors that influence customer satisfaction and provides practical recommendations to improve accessibility, security and user experience, thereby enhancing customer satisfaction and loyalty.

2. Literature review

2.1. Theoretical foundations

This study was carried out mainly based on the ES-QUAL (E-Service Quality) model developed by Parasuraman, Zeithaml and Malhotra (2005), which built on the original SERVQUAL framework (Parasuraman et al., 1988). SERVQUAL was created to measure service quality in face-to-face settings, focusing on five areas: reliability, assurance, tangibles, empathy and responsiveness. In contrast, ES-QUAL was designed to assess service quality in electronic settings, like online banking or ATMs. It highlighted four key factors that matter most in digital services: efficiency, fulfillment, system availability and privacy/security.

In parallel, customer satisfaction was based on the Expectancy-Disconfirmation Theory (EDT) by Oliver (1997), which said that people felt satisfied when the service they got met or went beyond what they expected. In self-service situations like using ATMs, how customers saw the quality of the service had a big impact on what they expected and how satisfied they

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felt (Davis et al., 1989). These two theories are still the most common ways to study ATM service quality and customer satisfaction in both developed and developing countries.

2.2. ATM service quality and customer satisfaction

Recent researches from 2020 to 2024 have continued to support and develop the application of the ES-QUAL framework in assessing ATM service quality. For example, a study by Elifneh et al. (2023) in Ethiopia used structural equation modeling (SEM) to analyze data from customers of the Commercial Bank of Ethiopia. The findings showed that reliability, ease of use and privacy/security had a significant positive impact on customer satisfaction.

Similarly, a study by Yoeung, Hill and Ung (2023) in Cambodia found that rural ATM users cared most about getting what was promised, fast transactions and a reliable system. Their results showed that the ES-QUAL factors should be adjusted to fit local conditions, like how good the infrastructure is and how familiar people are with digital banking.

In Bangladesh, Hoque et al. (2024) looked at private banks and found that people were more satisfied and loyal when ATMs were easy to use, worked 24/7, had a clear interface and didn't make mistakes during transactions. The study also pointed out that things like age, gender and education can affect how customers see and feel about ATM service quality.

In Vietnam, Nguyen, Ho and Ngo (2024) conducted a study to assess how new digital banking features affect customer satisfaction, including ATMs. Although they didn't focus only on ATMs, they found that adding things like biometric logins or QR code withdrawals made customers, especially young ones feel the service was more valuable and satisfying.

2.3. Emerging dimensions and refinements

Even though the original ES-QUAL model is still strong, recent studies have made some useful dimensions related to ATM service quality:

- Convenience: This wasn't part of the original model, but many researchers (like Yoeung et al., 2023; Hoque et al., 2024) state that it's very important for using ATMs.

- Clear interface and language choices: These have become important, especially in areas with different languages or in remote and rural areas, as part of how easy the ATM is used.

- Cash availability and machine downtime: These real-life problems are often included under fulfillment or reliability (Elifneh et al., 2023).

These updates show that while basic models like ES-QUAL gives a good starting point, it's necessary to make some adjustments based on local conditions.

3. Research model and hypotheses development

This study is conducted based on two well-known ideas: the ES-QUAL model (Parasuraman et al., 2005), which helps measure service quality in electronic systems and the Expectancy-Disconfirmation Theory (Oliver, 1997), which explains how satisfaction depends on whether services meet people's expectations.

A model is used to look at how five parts of ATM service quality affect how satisfied customers feel. These five parts are:

- Tangibles: how the ATM looks and how modern and clean it is.

- Convenience: how easy it is to find and use the ATM.

- Security: how safe people feel when using the ATM.

- Responsiveness: how quickly and effectively the bank helps when problems happen.

- Reliability: whether the ATM works well and gives the right information.

The main thing we are trying to explain is customer satisfaction - how happy people are with the ATM service based on their experience.

Hypotheses

Based on the conceptual model, the following hypotheses are proposed:

H1: Tangibles have a positive effect on customer satisfaction.

H2: Convenience has a positive effect on customer satisfaction.

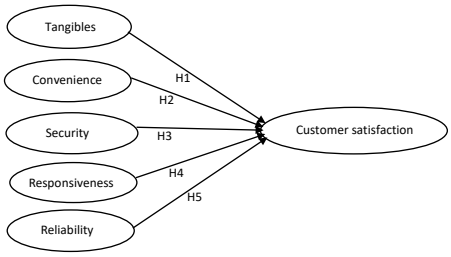
H3: Security has a positive effect on customer satisfaction.

H4: Responsiveness has a positive effect on customer satisfaction.

H5: Reliability has a positive effect on customer satisfaction.

Conceptual Framework

Figure 1. Conceptual Framework of ATM Service Quality and Customer Satisfaction



4. Research methodology

4.1. Research design

This study employed a cross-sectional survey method to collect data from ATM users of six

commercial banks in Thai Nguyen province. A structured questionnaire was developed based on established theories and validated scales from previous studies. Data were analyzed using SPSS 26.0 for descriptive statistics, reliability testing (Cronbach's Alpha) and exploratory factor analysis (EFA) and AMOS 24.0 for confirmatory factor analysis (CFA) and structural equation modeling (SEM).

The SEM method was used to test relationships between latent variables, enabling simultaneous assessment of complex links between ATM service quality dimensions and customer satisfaction. Compared with traditional regression, SEM allows measurement of latent constructs through observed indicators and testing of hypotheses with high reliability. Model fit was evaluated using indices such as Chi-square/df, CFI, TLI, RMSEA and PClose to ensure validity and robustness of the findings.

4.2. Sample and data collection

The survey targeted individual customers who had used ATM services of six major commercial banks in Thai Nguyen province, including BIDV, Vietcombank, VietinBank, Agribank, MB Bank and Techcombank. These banks have extensive networks across both urban and rural areas, allowing for diverse customer experiences.

Convenience sampling with screening criteria was applied, requiring participants to have used ATM services from at least one of these banks within the past three months to ensure recent and relevant experiences. Data were collected through both direct and online surveys from June to August 2025. Out of 350 responses, 300 valid questionnaires were retained for analysis, with 50 from each bank.

This sample size meets the requirements for SEM analysis, as suggested by Hair et al. (2019), which recommends a minimum of 200 samples when the model has more than 20 observed variables. To enhance representativeness, the study also balanced respondents by area (urban and rural), age and occupation to reflect the diversity of ATM users in Thai Nguyen.

4.3. Measurement instrument

Table 1. Constructs, Number of Items and Sources of Measurement

Factor	Coded	Number of items	Example of item	Sources
Tangibles	TAN	4	ATM has modern look; easy to use interfact	Nham & Phan (2015)
Convenience	CON	4	ATM is convenient in location and time of use.	Narteh (2013)
Security	SEC	4	Transactions are well protected.	Aslam et al. (2019); Al-Hawari (2011)
Responsiveness	RES	4	ATM problems are handled promptly.	Narteh (2013); Nham & Phan (2015)
Reliability	REL	4	ATM is working smoothly.	Narteh (2013); Nham & Phan (2015)
Customer Satisfaction	CS	3	I am satisfied with the ATM service.	Fornell et al. (1996); Aslam et al. (2019)

Source: Compiled by the authors based on prior studies

This study uses six constructs, including five components of ATM service quality (Tangibles, Convenience, Security, Responsiveness, Reliability) and one dependent variable, Customer Satisfaction. The scales are inherited and adjusted from previous studies (Narteh, 2013; Nham & Phan, 2015; Aslam et al., 2019; Al-Hawari, 2011; Fornell et al., 1996) to suit the Vietnamese context. The observed variables are measured using a 5-level Likert scale (1 = Completely disagree, 5 = Completely agree).

4.4. Data Analysis Methods

The dataset included 300 valid responses from six commercial banks. Data were first checked for missing values, outliers and normality using SPSS. Scale reliability and validity were tested through Cronbach's Alpha, EFA and CFA. The SEM model was then analyzed using AMOS. Reliability was accepted when Cronbach's Alpha and CR ≥ 0.70, convergent validity when AVE ≥ 0.50 and discriminant validity when HTMT < 0.85 or according to the Fornell-Larcker criterion. Model fit was evaluated with indices $\chi^2/df \leq 3$, CFI ≥ 0.90, TLI ≥ 0.90, RMSEA ≤ 0.08 and SRMR ≤ 0.08. Hypotheses were tested through path coefficients (β) and p-values, while the R^2 value of customer satisfaction (CS) indicated the model's explanatory power.

5. Results

5.1. Descriptive Statistics of Respondents

Table 2. Respondents' Demographic Profile (N = 300)

Variable	Frequency	Percent (%)
Gender		
Male	161	53.7
Female	139	46.3
Age		
Up to 30 years	143	47.7
From 31 to 45 years	105	35.0
41 years and above	52	17.3
Marital Status		
Single	93	31.0
Married	207	69.0
Monthly Income		
Less than 10 million VND	78	26.0
From 10 to 20 million VND	179	59.7
More than 20 million VND	43	14.3
Job Position		
State servant	54	18.0
Company employee	135	45.0
Student	44	14.7
Other	67	22.3
Education Attainment		
Below university level	190	63.3
Bachelor degree	91	30.3
Master's degree and above	19	6.3
Length of ATM Service Use		
Less than 5 years	37	12.3
From 5 to 10 years	123	41.0
More than 10 years	140	46.7

Source: Compiled by the authors

The survey included 300 ATM users from six major commercial banks in Thai Nguyen province. Male respondents accounted for 53.7% and females 46.3%, showing a balanced gender distribution. Most

users were under 30 years old (47.7%), followed by those aged 31-45 (35.0%) and 46 or older (17.3%). The majority were married (69%) and had a monthly income of 10-20 million VND (59.7%). Company employees made up 45% of the sample, followed by students (14.7%) and civil servants (8%). Most participants had less than a university degree (63.3%), while 30.3% held a bachelor's degree. Nearly half of the respondents (46.7%) had used ATM services for 10 years or more, highlighting the long-term and important role of ATMs in Thai Nguyen's banking system.

5.2. Descriptive analysis of constructs

Table 3. Descriptive Statistics for ATM Service Quality Constructs and Customer Satisfaction

Construct	Mean (M)	Std. Deviation (SD)
Convenience (CON)	2.89	0.61
Security (SEC)	3.56	0.81
Tangibles (TAN)	3.42	0.70
Reliability (REL)	3.36	0.78
Responsiveness (RES)	3.66	0.73
Customer Satisfaction (CS)	3.54	0.57

Source: Compiled by the authors

Descriptive statistics were calculated to examine the central tendencies and variability of the observed variables. The analysis focused on the mean and standard deviation of the five ATM service quality dimensions and customer satisfaction. The mean scores ranged from 2.89 to 3.66, indicating an overall average to good perception. Responsiveness scored the highest with a mean of 3.66 and SD of 0.73, showing users rated response speed well, though variability suggests differences across locations. Security and customer satisfaction had means of 3.56 and 3.54, respectively, with security showing the highest variability (SD=0.81), indicating some users still perceive risks such as skimming or inadequate security measures. Tangibles and reliability were moderate at 3.42 and 3.36, with reliability showing greater variability due to issues like machine availability, transaction errors or network disruptions. Convenience had the lowest mean of 2.89 and SD of 0.61, reflecting customer agreement on existing inconveniences such as machine density, location, queues, operating hours and fees. Customer satisfaction showed the lowest variability (SD=0.57), suggesting a relatively stable satisfaction level and potential for improvement if convenience is increased and security and reliability issues are addressed.

5.3. Reliability analysis

Table 4. Cronbach's alpha for measurement constructs

Factors	No. of Items	Cronbach's Alpha (α)
Tangibles	4	0.842
Convenience	4	0.846
Security	4	0.872
Responsiveness	4	0.847
Reliability	4	0.858
Customer Satisfaction	3	0.973

Source: Compiled by the authors

The internal consistency reliability of all measurement constructs was assessed using Cronbach's Alpha. As shown in Table 4, all six factors exceeded the commonly accepted threshold of 0.70 (Nunnally & Bernstein, 1994), indicating good to excellent internal reliability.

All corrected item-total correlations were above 0.61 and none of the items significantly increased Cronbach's Alpha when deleted. The particularly high alpha value for the Customer Satisfaction scale reflects the internal coherence of this construct.

These results confirm that all factors in the research model demonstrate satisfactory internal reliability and are suitable for further validity testing and structural modeling.

5.4. Exploratory factor analysis (EFA)

Table 5. Results of exploratory factor analysis (EFA)

Indicator	Value
Kaiser-Meyer-Olkin - KMO	.878
Measure of Sampling	4423.40 (df = 253, p < 0.001
Number of Components (Eigenvalue > 1)	6
Cumulative Variance Explained	73.77

Source: Compiled by the authors

To examine the underlying structure of the measurement items, an Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis with Varimax rotation. The results support the adequacy of the dataset for factor analysis.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.878, exceeding the recommended threshold of 0.60, indicating sufficient correlations among items. Bartlett's Test of Sphericity was also significant ($\chi^2 = 4423.40$, $df = 253$, $p < 0.001$), confirming the suitability of the data for factor analysis.

EFA results revealed six components with eigenvalues greater than 1, accounting for 73.77% of the total variance. The rotated component matrix showed clean loadings above 0.70 for most items, with no significant cross-loadings, indicating clear factor distinctions.

The extracted factors align well with the conceptual framework, representing the following constructs: Factor 1: Security (SEC); Factor 2: Reliability (REL); Factor 3: Convenience (CON); Factor 4: Responsiveness (RES); Factor 5: Tangibles (TAN); and Factor 6: Customer Satisfaction (CS).

These results confirm that the observed variables loaded appropriately on their intended constructs, thereby supporting the dimensionality of the measurement instrument for subsequent confirmatory factor analysis (CFA) and structural modeling.

5.5. Confirmatory factor analysis (CFA)

The CFA analysis results show that the measurement model has a very good fit with the survey data.

Specifically, the goodness-of-fit indices are all within the recommended threshold according to Hu & Bentler (1999):

Chi-square/df = 1.573 (< 3.0) indicating an acceptable model fit.

CFI = 0.971, TLI = 0.966, IFI = 0.972 all exceed the threshold of 0.90, indicating that the model has a very high level of fit.

NFI = 0.926 is also greater than 0.90, confirming that the model meets the standard compared to the data.

RMSEA = 0.044 (< 0.08) indicates a low error of approximation, implying that the model fits the population well.

PCLOSE = 0.875 (> 0.05) proves that the hypothesis RMSEA ≤ 0.05 is accepted, meaning that the model has an excellent fit.

Thus, all fit assessment indices meet or exceed international academic standards, confirming that the CFA model has a very good fit with the actual data. This creates a solid foundation for continuing to test the reliability, convergent validity and discriminant validity of the scale and deploying the SEM model in the next step.

Table 6. Summary of CFA Results

Construct	Cronbach's α	CR	AVE	Conclusion
TAN_1234	.842	.842	.571	Reliable, valid
RES_1234	.846	.847	.582	Reliable, valid
SEC_1234	.872	.874	.634	Reliable, valid
REL_1234	.847	.859	.605	Reliable, valid
CON_1234	.858	.851	.590	Reliable, valid
CS_123	.973	.973	.924	Reliable, valid

Source: Compiled by the authors

Table 6 shows the reliability and convergent validity of the scales. All scales had Cronbach's α between 0.842 and 0.973, exceeding the 0.70 threshold, indicating good internal consistency. Composite Reliability (CR) values also ranged from 0.842 to 0.973, confirming stable and reliable measurement. Average Variance Extracted (AVE) values ranged from 0.571 to 0.924, above the 0.50 threshold, demonstrating that the observed variables effectively represent their latent constructs. The Customer Satisfaction scale had an AVE of 0.924, indicating particularly high measurement quality. Overall, all scales meet international standards for reliability and convergent validity, providing a solid basis for discriminant validity testing and SEM analysis.

Table 7. HTMT Ratios among Constructss

Construct	HTMT					
	TAN_1234	RES_1234	SEC_1234	REL_1234	CON_1234	CS_123
TAN_1234	–	.275	.181	.089	.109	.338
RES_1234		–	.283	.217	.132	.373
SEC_1234			–	.325	.223	.459
REL_1234				–	.269	.404
CON_1234					–	.388
CS_123						–

Source: Compiled by the authors

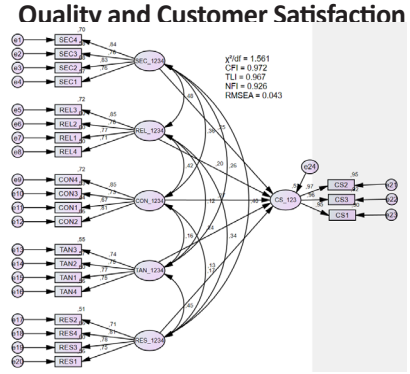
Note: All HTMT values < 0.85 (Henseler et al., 2015), confirming discriminant validity.

The discriminant validity results using the HTMT index are shown in Table 6. All HTMT values ranged from 0.089 to 0.459, well below the 0.85 threshold recommended by Henseler et al. (2015), indicating that the latent variables are clearly distinguishable. This confirms that the scales for Tangibles, Responsiveness, Security, Reliability, Convenience and Customer Satisfaction each measure distinct aspects of ATM service quality. For instance, Security and Customer Satisfaction had the highest HTMT value of 0.459, but it is still below 0.85, ensuring discriminant validity. Overall, the results confirm that all scales meet discriminant validity requirements, making them suitable for SEM analysis.

5.6. Structural model and hypotheses testing

The structural model was estimated using Structural Equation Modeling (SEM) in AMOS to test the hypothesized relationships between the five dimensions of ATM service quality and customer satisfaction.

Figure 2. Structural Equation Model for ATM Service Quality and Customer Satisfaction



After confirming the measurement value by CFA, the study conducted structural model testing (SEM) to evaluate the relationship between five components of ATM service quality (Tangibles, Reliability, Responsiveness, Security, Convenience) and customer satisfaction. The analysis was performed using AMOS 24.0 software.

The model fit evaluation indexes showed very good results and were all within the acceptable threshold as recommended by Hu & Bentler (1999). Specifically, Chi-square/df = 1.561 (< 3.0), CFI = 0.972, TLI = 0.967, RMSEA = 0.043 (< 0.08). This proves that the proposed research model fits the actual data and has high explanatory value.

The study found that Convenience has the strongest impact on customer satisfaction (β = 0.266, p < 0.001), highlighting the importance of ATM location, operating hours and ease of use. Security and Tangibles also significantly affect satisfaction (β = 0.249 and 0.236, p < 0.001), confirming that transaction safety and physical

conditions influence user experience. Reliability and Responsiveness have positive but smaller effects (β = 0.199 and 0.130), with Responsiveness being the least influential, suggesting Vietnamese customers prioritize convenience and security over response speed. The model explains 53% of the variance in customer satisfaction ($R^2 = 0.53$). Overall, the findings indicate that banks should focus on convenience, security and facility quality, while improving responsiveness to maintain customer trust and loyalty.

Table 8. Standardized regression weights, standard errors, critical ratios and hypothesis testing

Hypo-thesis	Path	Estimate (β)	S.E.	C.R.	p-value	Result
H1	Tangibles → Customer Satisfaction	0.236	0.053	4.209	***	Supported
H2	Convenience → Customer Satisfaction	0.266	0.041	4.936	***	Supported
H3	Security → Customer Satisfaction	0.249	0.042	4.246	***	Supported
H4	Responsiveness → Customer Satisfaction	0.130	0.056	2.192	0.028	Supported
H5	Reliability → Customer Satisfaction	0.199	0.043	3.373	***	Supported

Source: Compiled by the authors

*Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. The model explains 53% of the variance in Customer Satisfaction ($R^2 = 0.53$).*

6. Discussion

The SEM results show that Convenience has the strongest impact on customer satisfaction (β = 0.266; $p < 0.001$), confirming that ATM location, accessibility and ease of use are key factors, consistent with both international (Nigatu et al., 2023) and Vietnamese studies (Giao, 2019). Security also significantly affects satisfaction (β = 0.249; $p < 0.001$), highlighting the importance of safe transactions and customer trust, as supported by Aslam et al. (2019) and Nham and Phan (2015). Tangibles (β = 0.236; $p < 0.001$) and Reliability (β = 0.199; $p < 0.001$) positively influence satisfaction, reflecting the role of machine quality, modernity and service consistency. Responsiveness has a smaller but significant effect (β = 0.130; p = 0.028), showing that immediate support is less critical than convenience and security for Vietnamese ATM users. The model explains 53% of the variance in customer satisfaction ($R^2 = 0.53$), indicating strong explanatory power. Overall, convenience and security are the main pillars of satisfaction, tangibles and reliability provide support and responsiveness has a supplementary role, aligning Vietnamese results with international findings.

7. Conclusion and Implications

This study examined the impact of ATM service quality on customer satisfaction at commercial banks in Thai Nguyen province, Vietnam. Using the ES-QUAL framework and SEM, results show that all five dimensions, including Tangibles, Convenience, Security, Responsiveness and Reliability, positively affect satisfaction. Convenience and Security have the strongest impact, while Responsiveness has the weakest. The study highlights the continued importance of ATMs, especially in areas where internet and mobile banking are not fully adopted and provides empirical evidence beyond major cities like Hanoi and Ho Chi Minh City.

Theoretical Implications

The study confirms the multidimensional nature of service quality in self-service banking, supporting ES-QUAL and Expectancy-Disconfirmation Theory in semi-urban and rural contexts. It shows that different service aspects influence satisfaction to varying degrees and emphasizes the value of localized research in provinces with mixed economies.

Managerial Implications

Increasing convenience requires expanding ATM coverage in rural areas, industrial parks and new residential zones and adding transaction functions such as interbank transfers and bill payments. Ensuring security involves investing in OTP, transaction alerts, surveillance and fraud detection to build trust and retain customers. Improving tangibles focuses on enhancing machine quality, interface usability, speed and overall ATM infrastructure. Enhancing reliability means maintaining stable operation, minimizing cash shortages and technical issues, especially during holidays. Boosting responsiveness can be achieved by integrating support channels at ATMs, such as chatbots, hotlines or QR-based online support, to quickly resolve problems.

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IMPACT OF CAPITAL STRUCTURE ON FINANCIAL PERFORMANCE OF LISTED SEAPORT ENTERPRISES IN VIETNAM

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Abstract: ***The study aims to examine the impact of the enterprise's capital structure on financial performance of listed seaport enterprises in Vietnam. The research samples included 20 seaport enterprises, data collected over an 8-year period from 2017 to 2024. The study applied quantitative methods with the support of Stata software. The research results show that total debt ratio, debt to equity ratio have an inverse impact; growth rate and operating time are not statistically significant, while enterprise size, liquidity, efficiency and export turnover have a positive impact on financial performance. Based on the research results, the authors make some recommendations to improve the capital structure for listed seaport enterprises.***

• Keywords: *debt ratio, debt to equity ratio, capital structure, financial performance, seaport enterprises.*

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1. Rationale

During the operation process, enterprises always need to plan appropriate capital mobilization policies at each time in order to maintain operations, expand investment and improve competitiveness. Enterprises can use internal capital sources such as owners' equity and retained earnings. Enterprises also use external capital sources such as bank credit, bond issuance, stock issuance and other forms of commercial credit. Choosing and combining these capital sources reasonably helps enterprises minimize capital costs, reduce financial risks and improve operating efficiency in a sustainable manner. Building an optimal capital structure, exploiting the advantages of each source of funding is the foundation for enterprises to improve their financial capacity.

In the context of globalization, businesses operate in an increasingly competitive environment not only within an industry or a country but also on a regional and global scale. Business managers need to identify and evaluate the impact of capital structure on financial performance in order to propose appropriate capital mobilization policies. As a result, businesses can adjust their financial policies flexibly and easily adapt to fluctuations from the external environment. This can also be the foundation for improving financial performance, reflected through indicators such as return on assets (ROA), return on equity (ROE), or return on sales (ROS). Financial performance is not only the output of the capital use process, but also a measure reflecting the operational capacity, growth potential and value creation capacity of enterprises in the long term.

Seaport enterprises in Vietnam have great development prospects associated with the trend of economic integration. Acting as a gateway connecting international trade, seaport enterprises hold a key position in the global supply chain, thereby contributing to improving competitiveness and promoting the development of Vietnam's economy. Therefore, in order to have the ability to develop sustainably in a volatile business environment, seaport enterprises need to constantly improve financial efficiency associated with building a reasonable capital structure, optimizing capital costs and increasing enterprise value.

The study collected financial data of 20 listed seaport enterprises in Vietnam in the period of 2017-2024 to assess the impact of capital structure on the financial performance of enterprises. Based on the results of regression analysis, the study provides a number of recommendations that can be the basis for recommendations to help seaport enterprises build an optimal capital structure and achieve sustainable financial performance.

2. Literature review

Studies on the impact of capital structure on financial performance are quite diverse but the results are not consistent due to different contexts and theoretical assumptions.

Mohammad & Bujang (2020) analyzed data from the Bursa Malaysia exchange of 108 companies in all three sectors: finance, construction and plantation for analysis. The results showed that the impact of capital structure is different between industries. In the plantation industry, the short-term debt ratio has a positive impact, the long-term debt ratio has a

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negative impact on ROA and ROE. For the financial industry, the debt ratio has a positive impact on ROE but a negative impact on ROA. In enterprises in the construction industry, the short-term debt ratio has a negative impact on ROE while the long-term debt ratio has a positive impact on ROE.

Tesema's study(2024) used panel data from the financial statements of 85 manufacturing firms in Ethiopia for the period 2017-2021 with 425 observations. The results showed that debt ratio and long-term debt ratio had negative and statistically significant effects on ROA. In addition, control variables such as fixed asset utilization efficiency and firm size had positive and statistically significant effects on financial performance.

Kong et al. (2023) analyzed the relationship between capital structure and financial performance of 28 non-financial listed firms in Ghana for the period 2008–2019. In this study, debt ratio (DR) and debt to equity ratio (DE) both have positive and statistically significant effects on ROE of both groups of enterprises. In addition, enterprise size and asset growth also have positive effects, while tangible assets (TAN) do not have significant effects. The causal analysis shows a bidirectional relationship between capital structure and ROE, and emphasizes the role of capital structure policy in improving the financial performance of enterprises.

Mazanec's study (2023) aimed to evaluate the impact of capital structure on the financial performance of nearly 4.000 small and medium-sized enterprises in the transport sector in Central Europe. The results of multiple linear regression showed that capital structure with the debt ratio variable had a negative impact on the performance of transport companies. In addition, the ratio of long-term assets had a negative impact on ROA, while the ratio of cash to total assets and liquidity ratio had a positive impact on ROA.

The study conducted by Ahmed et al. (2023) used panel data from 156 manufacturing companies listed on the Tehran Stock Exchange during 2011–2019. The authors performed regressions using a fixed-effects model (FEM). Debt ratio had a negative and significant impact on ROA and EPS. Debt to Market Capitalization had a negative and significant impact on all financial performance indicators (ROA, Tobin's Q, EPS). In addition, the variable controlling revenue growth rate positively affects all efficiency indicators, the variable of business operation time has an inverse effect on ROA and EPS but a positive effect on Tobin's Q.

Bui Thi Ngoc et al. (2023) conducted a study to analyze the relationship between capital structure and enterprise value, based on audited financial statement data of 769 enterprises listed on the Vietnamese stock market during the period of 2012-2022. In this study, ROA, ROE and Tobin's Q are positively affected by debt ratio. However, when separating the components of debt, the results indicate that both short-term debt ratio and long-term debt ratio have negative impacts on financial performance measured by ROA and ROE.

Based on a panel data sample of 116 listed service enterprises in Vietnam during the period 2010-2016, Nguyen Thi Dieu Chi (2018) found empirical evidence of the negative impact of debt structure on financial performance. Accordingly, the regression results showed that both short-term debt structure and long-term debt structure are factors that negatively affect ROA. Control variables of asset structure and market interest rate have a negative impact on ROA. Other control variables such as revenue growth rate, operating time, and management capacity do not affect the financial performance of service enterprises.

Bui Van Thuy & Nguyen Thi Ngoc Diep's study (2016) showed that increasing debt ratio, especially long-term debt, has a negative and statistically significant impact on the financial performance of non-financial companies in Vietnam. In addition, short-term debt has a positive and significant impact on Tobin's Q, but is not statistically significant on ROE. The control variables of company size and asset growth rate both have a positive impact on ROE. However, growth has a negative impact on Tobin's Q. The results also confirm that the impact of capital structure is significantly different across industries.

Duong Van Chi et al. (2023) conducted this study on 31 consumer goods manufacturing enterprises in Vietnam during the period 2010-2021. The authors also concluded that the debt ratio has a negative and statistically significant impact on both ROE and ROA. This shows that the use of high debt reduces financial performance in the consumer goods industry. For consumer goods manufacturing enterprises, enterprise size, asset growth and asset utilization efficiency all have positive and statistically significant impacts on financial performance.

Tran Thi Phuong Thao (2024) studied the data of 81 listed logistics enterprises in Vietnam in the period of 2018-2023 and showed that the debt ratio has a negative and statistically significant impact on the financial performance (ROA) of this group of enterprises. In addition, enterprise size, solvency and asset frequency have a positive impact on ROA.

Studies on the impact of capital structure on the financial performance of enterprises have relatively different results. It can be seen that there is no capital structure theory that can generally explain the decisions on capital mobilization structure of all enterprises. Because the company's financing policies

are determined depending on many factors such as the financial capacity of the enterprise itself, industry characteristics, the capacity and perspective of the enterprise's managers, and macroeconomic factors. In Vietnam, although many studies have examined the relationship between capital structure and financial performance, these studies only focus on a large sample representing listed companies, or on a group of enterprises in services, consumer goods, hotels, pharmaceuticals, steel or logistics...

Port companies belong to the logistics sector but have their own financial characteristics: operating capacity depends largely on the level of investment in long-term assets, exploitation output is affected by macroeconomic policies, import and export value of the economy... These characteristics can affect the influence of capital structure on financial performance. Empirical studies on the impact of capital structure on financial performance of the seaport industry are still limited, despite the strategic importance of this field in trade and logistics. Based on this gap, the author conducts research to build a research model with variables representing micro and macro factors to clarify the impact of capital structure on financial performance of listed seaport enterprises in the current context.

3. Research model and hypothesis

In the model, the financial performance of the enterprises is measured by the return on assets (ROA). Capital structure is measured by two basic indicators: debt ratio and debt to equity ratio. In addition, control variables in the model include: Growth rate, solvency, asset turnover, enterprise size, enterprise operation time, and Vietnam's export - import turnover. In the model, the authors added the export - import turnover variable for research, this is a new point compared to previous studies.

Information about the variables can be described in Table 1.

Table 1. Variables in the model

Criteria	Variable code	Measurements	Hypothesis of relationship with dependent variable
Return on assets	ROA	Profit after tax/Average total assets	
Debt Ratio	TD	Liabilities / Total Assets	-
Debt on Equity Ratio	DE	Liabilities / Owner's Equity	-
Growth Rate	SGR	Revenue Growth Rate	+
Solvency	LIQ	Current Assets/Current Liabilities	+
Asset Turnover	EFF	Net Revenue/Average Assets	+
Business Size	SIZE	Log (Total Assets)	+
Time in Operation	AGE	Number of Years in Operation	+
Export - Import Turnover	EI	Total Value of Exported and Imported Goods and Services	+

Source: Author compiled and constructed

The regression models are described as follows:

$$ROA_{it} = \beta_0 + \beta_1.TD_{it} + \beta_2.DE_{it} + \beta_3.SGR_{it} + \beta_4.LIQ_{it} + \beta_5.EFF_{it} + \beta_6.SIZE_{it} + \beta_7.AGE_{it} + \beta_8.EI_{it} + u_{it}$$

4. Research methods

The data used in this study is secondary data, collected from audited financial statements of seaport companies listed on the Vietnamese stock market over an 8-year period, from 2017 to 2024. The research sample is 20 companies, corresponding to 160 observations. The author uses Stata 17 software to support data processing and perform tests. The author analyzes the data using the following steps: descriptive statistics, correlation testing and linear regression between variables in the model. This process includes checking assumptions such as autocorrelation, heteroscedasticity and multicollinearity to select the appropriate regression model. The three models applied include: Pooled OLS, fixed effects model (FEM) and random effects model (REM). After determining the appropriate model, the author plans to test the reliability of the model. If defects are detected, the study continues to use the GLS model to calibrate and ensure the accuracy of the estimated results.

5. Research results

5.1. Description of research data

Table 2. Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	160	9.73	6.38	-.44	36.75
ROS	160	19.23	14.23	-1.72	70.18
TD	160	.27	.22	.03	.96
DE	160	1.51	4.92	.03	30.66
SGR	160	.94	10.07	-.72	127.45
LIQ	160	4.08	4.30	.65	23.99
EFF	160	.71	.56	.17	3.48
SIZE	160	6.09	.49	5.17	7.25
AGE	160	12.10	6.86	2.00	34.00
EI	160	2.72	.18	2.30	2.895

Source: Data analysis results using STATA

The return on assets (ROA) of the enterprises in the research sample fluctuated around 9.73%, with the smallest value being -0.44% and the largest value reaching 36.73%. The return on sales (ROS) had an average value of 19.263%, with the lowest value being -1.72% and the highest value reaching 70.18%. The above data shows that there is a significant difference in financial performance among listed seaport enterprises. The majority of enterprises have profit margins of ROA >0, the only case with negative profit margins is An Giang Port Joint Stock Company (stock code CAG) in 2024.

Regarding capital structure: The average debt ratio is 27.8%, reflecting that equity capital still plays a leading role in financing policy. However, the debt-to-equity ratio has a fairly high average value of 1.516 because the Vegetable Port Joint Stock Company (stock code VGP) has a very high debt ratio (95% - 97%) throughout the research period.

The control variables SGR, LIQ, EFF, AGE, EI also differ among listed seaport enterprises, with a large gap between the largest and smallest values.

5.2. Correlation matrix

Table 3 shows the results of the correlation test as follows:

Table 3. The correlation coefficient matrix between the variables in the model

	ROA	TD	DE	SGR	LIQ	EFF	SIZE	AGE	EI
(1) ROA	1.00								
(2) TD	-0.32*	1.00							
(3) DE	-0.34*	0.75*	1.00						
(4) SGR	-0.10	0.25*	0.29*	1.00					
(5) LIQ	0.07	-0.51*	-0.19*	-0.06	1.00				
(6) EFF	-0.11	0.67*	0.76*	0.30*	-0.31*	1.00			
(7) SIZE	0.04	0.49*	0.29*	0.07	-0.35*	0.10	1.00		
(8) AGE	0.05	0.10	0.23*	0.043	0.05	0.07	0.36*	1.00	
(9) EI	0.10	-0.07	0.01	-0.04	0.05	-0.05	0.06	0.22*	1.00

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Data analysis results using STATA

According to the table above, the variables TD, DE, SGR, EFF have an inverse impact on ROA, the remaining variables have a positive impact on ROA. Analysis of the correlation coefficient between independent variables shows that no pair of variables has a coefficient exceeding 0.8, so initially excluding the possibility of multicollinearity. To confirm, the author calculates the variance inflation factor (VIF) in the regression results.

5.3. Regression results and discussion

Regression of three models with dependent variables ROA and independent variables TD, DE, SGR, LIQ, EFF, SIZE, AGE and EI. The regression results using OLS, FEM, REM methods are shown in Table 4. At the same time, after performing Hausman test, the REM model is more suitable.

According to Table 4, all VIF values are in the range of 1.07 to 4.2, less than the threshold of 10. Therefore, it can be affirmed that the model does not have multicollinearity problems. The study continues to perform the necessary tests to determine the appropriate regression model.

Homogeneity of variance test results in P-value of 0, less than 5%, indicating that the model has heteroscedasticity. The autocorrelation test results in P-value = 0.5123, greater than 5%, so it is concluded that there is no autocorrelation in the model. Use the GLS regression method to correct errors and improve the reliability of the model. Model is defined as follows:

$$ROA_{it} = -28.49 - 10.97TD_{it} - 0.72DEit + 0.166LIQ_{it} + 6.495EFF_{it} + 4.909SIZE_{it} + 2.712EI_{it} + u_{it}$$

Table 4. Regression results

	VIF	OLS	FEM	REM	FGLS
TD	4.20	−14.09***	−22.27***	−20.46***	−10.97***
DE	3.95	−0.748***	0.163	−0.185	−0.720***
SGR	1.12	-0.0199	0.00283	-0.00479	-0.0194
LIQ	1.64	0.0658	0.0928	0.0785	0.166*
EFF	3.09	7.429***	6.446***	5.938***	6.495***
SIZE	1.87	4.866***	6.049	5.782**	4.909***
AGE	1.35	0.0328	-0.258	-0.153	-0.0382
EI	1.07	2.735	3.995*	3.275*	2.712*
_cons		-28.29***	-33.95	-31.18**	-28.49***
N		160	160	160	160
R-sq		0.321	0.266	0.256	
Hausman Test				chi2(7) = 6.04	
				Prob > chi2 = 0.5354	
Breusch and Pagan Lagrangian Test				chibar2(01) = 164.72	
				Prob > chibar2 = 0.0000	
Wooldridge Test				F(1,19) = 0.446	
				Prob > F = 0.5123	

t statistics in brackets

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Source: Data analysis results using STATA

The debt ratio variable has a negative and statistically significant impact at the 1% level on ROA. This means that when the debt ratio increases by 1%, ROA decreases by about 10.97%, reflecting the negative relationship between debt use and asset profitability. Similarly, the DE variable has a negative and statistically significant impact at the 1% level on ROA. When the debt-to-equity ratio increases by 1%, ROA decreases by 0.72%. The relationship between the debt-to-equity ratio and ROA is negative.

In this model, the control variables LIQ, EFF, SIZE, EI have a positive and statistically significant impact on ROA. This result shows a positive relationship between solvency, asset turnover, enterprise size, and export-import turnover with the dependent variable ROA. Specifically, LIQ and EI have a positive impact on ROA at the 10% statistical significance level, EFF and SIZE have a positive impact on ROA at the 1% statistical significance level. The remaining control variables SGR and AGE are not statistically significant, meaning they do not affect the ROA of the enterprise.

The results of testing the hypotheses are as follows:

Hypothesis H1: According to the regression results, the debt ratio (TD) has a negative and statistically significant impact on financial performance, with a confidence level of 99%. The impact of TD on ROA is quite large (-10.97). Thus, hypothesis H1 is accepted in this model.

Hypothesis H2: The debt-to-equity ratio (DE) has a negative impact on the financial performance variable. Specifically, the impact of DE on ROA is (−0.720). Thus, hypothesis H2 is accepted.

Enterprises with high profitability often prioritize the use of internal capital instead of external mobilization. Increasing debt will increase financial risk due to dependence on debt repayment obligations, while issuing additional shares can lead to a decrease in the control of existing shareholders. Therefore, enterprises with good financial performance often choose the form of financing with retained earnings to carry out investment activities, thereby maintaining financial autonomy and limiting negative impacts on ownership structure. Some studies have similar results such as Tesema (2024), Mohammad & Bujang (2020), Mazanec (2023), Bui Thi Ngoc et al. (2023), Duong

Van Chi et al. (2023), Tran Thi Phuong Thao (2024), Tran Thi Bich Ngoc et al. (2017), Duong Van Chi et al. (2023).

Hypothesis H3: SGR does not show an impact on the financial performance of enterprises. Accordingly, hypothesis H3 is not accepted.

Hypothesis H4: Liquidity (LIQ) has a positive impact on the financial performance of enterprises. Hypothesis H4 is accepted. This result is similar to the studies of Mazanec (2023), Tran Thi Phuong Thao (2024). Enterprises with good liquidity often have stable cash flow, high financial autonomy, thereby maintaining financial performance.

Hypothesis H5: Asset efficency (EFF) has a positive and statistically significant impact on ROA, showing that hypothesis H5 is accepted. This result is similar to the findings of Tran Thi Phuong Thao (2024), Duong Van Chi et al. (2023).

Hypothesis H6: In the research model, enterprise size (SIZE) has a positive impact on the financial performance of enterprises. Accordingly, hypothesis H6 is accepted. This result is consistent with the findings of many studies such as Tesema (2024), Kong et al. (2023), Nguyen Thi Dieu Chi (2018), Tran Thi Phuong Thao (2024), Tran Thi Bich Ngoc et al. (2017), Duong Van Chi et al. (2023).

Hypothesis H7: The number of years of operation of the enterprise (AGE) does not show the influence on the financial structure in the model, so hypothesis H7 is not accepted.

Hypothesis H8: In the model, export-import turnover (EI) has a positive and statistically significant impact on the financial performance of the enterprise. Therefore, hypothesis H8 is accepted. Export-import turnover is an important macro factor representing the level of trade of goods between a country and the world. This factor directly affects the revenue of port exploitation enterprises, thereby positively affecting the financial performance of the enterprise.

6. Conclusion and recommendations

With the aim of studying the impact of capital structure on the financial performance of seaport enterprises, the study collected financial data of 20 listed seaport enterprises in Vietnam in the period of 2017-2024 as a basis for analysis and evaluation. The regression methods applied include OLS, FEM, REM and GLS. The dependent variable used to measure the financial performance of enterprises is ROA. The research results show that capital structure measured by two independent variables, TD and DE, has an inverse effect on the financial performance of enterprises. Revenue growth rate (SGR) and operating time (AGE) are statistically insignificant variables, while enterprise size (SIZE), liquidity (LIQ), asset efficiency (EFF), and export turnover (EI) have a positive impact on ROA.

Based on the results, some recommendations are made as follows:

First, enterprises need to restructure their capital structure and deliberately consider increasing the proportion of debt in their financial structure. The abuse of debt reduces the financial independence of enterprises, and high interest expenses put pressure on the need to achieve a certain level of profitability to ensure solvency. As a result, enterprises' profitability is reduced and financial risks are increased. Instead, enterprises should carefully evaluate alternative sources of funding to ensure maintaining operating efficiency at a more stable and sustainable level.

***Second*,** to optimize operational efficiency, seaport enterprises need to balance the two main sources of funding: loans and equity. In particular, retained earnings need to be exploited as an important internal source of capital, not only helping to increase financial initiative but also helping enterprises take advantage of investment opportunities in a timely manner. Accumulating retained earnings through a reasonable dividend policy and cost savings will contribute to strengthening internal financial strength, while limiting arising debt obligations. In addition, enterprises should also consider issuing additional common shares or preferred shares as a solution to expand equity capital at a reasonable cost of capital.

Third, enterprises need to maintain and improve profit margins at the same time as asset utilization efficiency. The main measure is to control business costs well, set appropriate selling prices to ensure asset efficiency, maintain stable profit margins, thereby improving the quality of financial growth in a sustainable manner.

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ASSESSING ESG COMPLIANCE: AN IN-DEPTH STUDY OF VIETNAM'S LISTED TEXTILE AND APPAREL FIRMS

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Abstract: ***This study investigates the impact of ESG compliance on the financial performance of Vietnam's listed textile and apparel firms. The dataset includes 30 listed textile and apparel firms on the Vietnam Stock Exchange from 2019 to 2023. The results indicate that firms with higher ESG compliance demonstrate improved financial performance. However, smaller firms encounter difficulties in ESG adoption due to financial constraints and regulatory challenges.***

• Keywords: *ESG compliance, financial performance, textile and apparel industry, sustainable business.*

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1. Introduction

Environmental, Social, and Governance (ESG) compliance has become a crucial aspect of corporate sustainability worldwide. As businesses integrate ESG principles into their operations, they not only mitigate risks but also enhance financial performance, strengthen reputational standing, and secure long-term competitiveness (Chen, Song, & Gao, 2023). As a result, investors, consumers, and regulators now demand greater transparency and accountability, shifting ESG compliance from a voluntary commitment to a strategic necessity (Kandpal et al., 2024; Ali, Frynas, & Mahmood, 2017). In particular, the tightening of global regulations aimed at fostering a green economy such as the European Union's Corporate Sustainability Due Diligence Directive, set to take full effect by 2027 has increased accountability demands on supply chain participants (Butt & Kousar, 2024). As Vietnam deepens its integration into the global economy, enhancing ESG compliance will be crucial for maintaining its competitive edge in international trade.

On a national level, Vietnam has demonstrated strong commitments to sustainability, including Vietnam ESG Initiative 2025 , a pledge to achieve net-zero emissions by 2050 and the implementation of a National Green Growth Strategy (Ministry of Planning and Investment, 2024). Concurrently, international trade agreements, such as the EU-Vietnam Free Trade Agreement (EVFTA), now incorporate stricter sustainability-related provisions, compelling local firms to adopt responsible practices to retain market access (Nguyen, 2023).

In order to contribute to this green movement, Vietnam has to re-evaluate the operations of its key economic sector, and the textile and apparel sector being one. As of 2024, the industry employed approximately 2.5 million workers, accounting for nearly 4.8% of the national labor force, and contributed $44 billion in export revenue (VITAS, 2024). Despite its importance, ESG compliance among the textile and apparel industry, remains underdeveloped and is now facing with many hurdles (PwC, 2022). While the country's rapid industrialization has spurred economic growth, this sector grapple with persistent environmental degradation including wastewater pollution and high carbon emissions coupled with labor rights gaps and weak corporate governance. Moreover, structural challenges further impede progress: SMEs, which constitute over 80% of this fragmented market, lack resources and expertise to prioritize ESG. This is even more exacerbated by stringent international supply chain requirements (e.g., EU CSRD), technological gaps in monitoring ESG metrics, and risks of greenwashing. According to Mitra and Bui (2024), only 30% of surveyed SMEs have implemented formal ESG strategies, with smaller enterprises often lagging behind due to limited financial and human resources as well as a lack of awareness or understanding of ESG principles. Firms that neglect ESG alignment may face increased financing constraints and elevated corporate risk, potentially leading to diminished investor confidence and market penalties (Zhang et al., 2024).

While extensive research has explored ESG compliance in developed economies, there is a notable gap in the literature regarding its adoption and financial impact in developing markets like Vietnam. Existing ESG studies in Vietnam have predominantly focused on sectors such as banking and manufacturing, leaving the textile and apparel industry under-researched. Given the sector's pivotal role in Vietnam's economic development and the increasing global emphasis on sustainability, this study seeks to address this gap by providing a comprehensive assessment of ESG compliance among Vietnam's listed textile and apparel firms.

This research investigates the relationship between

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ESG compliance and financial performance, testing the hypothesis that firms adhering to ESG principles exhibit stronger financial outcomes. Additionally, the study also investigate the current situation of ESG adoption in the textile sector. The findings aim to provide actionable insights for policymakers, investors, and industry leaders to develop strategies that enhance ESG compliance while ensuring long-term business sustainability.

The structure of the paper is as follows: Section 2 disscusses the existing literature and employed framework on the relationship between ESG performance and firm's financial situation. Section 3 describes the methodology employed in the model. Section 4 reports and analyzes the empirical findings. Lastly, Section 5 provides the study's conclusion.

2. Literature reviews

Empirical research has shown that ESG compliance has a significant influence on the financial performance of textile and apparel firms in Vietnam.

Phan et al. (2020) explored the link between sustainable development practices and financial outcomes in Vietnam's textile industry. Using a mixed-method survey and structural equation modeling (PLS-SEM), the study found that environmental and social initiatives within workplaces and communities positively impact profitability and business growth. Factors such as customer loyalty, employee satisfaction, and corporate reputation act as mediators, strengthening the relationship between sustainable development practices and financial performance. Additionally, the study highlights that entrepreneurial orientation enhances the financial benefits of sustainability efforts.

Pham et al. (2023) assessed the financial performance of Vietnam's textile industry using the entropy-TOPSIS method to rank firms based on key financial indicators like liquidity, solvency, and profitability. The results show that firms with strong ESG integration consistently outperform others in financial stability and operational efficiency. A clear positive correlation exists between ESG adherence and financial metrics such as return on assets and debt management. Moreover, ESG-compliant firms are better equipped to handle financial risks, particularly during economic downturns. Despite the study's valuable insights, its relatively small sample size limits the broader applicability of the findings.

Research by Tasneem Usmani (2024) offers empirical evidence on the positive relationship between ESG performance and financial outcomes in the global textile and apparel industry. The study finds that firms with higher ESG scores demonstrate stronger ROE and ROA, emphasizing ESG's role as a strategic driver of financial performance. It also highlights increasing investor pressure for sustainable practices, reinforcing the need to integrate ESG into core business strategies, particularly in environmentally sensitive industries. This reinforces the view that ESG is not merely a matter of ethics or social responsibility, but a strategic tool that contributes to long-term financial performance and corporate value.

Building on the insights from the literature, this study investigates whether the overall disclosure of ESG practices correlates positively with financial performance. The hypothesis is therefore structured as follows:

H1: There is a positive relationship between overall ESG compliance and the financial performance of Vietnam's textile and apparel firms.

3. Research methods

3.1. Empirical model

To evaluate the primary hypothesis regarding the impact of ESG compliance on financial performance, this study proposes three distinct regression models.

The first proposed model evaluates the impact of ESG compliance on ROA, determine whether there exists a positive relationship between a firm's ESG score and its asset utilization. The model is specified as follows:

$$ROA_{i,t} = \beta_0 + \beta_1 * ESG_{i,t} + \beta 2 * Size_{i,t} + \beta 3 * Lev_{i,t} + \beta 4 * FX_{i,t} + u_{i,t} \quad (1)$$

The second model examines the relationship between ESG compliance and ROE, measuring the profitability relative to shareholders' equity. The model is specified as:

$$ROE_{i,t} = \beta_0 + \beta_1 * ESG_{i,t} + \beta 2 * Size_{i,t} + \beta 3 * Lev_{i,t} + \beta 4 * FX_{i,t} + u_{i,t} \quad (2)$$

The third model focuses on whether ESG compliance positively affects profitability margins. The model is specified as follows:

$$NPM_{i,t} = \beta_0 + \beta_1 * ESG_{i,t} + \beta 2 * Size_{i,t} + \beta 3 * Lev_{i,t} + \beta 4 * FX_{i,t} + u_{i,t} \quad (3)$$

In this study, the author employed return on assets, return on equity, net profit margin as the dependent variables, ESG score as the independent variable, and firm size, leverage, exchange rate as the controllable variables.

Return on Assets (ROA). ROA is a fundamental financial metric that evaluates a firm's efficiency in generating profits relative to its total assets. It serves as a critical indicator of operational effectiveness and managerial competency in resource utilization. Previous studies (McGuire, Sundgren, & Schneeweis, 1988; Orlitzky, Schmidt, & Rynes, 2003) have identified ROA as a key measure in analyzing the financial implications of corporate social performance.

Return on Equity (ROE). ROE quantifies a firm's ability to generate profit from shareholders' equity, which is reflected in the efficiency of capital utilization. This metric is particularly significant for investors as it highlights the effectiveness of management in delivering shareholder value. Empirical research (Waddock & Graves, 1997; Barnett & Salomon, 2012) suggests a positive correlation between corporate social responsibility (CSR) and ROE, demonstrating the financial benefits of ethical and sustainable business practices.

Net Profit Margin (NPM). Net Profit Margin (NPM) assesses a firm's ability to convert revenue into net profit after accounting for all expenses, serving as a critical indicator of cost management and operational efficiency. Higher NPM values reflect stronger financial performance and strategic cost control. Prior research indicates a generally positive relationship between sustainability practices and improved financial performance metrics, including profitability (Alshehhi et al., 2018).

ESG Score (ESG). ESG score is primary independent variable in this study, which is assessed by the author according to the GRI framework. The GRI framework provides a standardized methodology for evaluating corporate ESG performance, ensuring consistency and comparability across industries and geographical regions (Brown, de Jong, & Levy, 2009; Joseph, 2012). Empirical evidence (Buallay, 2019; García, Mendes-Da-Silva, & Orsato, 2017) has established a strong association between ESG performance and financial outcomes. While not all studies explicitly adopt the GRI framework, their findings support the relevance of structured ESG metrics in financial analysis.

Firm Size (Sizen). Firm size is incorporated as a control variable, as larger firms typically possess greater financial resources and face greater regulatory scrutiny, thereby increasing their capacity and incentives to implement ESG initiatives (Brammer & Pavelin, 2008).

Leverage (Lev). Leverage is included to account for financial risk and capital structure, as firms with high debt obligations may have limited flexibility in allocating resources to ESG initiatives (Ortiz-de-Mandojana & Bansal, 2016). High financial leverage can constrain a firm's strategic options and discourage long-term investments in sustainability due to increased risk aversion and liquidity concerns.

Exchange Rate (FX). Exchange rate fluctuations, particularly between the USD and VND, are controlled for due to their impact on firms' cash flows and profitability. Firms involved in international trade face significant exchange rate exposure (Muller & Verschoor, 2006).

3.2. Data collection

The data collection process integrates both quantitative and qualitative approaches to assess ESG compliance in Vietnam's textile and apparel industry. Quantitative data, spanning 2019–2023, is sourced from publicly available financial reports, ESG disclosures, and corporate websites. Key metrics include ESG scores, financial indicators such as return on assets, return on equity, net profit margin, along with control variables like firm size, financial leverage, and the USD/VND exchange rate. Given the limited transparency of ESG practices within the sector, the author developed a scoring framework to evaluate compliance based on available data, including corporate disclosures, third-party sustainability ratings, regulatory filings, and independent reports. This comprehensive assessment yielded 150 observations. To complement the quantitative analysis, qualitative data is gathered through secondary sources such as industry reports, government publications, and media articles, as well as existed interviews with key stakeholders, including corporate executives, ESG officers, and industry experts.

4. Results and dissussion

4.1. The Current State of ESG Practices in Vietnam's Textile & Apparel Firms

Vietnam's textile and apparel industry plays a pivotal role in the country's economic landscape, serving as one of its core export-driven sectors (Nguyet A. Vu (2014). The sector is projected to reach $47–48 billion in exports by 2025, driven by improved global market positioning, domestic policy support, and enhanced sustainability practices. The sector employs over 2.5 million workers, mainly from rural areas, supporting poverty reduction and industrial expansion (Vietnam Ministry of Industry and Trade, 2023). However, despite its significant contribution to employment and trade, the industry's reliance on low-wage labor and external supply chains raises concerns about long-term sustainability (Phan, Doan, & Nguyen (2020).

Vietnam is the fifth-largest garment exporter globally, with over 13,000 textile and garment enterprises, including major clusters in Ho Chi Minh City, Binh Duong, Thai Binh, Hung Yen, and Bac Giang (VIRAC, 2023). The industry structure comprises three primary segments: yarn, fabric, and garment production, with the garment sub-sectorcontributing the largest share of revenue.

Vietnam's textile exports are highly dependent on international markets, with over 80% of production exported to countries like the U.S., EU, Japan, and South Korea (Statista, 2023). This export-driven structure exposes the sector to global demand fluctuations, regulatory pressures, and ESG compliance requirements. Particularly, the EU's Green Deal and other trade policies increasingly demand sustainable manufacturing. Free Trade Agreements (FTAs) such as CPTPP and EVFTA provide market advantages but also push firms toward higher ESG standards to maintain access to global markets (WTO Center, 2023).

4.2. Descriptive statistics

Table 1 presents the descriptive statistics of the main variables used in the study. The return on assets (ROA) ranges from [-0.670;4.578], with a mean of 0.071, suggesting that firms generally achieve modest profitability relative to their assets. The relatively high maximum value indicates the presence of potential outliers or firms with exceptionally high asset efficiency. Similarly, the return on equity (ROE) varies between

[-1.344; 9.157], with an average of 0.091. While most firms generate positive shareholder returns, a minority exhibit significantly negative ROE, which may reflect financial distress or poor managerial performance. The ESG score ranges from [0.057;0.942], with a mean of 0.340, indicating moderate to low levels of ESG compliance among the firms in the sample.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	150	0.071	0.380	-0.670	4.578
ROE	150	0.091	0.408	-1.344	9.157
NPM	150	0.028	0.651	-6.260	4.808
ESG	150	0.340	0.254	0.057	0.942
LEV	150	2.784	1.404	0.027	6.876
SIZE	150	6.904	1.446	1.981	9.920
FX	150	23295.39	257.232	23050.24	23787.32

Source: Authors' calculation

Table 2 presents the correlation analysis among the variables. ROE exhibits the strongest positive correlation with ROA (0.99), indicating that firms with higher asset efficiency also achieve greater shareholder returns. Similarly, NPM is positively correlated with ROA (0.63), suggesting that firms with higher net profit margins tend to generate greater returns on assets. ESG scores show a weak but positive relationship with both ROA (0.19) and ROE (0.22), implying that firms with stronger ESG compliance may experience slightly improved financial performance. FX shows a weak positive correlation with ROA (0.13), suggesting that exchange rate movements may have a minor effect on firm profitability. In contrast, leverage (LEV) and firm size (SIZEN) exhibit weak negative correlations with ROA and ROE, hinting at potential trade-offs between financial structure, firm scale, and profitability.

Table 2. Correlation matrix

Variable	ROA	ROE	NPM	ESG	LEV	SIZEN	FX
ROA	1						
ROE	0.99**	1					
NPM	0.63**	0.63**	1				
ESG	0.19**	0.22**	0.14**	1			
LEV	-0.16**	-0.16**	-0.03**	-0.35**	1		
SIZEN	-0.17**	-0.15**	-0.08**	0.174*	0.22**	1	
FX	0.13**	0.11**	-0.03**	-0.10**	-0.04**	0.01**	1

|r| < 0,1, **|r|<0,05, *|r|<0,01*

Source: Authors' calculation

4.3. Estimation result

Table 3. Regression results of Model (1)

	POLS	FEM	REM
	ROA	ROA	ROA
ESG	0.0319***	0.128**	0.0319*
	(0.0048)	(0.0092)	(0.0048)
LEV	-0.0075	0.783***	-0.0075
	(-1.71)	(0.43)	(-1.71)
SIZEN	-0.1076	0,0009	-0,1076
	(-1.81)	(0.83)	(-1.76)
FY	0.0004***	0.0005***	0.0004***
	(0,062)	(0,043)	(0,062)
_cons	0.7063*** (0.0346)	-0.5494*** (0.0751)	0.7063*** (0.0346)
N	150	150	150
R-squared	53.14%	76.55%	74.98%

Source: Authors' calculation

Table 4. Regression results of Model (2)

	POLS	FEM	REM
	ROE	ROE	ROE
ESG	0.8043***	1.3304***	0.8043***
	(0.02)	(0.01)	(0.02)
LEV	-0.0075**	0.1783	-0.0075*
	(-0.872)	(0.325)	(-0.872)
SIZEN	-0.1076	0.0079*	-0.1076
	(-0.015)	(0.21)	(-0.015)
FY	0.0004***	0.0005***	0.0004***
	(0,064)	(0,045)	(0,064)
_cons	-0.33 (-0.0387)	0.5494 (0.0951)	-0.7985 (0.0021)
N	150	150	150
R-squared	51.27%	77.13%	75.64%

Source: Authors' calculation

Table 5. Regression results of Model (3)

	POLS	FEM	REM
	NPM	NPM	NPM
ESG	0.4709**	0.5551**	0.4709*
	(0.047)	(0.101)	(0.047)
LEV	0.0255**	0.0492	0.0255
	(0.053)	(0.074)	(0.053)
SIZEN	-0.0570	0.7428*	-0.0570**
	(-0.015)	0.014	(-0.015)
FY	-0.0004	-0.0001*	-0.0002*
	(0.064)	(0.045)	(0.064)
_cons	0.4942 (0.0387)	0.4461 (0.0811)	0.4942 (0.0387)
N	150	150	150
R-squared	41.35%	76.41%	33.61%

Source: Authors' calculation

Table 6. F-Test Results

Model	F	Prob > F	Model Selection
ROA	4.44	0.0000	FEM
ROE	4.56	0.0000	FEM
NPM	1.31	0.0000	FEM

Source: Authors' calculation

Table 6 reports the F-test results, showing that FEM is preferred for all models (ROA, ROE, and NPM), as all p-values are 0.0000. This indicates significant individual effects, justifying the use of Fixed Effects Models over Pooled OLS.

The Breusch-Pagan test results reject the null hypothesis at the 1% level, confirming that REM is appropriate for all dependent variables due to the presence of unobserved heterogeneity. The Hausman test results support REM for ROA and ROE as the p-values exceed 5%, indicating no correlation between individual effects and explanatory variables. For NPM, the p-value below 5% suggests FEM is more suitable. All VIF values remain below 10, indicating no significant multicollinearity among independent variables. Autocorrelation is detected in ROE and NPM, requiring FGLS estimation for robust results.

Based on the FGLS results, the author came to the results of the model as follows:

$$ROA_{i,t} = 2.490 + 0.39699 * ESG_{i,t} + 0.08191 * Size_{i,t} + 0.00548 * Lev_{i,t} + 0.00027 * FX_{i,t} + u_{i,t} \quad (1)$$

$$ROE_{i,t} = 2.754 + 0.87685 * ESG_{i,t} + 0.15841 * Size_{i,t} + 0.01281 * Lev_{i,t} + 0.00050 * FX_{i,t} + u_{i,t} \quad (2)$$

$$NPM_{i,t} = 0.4606 + 0.01523 * ESG_{i,t} + 0.00472 * Size_{i,t} + 0.00466 * Lev_{i,t} - 0.00017 * FX_{i,t} + u_{i,t} \quad (3)$$

4.4. Discussion

The results of this study yield several key insights:

First, ESG practices demonstrate a positive and statistically significant relationship with firm profitability. The FGLS estimates reveal that ESG has a strong effect on both ROA (0.39699, p = 0.005) and ROE (0.87685, p = 0.002), affirming that firms with higher ESG engagement tend to achieve better asset utilization and equity efficiency. For NPM, the relationship is positive but only marginally significant (0.01523, p = 0.078), indicating a weaker link between ESG initiatives and operating margins. These findings reinforce prior empirical evidence (Pham & Le, 2021; Nguyen et al., 2020; Nguyen et al., 2023), which highlight ESG as a mechanism for enhancing corporate sustainability, risk mitigation, and long-term value creation.

Second, financial leverage (LEV) appears to have no significant influence on ROA (p = 0.892) or ROE (p = 0.876), suggesting that the capital structure does not substantially affect asset or equity returns in this context. Interestingly, leverage exerts a significant positive effect on NPM (0.00466, p = 0.048), implying that debt financing when effectively managed can support operational profitability through resource allocation and cost control. This nuance aligns with earlier findings by Friedlan (1994) and Teoh et al. (1998), emphasizing the strategic role of debt in enhancing reported earnings.

Third, firm size (SIZEN) contributes positively to both ROA (p = 0.042) and NPM (p = 0.042), likely due to economies of scale, improved bargaining power, and operational efficiencies in larger firms. However, its effect on ROE is marginal (p = 0.056), suggesting that while size enhances profitability, it does not directly translate into shareholder returns. These results are consistent with prior studies (Robin & Wu, 2015; Skinner & Sloan, 1999) that acknowledge firm size as a partial determinant of financial performance, mediated by strategic resource deployment.

Fourth, foreign exchange fluctuations (FY) have mixed effects. FY positively influences ROA (p = 0.028) and ROE (p = 0.044), supporting the view that currency depreciation improves export competitiveness and revenue inflows. Conversely, the negative and significant effect on NPM (–0.000017, p = 0.024) indicates that margin volatility arises from exchange rate-induced cost pressures. This dual effect underscores the trade-off between top-line growth and bottom-line stability in export-oriented sectors, echoing insights from Nguyen et al. (2023).

Fifth, the theoretical implications reinforce multiple strategic perspectives. From an agency theory lens, ESG's positive effect suggests that responsible governance reduces principal-agent conflicts, aligning managerial decisions with shareholder interests. Under resource-based theory, ESG is positioned as a strategic asset strengthening brand equity, stakeholder trust, and operational capabilities. The stakeholder theory view is also validated, as firms prioritizing stakeholder needs through ESG demonstrate superior financial outcomes. Finally, within institutional theory, ESG adoption signals legitimacy and regulatory alignment, enhancing investor confidence and long-term resilience.

Overall, these findings underscore that ESG integration is not merely a symbolic or regulatory act, but a strategic imperative. In Vietnam's textile industry, ESG-oriented firms outperform peers in key financial metrics yet the realization of long-term benefits depends on complementary institutional support, improved corporate governance, and deeper stakeholder engagement.

5. Conclusion

This study examines the impact of ESG compliance on financial performance among Vietnam's listed textile and apparel firms. Using a dataset of 30 firms from 2019 to 2023, the study employs econometric models, including OLS, Fixed Effects, and FGLS, to analyze the relationship between ESG and financial metrics. The results indicate that firms with stronger ESG commitments experience improved profitability, particularly in ROA and ROE, though the effect on NPM is weaker. The findings reinforce theories such as agency, resource-based, and stakeholder theory, emphasizing ESG's role in enhancing firm competitiveness and investor confidence. Despite the benefits, challenges remain, especially for SMEs, due to resource constraints and regulatory gaps.

To improve ESG adoption, policymakers should implement clear regulatory frameworks, financial incentives, and industry collaborations. Firms should integrate ESG into business strategies, enhance corporate governance, and prioritize sustainability efforts. Investors must support capacity building and innovation to ensure long-term market positioning. This study contributes to the literature on ESG in emerging economies, offering insights for stakeholders to balance sustainability with financial performance and competitiveness in the evolving global market.

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IMPACT OF INSTITUTIONAL OWNERSHIP ON COST STICKINESS: EMPIRICAL EVIDENCE FROM LISTED COMPANIES ON STOCK MARKET OF VIET NAM

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Abstract: ***This study assesses the impact of institutional ownership on the stability of costs in listed companies on the Vietnamese stock exchange, based on data from 197 companies from 2020-2023. After comparing Pooled OLS, FEM, REM models and performing necessary defect tests (multicollinearity, homogeneity of variances, and serial correlation), the authors used the FGLS model to overcome the heteroscedasticity and autocorrelation problems to test the hypothesis. The findings provide empirical evidence that institutional ownership increases the stability of SG&A costs in listed companies in Vietnam.***

• Keywords: *institutional ownership, cost stickiness, selling, general & administrative (SGA) expenses, listed companies, Vietnam.*

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1. Introduction

Institutional ownership is defined as companies or organizations that invest money on behalf of other people or organizations (Velte, 2023). Institutional characteristics such as investment horizon, concentration of ownership, and independence from the board of management bring higher monitoring in some organizations than in others (Ramalingegowda & Yu, 2012). Furthermore, institutional investors' monitoring activities are not only related to corporate characteristics but are also clearly linked to CEOs' roles and behaviors with emphasizing their important function in the corporate governance system (Velte, 2023). As mentioned by Shleifer & Vishny (1986), large investors, especially institutional investors, hold more resources and incentives to monitor senior management. As they often represent the largest and most professional shareholders in listed companies, they place a great influence on the board of directors. These investors, therefore, can exercise their exit rights to threaten dissatisfied executives or hold investments to pressure strategic changes through voice rights (Velte, 2023). Most institutional investors focus on financial performance and investment risks from a traditional perspective, and numerous studies indicate that they positively impact the financial performance of companies. These include reducing information asymmetry in capital markets, limiting fraudulent financial reporting (Jain, 2022), and increasing financial flexibility (Salehi et al., 2016). However, studies also show that the impact of institutional investors is not always positive, especially when the cost of equity increases, which reduces the value of the company (Faysal et al., 2021). Consequently, institutional investors may act as active or passive monitors, leading to inconsistent or unpredictable impacts on the financial performance of companies. Moreover, costs are a critical factor influencing company performance. Therefore, we assert that institutional ownership affects cost adjustments during the execution of monitoring roles by institutional investors.

Cost behavior is often related to factors such as changing the size of business activities of the company, managers' adjusting resources for their personal interests, etc. According to previous studies, the costs fluctuate asymmetrically with the size of business activities. Noreen & Soderstrom (1997) argued that asymmetric cost behavior results from the managers' preferring to retain unused resources rather than incur adjustment costs during a declining sales period. Anderson et al. (2003) conducted the pioneering study that provided the first empirical evidence for the existence of asymmetric cost behavior when finding that SG&A expenses increase more than the sales (0.55% vs. 0.35%) when the sales increase, and they decrease when the sales decrease, called "cost stickiness".

Jensen & Meckling's (1976) agency theory focused on the problems of information asymmetry and conflicts of interest between management and shareholders due to the separation of ownership and control. A prominent factor in agency theory is that the managers tend to overexpand their company in order to make "empire-building", causing the waste of valuable economic resources to maintain or expand the company beyond the optimal value. This managers' tendency is to serve their personal interests such as power, prestige, and higher salaries, rather than the interests of shareholders or the company (Anderson et al., 2003). Hence, on the basis of the argument of agency theory, we argued that the conflicts between the agents

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(managers) and the owners will be resolved when both parties reach common interests. Accordingly, it is assumed that both managers and owners give appropriate responses to the asymmetric behavior of costs to achieve their goals. Therefore, the purpose of this study is to examine, review the impact of institutional ownership on the stickiness of costs in the companies.

To achieve the study objectives, we analyzed data from 197 listed companies on the Vietnam stock market between 2020-2023, excluding sectors like investment, insurance, banking, financial institutions, and leasing. The results show that institutional ownership influences the stickiness of SGA expenses, providing empirical evidence of its role in asymmetric cost behavior among Vietnamese listed firms. The following sections of this paper include: (2) theoretical basis and research hypotheses, (3) Methodology, (4) research results and discussion, and finally, (5) conclusion

2. Theoretical basis and research hypotheses

2.1. Theoretical basis

In this section, the importance of the concept of cost stickiness was emphasized, and the agency theory was used to explain the relationship between organizational ownership and cost fluctuations. This theory clarifies how conflicts of interest between owners and managers affect decisions, thereby affecting the cost stickiness in the companies.

Concept of cost stickiness: The concept of cost "stickiness" has been developing since 1927, reflecting research trends across various periods. Initially, Brasch (1927) demonstrated that different cost curves for the same activity level provided the first evidence of cost stickiness. In 1994, Noreen and Soderstrom found that general administrative expenses in Washington hospitals were not proportional to activity levels. In 1997, they argued that some expenses increased more rapidly with rising activity levels, contradicting the traditional model. Kaplan and Cooper (1998) also found that managers tended to increase costs more than they reduced them for equivalent changes. Finally, Anderson et al. (2003) confirmed that costs exhibit asymmetric behavior, meaning costs increase more when activity rises than they decrease when activity falls by the same amount, a phenomenon known as cost stickiness.

Agency Theory: Jensen and Meckling (1976) define an agency relationship as a contractual agreement in which one or more individuals (the principal) hire an agent to act on their behalf, delegating certain decision-making authority. By its nature, the agency relationship becomes problematic when the interests of the principal and the agent are misaligned. Agency costs contribute to cost stickiness (Anderson et al., 2003), as managers often prioritize growth activities, expand operations, or retain inefficient resources to enhance their power, status, or salaries, disregarding the negative impact on costs and stickiness. This behavior can lead to fluctuations in operating costs, reducing cost stickiness. When managers prioritize personal interests over the owners' long-term goals, they are more likely to make suboptimal decisions or retain unnecessary resources, resulting in undesirable cost fluctuations. In contrast, owners typically aim to maximize profits and maintain cost stickiness to ensure the company's long-term efficiency. These conflicts influence the company's development strategies, leading to decisions that affect cost stickiness.

2.2. Research hypotheses

In the agency theory, Jensen and Meckling (1976) argued that the relationship between managers and shareholders leads to the agency cost, affecting the business performance. From the agency cost perspective, the institutional investors can monitor and control corporate policy, which can impact the board of directors' decisions, and may bear monitoring costs more effectively and engage in active ownership.

According to Kane and Velury (2004), institutional investors are assumed to act as a group that holds a relatively large number of shares and larger amounts of investment capital than individual investors, thereby exerting greater influence on the company. Institutional investors can play three potential roles: (1) actively monitor and improve firm performance; (2) cooperate with firm managers to extract private benefits at the expense of minority shareholders; or (3) maintain a passive attitude, thereby reducing the incentive to improve firm performance (Ruiz-Mallorquí and Santana-Martín, 2011). Given their large shareholdings, institutional investors have significant potential to mitigate agency problems between shareholders and management (Gillan and Starks, 2003). Due to the costs associated with monitoring, only large shareholders have the incentive to engage in it (Gillan and Starks, 2003). Institutional investors holding high ownership ratios play an effective monitoring role, whereas those with low ownership ratios tend to act as benefit-seekers. The larger the ownership ratio, the greater the opportunity to benefit from economies of scale in information collection, thereby reducing agency costs (Koh, 2003). Institutional investors often possess substantial financial resources and decision-making capabilities and are willing to withdraw capital if the company performs poorly, thereby prompting changes in its financial and shareholder structure.

Bai et al. (2025) argue that, under the influential monitor hypothesis, institutional investors, through active external monitoring, constrain management's opportunistic behavior. This may impact cost stickiness: institutional investors, who prioritize efficiency and profitability, may pressure the board of management to adjust costs more flexibly as revenues change, thereby reducing cost stickiness. Conversely, without close monitoring, the board of management may delay cost-cutting, leading to greater cost stickiness. As evidence, using a sample of 39,083 non-financial firms over multiple years, Chung et al. (2019) studied the impact of institutional ownership on cost stickiness. Their findings indicate that long-term institutional investors reduce cost stickiness, consistent with Ibrahim's (2018) findings in Egypt. Similarly, based on agency theory, Sun et al. (2024) provide evidence that firms with common institutional

ownership exhibit lower cost stickiness.

On the other hand, Tsouknidis (2019) found that higher institutional ownership in US-listed shipping companies is associated with lower firm performance. This may be because institutional investors impose additional monitoring costs on the board of management, slow decision-making, and hinder the ability to respond flexibly to market fluctuations. Furthermore, Tsouknidis (2019) argued that when these investors prioritize short-term profits, they may encourage risky projects or fail to oppose cost-inefficient decisions, making it difficult to reduce costs when sales decline. In this context, the board of management may become more cautious in adjusting costs, particularly in cutting costs, to avoid conflicts with institutional investors and maintain short-term stability, thereby increasing cost stickiness. Additionally, Woidtke (2002) argued that government organizations often pursue agendas that are not always aligned with corporate goals, creating potential conflicts of interest that reduce corporate efficiency. In other words, institutional investors may intervene to increase cost stickiness to achieve their own objectives. Based on the above arguments, we propose the following research hypotheses:

H1. Institutional ownership negatively impacts the cost stickiness.

H2. Institutional ownership positively impacts the cost stickiness.

3. Methodology

3.1. Research Data and Sample

The research data and sample include the companies listed on the HOSE and HNX during the period from 2020 to 2023. Investment companies, insurance companies, banks, financial institutions, and holding and leasing companies are subject to exclusions due to the specific nature of their activities. The inclusion criteria include (1) data availability, (2) continuous trading during the study period, and (3) fiscal year-end consistent with the calendar year. The final research sample consists of 197 companies.

3.2. Research model and measurement of variables

The authors employ a multiple regression model to estimate the impact of institutional ownership on cost stickiness. The model includes the dependent variable (cost stickiness in selling, general, and administrative expenses), the independent variable (institutional ownership), and a set of control variables, including firm size, financial leverage, asset intensity, and employee intensity. The proposed research model is specified as follows:

$$LNSGA_{it} = \beta_0 + \beta_1 LNSALE_{it} + \beta_2 LNSALE_{it}*DEC_{it} + \beta_3 LNSALE_{it}*DEC_{it}*INS_{it} + \beta_4 INS_{it} + \beta_5 EI_{it} + \beta_6 AI_{it} + \beta_7 LEV_{it} + \beta_8 SIZE_{it} + \varepsilon_{it} \quad (1)$$

The authors used the scale of Anderson et al. (2003) to measure cost stickiness as follows:

$$LN\frac{SGAi,t}{SGAi,t-1} = \beta_0 + \beta_1 LN\frac{SALEi,t}{SALEi,t-1} + \beta_2 * LN\frac{SALEi,t}{SALEi,t-1} *DEC + \varepsilon_{i,t} \quad (2)$$

Where: $SGA_{i,t}$ and $SGA_{i,t-1}$ are the total SGA expenses of company i in the current year t and the previous year t-1, respectively; $SALE_{i,t}$ and $SALE_{i,t-1}$ are the sales/revenue from the sale of goods, rendering of service of company i in the current year t and the previous year t-1, respectively. DEC is a dummy variable and equals 1 when the sales decrease and is 0 if the sales increase.

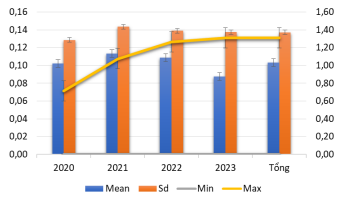
LNSGA and LNSALE, respectively, are the variations in the logarithm of total SGA expenses and sales/revenue from the sale of goods, rendering of service of company i in year t. INS is institutional ownership, calculated as the percentage of institutional ownership in company i in year t. The control variables in the model include AI (asset intensity), EI (employee intensity), SIZE (firm size), and LEV (financial leverage). Where AI is calculated as the logarithm of the ratio of total assets divided by sales and service revenue, EI is calculated as the logarithm of the total number of employees divided by sales and service revenue, SIZE is calculated as the logarithm of total assets, and LEV is calculated as the ratio. In order to satisfy the condition that firms' costs are sticky, $\beta 1 > 0$ and $\beta 2 < 0$ (Anderson et al., 2003). We focus on the coefficient $\beta 3$ of the interaction between LNSALE*DEC and INS.

When β_3 is positive, firms with INS reduce cost stickiness (supporting H1), and when negative, they increase it (supporting H2).

4. Research Results and Discussion

4.1. Descriptive Statistics

Fig. 1. Logarithmic statistics of SGA expense fluctuations by year



Source: Data collected and processed by the authors using Excel and STATA 15

During the 2020-2023 period, the SGA expenses of listed companies on the Vietnamese stock market showed significant fluctuations. The average LNSGA increased from 0.1022 in 2020 to 0.1200 in 2023, reflecting efforts to expand market share and invest in technology to support remote work after the pandemic. The standard deviation decreased from 0.1262 to 0.1130, indicating improved forecasting and cost control, driven by cost-cutting policies and tighter budget management amid economic uncertainty. The minimum and maximum values varied widely, from 0.0146 to 1.2630, highlighting differences in management strategies and resource allocation caused by market conditions and policy impacts. Overall, this period experienced an upward trend in average costs and a more even distribution among companies, showing that businesses have adapted to new challenges and maintained better cost control amid market volatility.

4.2. Research results and Discussion

To determine the most suitable model for panel data analysis, we conducted three tests: the F-test to compare

FEM with OLS, the Breusch-Pagan Lagrange multiplier test to compare REM with the OLS, and the Hausman test to compare FEM and REM. The results of the F-test (F(194, 570) = 0.78, Prob > F = 0.9773) and the Breusch-Pagan test (Chi-square(1) = 0.000, Prob > chi2 = 1.0000) both indicated that the pooled OLS model was more appropriate than FEM and REM, as both p-values exceeded the 0.05 significance level. Therefore, the pooled OLS model was deemed the most suitable for regression analysis. Subsequently, we tested for model violations, which showed that the model violated two assumptions: heteroskedasticity (Prob > chi2 = 0.0001) and autocorrelation (F(1, 189) = 4.979, Prob > F = 0.0268). To address these issues, we applied the FGLS model for more reliable hypothesis testing. The regression results of the FGLS model are presented in Table 1.

Table 1. Regression results of the OLS, FEM, REM and FGLS models

LNSGA	POOL	FEM	REM	FGLS
LNSALE	0.698***	0.700***	0.698***	0.675***
	[13.18]	[10.39]	[13.18]	[24.50]
LNSALE*DEC	-0.167	-0.0264	-0.167	-0.220***
	[-1.42]	[-0.18]	[-1.42]	[-2.69]
LNSALE*DEC*INS	-0.00373**	-0.00805***	-0.00373**	-0.00200*
	[-2.01]	[-3.53]	[-2.01]	[-1.76]
INS	-0.0000258	0.000177	-0.0000258	-0.0000479***
	[-0.50]	[1.11]	[-0.50]	[-2.93]
EI	0.0575	2.12	0.0575	-0.0936
	[0.08]	[1.12]	[0.08]	[-0.43]
AI	0.00371***	0.00518***	0.00371***	0.00187**
	[3.73]	[3.96]	[3.73]	[2.45]
LEV	-0.0000117	-0.000869	-0.0000117	-0.000184**
	[-0.04]	[-0.86]	[-0.04]	[-2.07]
SIZE	-0.00256	0.119*	-0.00256	0.00396*
	[-0.31]	[1.76]	[-0.31]	[1.65]
_cons	0.0297	-1.461*	0.0297	-0.0308
	[0.31]	[-1.79]	[0.31]	[-1.07]
t-statistics in brackets				
** p<0.1, ** p<0.05, *** p<0.01*				

Source: Analysis results from STATA 15

Table 1 shows the estimation results of the basic model of Equation (1). The results show that the estimated value of the coefficient β1 of LNSALE is 0.675 with a statistical significance of 1%; it indicates that SGA expenses increase by 0.675% for every 1% increase in the sales determined in the one-year period. The estimated value of β2 of LNSALE*DEC is -0.220 with a statistical significance of 1%, indicating the stable behavior of SGA expenses. The combined value of β1 + β2 = 0.455 shows that SG&A expenses decrease by 0.455% for every 1% decrease in sales. The above empirical results show that the SGA expenses of listed companies on the stock exchange of Vietnam in the period of 2020 - 2023 are sticky. The results also show that the coefficient of LNSALE*DEC*INS is negative (β3 = -0.002) and statistically significant (0.078); it indicates that the institutional ownership has an impact on increasing cost sickness, supporting the hypothesis H2. These study findings are contrary to the research results of Ibrahim (2018), Sun et al. (2024). When the institutional investors own a large number of shares and have control over the company, they often establish strict monitoring mechanisms to control the management's activities and limit unnecessary expansion or overspending behaviors. The institutional investors often have long-term interests, so they are willing to apply cost control measures to ensure financial stability and maintain long-term performance. The control variables affecting the volatility of LNSGA include AI (β_6 = 0.00187), LEV (β_7 = -0.000184) and SIZE (β_8 = 0.00396).

Conclusion: The research results indicate that INS influences the stickiness of SGA expenses in companies listed on the Vietnam stock market, with a coefficient of β3 = -0.002 and a significance level of 0.078. Although this coefficient is small, the trend suggests that as INS increases, the ability to maintain costs within a reasonable range with reduced volatility also improves. This reflects that institutional investors, through effective monitoring, often establish strict control mechanisms to regulate the board of management's operations, limiting abrupt expansion or cost-cutting behaviors to maintain company stability. In the context of rising sales, they tend to maintain appropriate cost levels, avoiding excessive increases that could cause inflexibility, while during sales declines, they limit abrupt cost reductions to protect the company's operations and reputation. Thus, INS encourages companies to keep costs within a reasonable range, enhancing corporate governance efficiency in alignment with agency theory principles. According to this theory, concentrated ownership by institutional investors promotes monitoring and control of the board of management's activities, thereby maintaining cost stickiness and reducing conflicts of interest among stakeholders.

This research helps listed companies on the Vietnamese stock market focus on building transparent monitoring mechanisms and encouraging institutional investors to actively participate in managing business activities. This contributes to promoting the cost stickiness, thereby enhancing the operational efficiency of these companies. However, the study only focuses on one type of organizational ownership, so future research could broaden to include various types of ownership structures.

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THE IMPACT OF GREEN SUPPLY CHAIN MANAGEMENT IN THE CIRCULAR ECONOMY CONTEXT ON FIRM PERFORMANCE OF FDI ELECTRONICS ENTERPRISES IN DONG NAI PROVINCE

Nguyen Thi Ngoc Diep* - Nguyen Huong Huyen**

Abstract: ***This study examines the impact of Green Supply Chain Management (GSCM) in the context of the Circular Economy (CE) on the firm performance of foreign direct investment (FDI) enterprises manufacturing electronic components in Dong Nai Province, Vietnam. Survey data collected from 215 FDI firms were analyzed using the PLS-SEM model to test the effects of key determinant groups, including external pressures (regulatory pressure - RGL; market pressure - MKT; supplier pressure - SPL), internal motivation (IM), green supply chain management practices (GSCM), circular economy capability (CEC), collaborative capability (CC), and firm performance. The empirical results substantiate that GSCM exerts a positive and statistically significant impact on firm performance, with CEC acting as a critical mediator in bridging GSCM and performance outcomes. The components of GSCM also exhibit statistically significant effects in enhancing firm performance. In addition, the study provides several policy implications for the Dong Nai provincial government in the context of attracting a new generation of FDI in the electronic manufacturing sector.***

• Keywords: *green supply chain management; circular economy; foreign direct investment; electronics industry.*

JEL codes: Q56, L23, M11

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1. Introduction

The rapid expansion of the global electronics industry over the past decade, together with the growth of the digital economy, has significantly increased the demand for semiconductor components, Internet of Things (IoT) devices, telecommunications equipment, and control systems. The global consumer electronics market reached USD 1.178 trillion in 2024 and is projected to expand to USD 1.480 trillion by 2029, while the global semiconductor market is expected to exceed USD 697 billion by 2025 (Statista, 2024). However, such robust industrial expansion has inadvertently precipitated a surge in e-waste generation, with 62 million tons generated in 2023, of which only 22.3% was formally recycled, resulting in the accumulation of heavy metals and hazardous compounds in the environment (World Semiconductor Trade Statistics, 2024). The European Union has implemented three key regulatory frameworks, namely WEEE, RoHS, and REACH. Specifically, the Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU requires manufacturers to design products that are easy to disassemble, reuse, and recycle. Accordingly, Green Supply Chain Management (GSCM) has become a core strategic orientation for electronics enterprises worldwide.

A substantial body of research has focused on widely recognized GSCM practices, including eco-design, green procurement, investment recovery, environmental collaboration with customers, internal environmental management, and waste management. The Sankey diagram visualizes the flow of impact, demonstrating that the strategic prioritization of critical GSCM practices such as eco-design, green procurement, green manufacturing, green packaging, green distribution, green marketing, green using, recycling, green information system, internal environmental management, and customer collaboration, together with continuous improvement and risk management, holds significant potential to translate GSCM practices into tangible operational benefits, thereby enhancing firm performance.

Against this backdrop, Vietnam has solidified its position as a pivotal FDI-driven electronics manufacturing hub in the region, as evidenced by the export value of the electronics industry reaching USD 110 billion in 2023, accounting for nearly 18% of the country's total export value, with FDI enterprises contributing more than 95% of the industry's total production value (General Statistics Office of Vietnam, 2024). The presence of multinational corporations such as Samsung, Intel, LG, Foxconn, and Luxshare has formed a multi-tier electronics industrial ecosystem, fostering the development of supporting industries in electronic components and ancillary services integrated into the global supply chains.

Among localities, Dong Nai Province stands out as a major industrial hub for electronic component manufacturing, serving both as a key electronics production center in Southern Vietnam and as one of the leading

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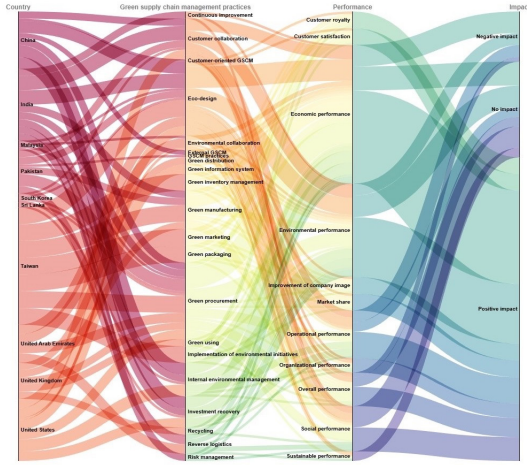
destinations for FDI inflows. According to the Dong Nai Provincial People's Committee (2024b), during the 2022-2024 period, the electronics sector accounted for over 20% of newly registered FDI capital in the province, reflecting a clear trend of production relocation from China, South Korea, and Taiwan to Vietnam to diversify global supply chains. In 2024, Dong Nai's total export value reached approximately USD 23.4 billion, of which the FDI sector contributed 75% - 85%, posting a 15.25% growth rate for computers, electronic products, and electronic components during the first nine months of the year (Dong Nai Provincial People's Committee, 2024a). However, the rapid expansion of the industry has also placed Dong Nai's FDI enterprises under increasing environmental compliance pressures from major export markets.

Figure 1. Sankey diagram illustrating the flow of GSCM practices towards firm performance



Source: Authors

In Vietnam, practical observations indicate that the adoption of both GSCM and circular economy practices remains at a nascent stage, primarily concentrated in top-tier FDI enterprises or operating under the strict mandates of parent corporations. For instance, Bosch Vietnam (Long Thanh) implements a rooftop solar power system with an annual output of approximately 2,300 MWh to align with the group's global carbon reduction targets; meanwhile, Mabuchi Motor Vietnam and Mitsuba Vietnam maintain environmental management systems in compliance with ISO 14001 standards, coupled with stringent chemical monitoring mechanisms as required by their Japanese parent companies. Although the electrical and electronics sector accounts for approximately 18% of Vietnam's total industrial production value and is characterized by high emission intensity, empirical studies in Vietnam remain limited and have predominantly focused on sectors other than electronics. Consequently, current literature fails to fully capture the actual level of GSCM adoption in this strategically pivotal sector.

2. Theoretical background and research hypotheses

2.1. Key concepts

2.1.1. Green supply chain and Green supply chain management (GSCM)

Green supply chain: The concept of "Green Supply Chain" was first introduced in the "Responsible Manufacturing" study published by Michigan State University in 1996. It was defined as a manufacturing paradigm aimed at optimizing resource efficiency while mitigating negative environmental footprints (Handfield et al., 1997). Building upon this foundation, numerous scholars have subsequently expanded and refined the concept through various theoretical lenses. Notably, Zhang et al. (2020) conceptualize the green supply chain as a strategic lever, enabling firms to simultaneously reduce environmental impacts and bolster operational efficiency and competitiveness. Recent studies further corroborate that the green supply chain functions as a holistic system, integrating environmental criteria across all supply chain stages, from design, sourcing, manufacturing, distribution to end-of-life management (Saini et al., 2023).

Green supply chain management (GSCM): The concept became increasingly consolidated in the early 2000s, as evidenced by Srivastava (2007) contends that the majority of environmental impacts originate from various supply chain stages, thereby necessitating a more comprehensive managerial approach. GSCM is oriented towards reducing environmental impacts, limiting waste, while simultaneously enhancing firm performance (Vachon & Klassen, 2006). Furthermore, GSCM is conceptualized as a strategic orientation that bolsters competitive advantage, elevates corporate image, and enhances firm resilience against environmental turbulence and regulatory pressures (Nazir et al., 2024).

Circular economy (CE): The concept of the circular economy traces its origins to the study by Pearce and Turner (1990). It introduced a new economic paradigm based on the principle that all resources can be transformed into inputs for subsequent processes, standing in stark contrast to the traditional linear model of "take, make, consume, dispose" (Phùng Chí Sỹ, 2021). To date, a universally accepted definition of CE remains elusive. Academic literature and professional organizations have proposed various approaches, ranging from optimizing material flows (Liu et al., 2009), implementing closed-loop circulation mechanisms (Ellen MacArthur Foundation, 2013; European Commission, 2015), and applying the 3R principle (Ormazabal et al., 2016), to reintegrating resources into the value chain (Stahel, 2016), maintaining value at the highest possible level (Cullen, 2017), and decoupling economic growth from the exploitation of finite natural resources (Geissdoerfer et al., 2017).

2.2. Theoretical Foundtations

2.2.1. GSCM Demensions

Within the realm of supply chain management, GSCM is conceptualized as an integrative approach embedding environmental objectives across all supply chain activities.

According to Srivastava (2007), the scope of GSCM extends from raw material extraction, product design, procurement, manufacturing, and distribution to consumption and post-consumption management. Building on this perspective, scholars have identified distinct dimensions of GSCM practices and empirically validated them across diverse manufacturing contexts:

(i) Eco-design: extensively documented by Rasit et al. (2019) and Khan et al. (2024), this practice involves integrating environmental criteria at the design stage to mitigate ecological footprints throughout the product life cycle.

(ii) Green procurement: consistently identified in Rasit et al. (2019) and Khan et al. (2024), this dimension emphasizes the critical role of selecting suppliers based on environmental criteria to curb ecological impacts originating from upstream supply chain stages.

(iii) Investment recovery: discussed by Zhu and Sarkis (2004) and Green et al. (2012), this factor entails divestment, reuse, or recycling activities aimed at optimizing asset value and minimizing waste generation.

(iv) Environmental collaboration with customers: as examined by Younis et al. (2016) and Khan et al. (2024), this practice focuses on joint efforts with customers to achieve environmental goals.

(v) Internal environmental management: explored in Lee et al. (2012), Zhu and Sarkis (2004), and Green et al. (2012), this dimension underscores the pivotal roles of leadership commitment, interdepartmental coordination, and the effective operation of environmental management systems.

(vi) Waste management: identified by Srivastava (2007) as a core GSCM practice, this factor targets the control of waste flows to minimize environmental repercussions.

In synthesis, the review of prior literature suggests that these dimensions constitute the core GSCM constructs, serving as the theoretical foundation for the proposed research model.

2.2.2. Circular Economy Capability

Within sustainability research, the circular economy (CE) is recognized as a pivotal paradigm for mitigating environmental footprints and maximizing resource efficiency. Building upon this premise, Andersen (2007) developed the concept of circular economy capability (CEC) as a structural construct reflecting a firm's ability to organize, integrate, and effectively operate 3R practices (reduce-reuse-recycle) throughout the entire product life cycle.

From a managerial perspective, CEC extends beyond the mere capacity to perform recycling and reuse activities, it signifies the strategic alignment between internal resources and stakeholder collaboration, geared towards the simultaneous optimization of economic, social, and environmental objectives (Hoang Thi Hong Le et al., 2024; Nhan Cam Tri, 2025).

Empirical evidence substantiates that firms possessing robust CEC exhibit superior environmental management performance, more effective regulatory compliance, bolstered brand image, and enhanced competitive capability in the marketplace (Khan et al., 2024).

2.3. Research hypotheses

External pressures and GSCM: This study integrates the institutional theory and contingency theory to elucidate the relationship between external pressures and GSCM practices. From the institutional perspective, firms' behaviors are shaped by three distinct pressures (coercive, normative, and mimetic), thereby inducing isomorphism in managerial practices. Meanwhile, contingency theory posits that the effectiveness of GSCM is contingent upon its alignment with specific contextual characteristics.

(i) Regarding coercive pressure: firms implement GSCM to comply with legal requirements, such as the Nature Restoration Law (EU, 2024) aimed at ecosystem restoration, or the Vietnam Law on Environmental Protection 2020, which promotes the circular economy orientation. Beyond mandatory regulations, incentive mechanisms such as financial support and tax exemptions also incentivize corporate compliance (Zailani et al., 2012).

(ii) Concerning normative pressure: market signals and environmental norms established by customers, public opinion, and community groups significantly influence firms' decisions to adopt GSCM.

(iii) About mimetic pressure: upstream green innovations establish norms that compel downstream firms to adapt, reflecting both normative and mimetic isomorphism (Srivastava et al., 2021). When suppliers develop green technologies or optimize recycling processes, downstream firms can easily adopt such practices thanks to cost advantages and synchronized technical requirements.

Accordingly, the study proposes the following hypotheses:

H1a: Regulatory pressure positively influences GSCM adoption in firms.

H1b: Market pressure positively influences GSCM adoption in firms.

H1c: Supplier pressure positively influences GSCM adoption in firms.

Internal motivation and GSCM:

Grounded in the Resource-Based View (RBV), internal motivation stems from firms' specific assets and capabilities, which are inimitable and instrumental in generating competitive advantages, thereby driving firms to proactively implement GSCM. The contingency approach further suggests that the efficacy of such motives is contingent upon the strategic fit between green initiatives and the organizational context (Stevels, 2022).

Regarding specific drivers, extant literature indicates that firms adopt GSCM not merely due to environmental stewardship but also owing to economic imperatives, such

as energy savings, waste reduction, optimized resource use, and increased recycling rates (Zhu et al., 2011). Furthermore, firms that strategically perceive environmental challenges as business opportunities (Sharma, 2000) exhibit a stronger inclination towards long-term innovation and sustainable strategies.

Therefore, the study postulates the following hypothesis:

H2: Internal motivation positively influences GSCM adoption in firms.

GSCM and circular economy capability:

This study leverages contingency theory to elucidate the relationship between GSCM and CEC, positing that the efficacy of GSCM in fostering a circular economy is contingent upon achieving a strategic fit with the organizational context. GSCM focuses on mitigating ecological footprints through green process design and green logistics (Costantini et al., 2015). Although differing in focal emphasis, GSCM is conceptualized as a pivotal bridging mechanism that facilitates the transition from linear to circular models, thereby reducing resource consumption and enhancing firm performance, which subsequently bolsters CEC (Kazancoglu et al., 2018).

Extant literature corroborates the synergistic relationship between GSCM and the circular economy. Integrating circular economy principles into GSCM not only improves environmental performance (ENP) but also reshapes processes according to circular logic (Genovese et al., 2017). Consequently, GSCM plays a strategic role in fortifying firms' circular economy capability. Based on this rationale, the study proposes the following hypotheses:

H3a: Eco-design positively influences firms' CEC.

H3b: Green procurement positively influences firms' CEC.

H3c: Investment recovery positively influences firms' CEC.

H3d: Environmental collaboration with customers positively influences firms' CEC.

H3e: Internal environmental management positively influences firms' CEC.

H3f: Waste management positively influences firms' CEC.

Circular economy capability and firm performance:

The relationship between CEC (circular economy capability) and firm performance is underpinned by contingency theory, emphasizing that the efficacy of circular economy initiatives is contingent upon their alignment with the organizational context. Turken et al. (2020) underscore that adopting circular economy practices necessitates supply chain restructuring and material flow redesign, thereby elevating operational complexity and risk. Moreover, circular economy implementation is shaped by technological, economic, and cultural factors, implying that no universal pathway exists for all firms (Genovese et al., 2017).

Notwithstanding these challenges, the circular economy is widely recognized as a critical strategy that enables firms to enhance performance across three dimensions: economic, environmental, and operational. Based on this rationale, the study proposes the following hypotheses:

H4a: CEC positively influences firms' economic performance (ECP).

H4b: CEC positively influences firms' environmental performance (ENP).

H4c: CEC positively influences firms' operational performance (OPE).

Collaborative capability, circular economy capability, and firm performance:

The study draws upon the relational view to explain the role of collaboration in transforming CEC into firm performance. From this perspective, firms' competitive advantages in the circular context derive from "relational rents" accruing from deep collaboration with suppliers and customers. Consequently, collaboration is posited as a critical lever in optimizing circular supply chains.

Navigating an increasingly complex business landscape, firms rely heavily on collaboration to improve performance and enhance competitive advantage. Contemporary inter-organizational relationships take diverse forms, including strategic alliances, supply chains, industrial clusters, and business ecosystems (Vargo & Lusch, 2004). Extant literature substantiates that collaborative capability mitigates transaction costs, streamlines processes, and enhances competitive capability. Crucially, within circular supply chains, synergetic linkages between upstream and downstream actors is an essential condition (Yu et al., 2014). In synthesis, collaborative capability plays a significant moderating role in the nexus between the circular economy and firm performance, serving as a cornerstone for operational optimization and sustainable development. Based on this rationale, the study postulates the following hypotheses:

H5a: Collaborative capability positively moderates the relationship between CEC and firms' economic performance (ECP).

H5b: Collaborative capability positively moderates the relationship between CEC and firms' environmental performance (ENP).

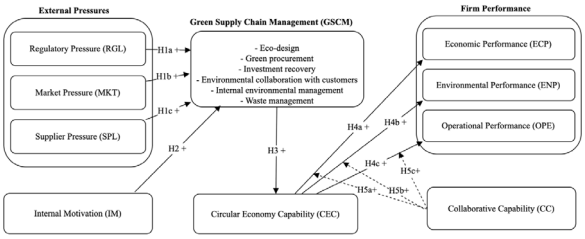
H5c: Collaborative capability positively moderates the relationship between CEC and firms' operational performance (OPE).

3. Research model, methodology and data

3.1. Research model

Grounded in contingency theory, institutional theory, the resource-based view, the relational view, and building upon the frameworks established by Green et al. (2012), Sahoo and Vijayvargy (2021), and Dey et al. (2022), in conjunction with the proposed hypotheses, the author present the research model as illustrated in Figure 2.

Figure 2. Research model



Source: Authors

3.2. Research methodology

This study employs a mixed-methods approach, combining qualitative and quantitative techniques to ensure methodological comprehensiveness. The qualitative phase utilized in-depth interviews to validate and adapt international measurement scales, thereby ensuring semantic consistency and contextual relevance for the Vietnamese setting. Concurrently, this phase served to screen variables and identify potential new indicators. Ten middle-to-senior managers from FDI electronics enterprises, each possessing a minimum of five years' experience, were interviewed to refine the survey questionnaire.

The survey was conducted from August 2024 to May 2025. A total of 238 valid questionnaires were obtained from respondents currently holding managerial positions across 215 FDI electronic component manufacturers in Dong Nai Province. The participant profile included Chief Executive Officers (CEOs), and functional heads of Design, Procurement, Production, Logistics, and Business Development.

Quantitative data analysis was executed using Partial Least Squares Structural Equation Modeling (PLS-SEM).

4. Research results and discussion

Regarding measurement model assessment, all outer loadings in the study met the reliability threshold of ≥ 0.7 (Nguyen Minh Ha & Vu Huu Thanh, 2020). Convergent validity, as reflected by the Average Variance Extracted (AVE) values, ranged from 0.548 to 0.738; with all values exceeding the minimum required level of 0.5 (Fornell & Larcker, 1981). Discriminant validity was confirmed as the square root of AVE for each construct was greater than all corresponding inter-construct correlations, and the HTMT values ranged from 0.164 to 0.803; all below the threshold of 0.85. The Variance Inflation Factor (VIF) values of all relationships in the model were below the recommended threshold (VIF > 5 or < 2), ranging from 1.000 to 2.063 (Hair et al., 2017).

The coefficient of determination (R^2) reached 0.602. The effect size (f^2) indicated clear differences in the magnitudes of influence among the determinants of GSCM, CEC, and firm performance. The predictive relevance (Q^2) results showed that all endogenous variables in the model achieved a moderate level of predictive accuracy. Specifically, GSCM had $Q^2 = 0.329$; CEC has $Q^2 = 0.284$; ECP has $Q^2 = 0.342$; ENP has $Q^2 = 0.333$; and OPE has $Q^2 = 0.278$. The positive Q^2 values, ranging from 0.278 to 0.342; indicated that the model exhibited moderate predictive capability for the dependent variables.

Direct effects SEM analysis

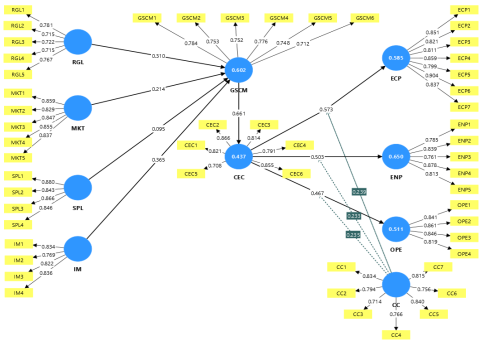
The study employed the bootstrapping technique in Smart-PLS with 5,000 resamples. The hypothesis testing results indicated that the majority of hypotheses were supported, with t-values exceeding 1.96 and p-values falling below 0.05; thereby confirming the statistical significance of the hypothesized relationships within the research model.

Indirect effects SEM analysis

The results revealed that regulatory pressure (RGL), market pressure (MKT), and internal motivation (IM) exerted significant indirect effects on CEC, as well as on the outcome variables including economic performance (ECP), environmental performance (ENP), and operational performance (OPE).

The findings, as illustrated in Figure 3, suggest that institutional pressures remain a key driving force compelling firms to implement GSCM. Both regulatory pressure and market pressure exhibited positive and statistically significant effects, confirming the coordinating roles of government intervention, industry norms and societal expectations in fostering GSCM. In contrast, the effect of supplier pressure lacked statistical significance, potentially reflecting the prevalence of short-term transactional relationships and a limited degree of environmental integration within the supply chain.

Figure 3. Results of the PLS-SEM structural model



Source: Results generated from Smart-PLS

Internal motivation demonstrated the most profound influence, highlighting the pivotal roles of top management commitment, environmental objectives, and innovation capability as fundamental drivers of GSCM from the resource-based view perspective. GSCM exerted a very strong impact on CEC, confirming its central role in the transition from the linear model to the circular model. Subsequently, CEC positively affected economic, environmental, and operational performance, indicating that the circular economy is not merely a normative concept but one that yields tangible operational value. Concurrently, collaborative capability played a significant moderating role, amplifying the impact of CEC on firm performance.

In summary, the findings provide robust empirical evidence validating the sustainable development strategy of FDI electronics enterprises in Vietnam.

5. Policy implications

Policy implications for Vietnam

First, it is imperative to fortify the legal framework governing the circular economy and GSCM. Although Vietnam has promulgated Decision No. 687/QD-TTg (2022), the current legal system still lacks technical guidelines, evaluation criteria, and specific monitoring mechanisms. Therefore, a robust and coherent regulatory framework should be developed to bridge central and local levels, while supplementing regulations related to circular reporting, standardized compliance verification, and compliance inspection mechanism.

Second, it is essential to leverage market forces through industry standardization. Market pressure has been proven to exert a significant influence on GSCM, particularly within global electronics supply chains. Vietnam should promulgate sector-specific green standards (e.g., ISO 14001, RoHS, REACH), establish a phased roadmap for ESG reporting, develop green capability index systems, and strengthen the role of industry associations in harmonizing environmental requirements. This will enable FDI enterprises to enhance adaptive capacity and increase the likelihood of integration into the supply chains of Samsung, Apple, Intel, and other global lead firms.

Third, it is necessary to stimulate firms' internal motivation through economic incentive mechanisms. Internal motivation has been empirically shown to exert a stronger effect than external pressure on the implementation of GSCM. Accordingly, policies should link incentives to environmental performance outcomes through green credit instruments, conditional reductions in environmental taxes and fees, prioritized customs clearance, expedited VAT refunds, and infrastructure fee reductions for enterprises meeting green standards. All these measures should be integrated within the MRV (Monitoring-Reporting-Verification) system and coupled with claw-back mechanisms to ensure substantive effectiveness.

Fourth, the establishment of a "green supplier program" is required. A standardized training, consulting, assessment program will enable both FDI firms and satellite suppliers to strengthen their capacity to meet international requirements, linked with an industry-specific "green capability scorecard".

Fifth, it is recommended to pilot circular industrial clusters in the electronics sector. This model would include shared testing and certification infrastructure, solvent regeneration stations, circular packaging systems, and a centralized MRV data platform. A performance-based incentive mechanism (environmental KPIs) and an infrastructure co-investment fund would help mitigate compliance costs and shorten certification lead times for firms operating within the cluster.

Sixth, strengthening supply chain collaborative capability is paramount. As collaborative capability has been shown to play a strong moderating role, policy should promote inter-organizational cooperation through thematic policy dialogues, on-site technical consultancy (LCA, MFCA, RoHS), and shared standardized data sets to synchronize supplier evaluation procedures.

Managerial implications at the firm level

FDI electronics enterprises should internalize GSCM as a core operational strategy rather than perceiving it merely as a regulatory tick-box exercise. In green procurement, firms should establish a comprehensive governance mechanism consisting of minimum criteria, a weighted scoring system, and a performance-based bonus-malus scheme. At the design stage, firms should prioritize eco-design, focusing on material rationalization, optimizing recyclability, and standardizing components.

In operations, firms should implement value-hierarchy-based material and waste management processes and strictly apply the waste management hierarchy. In addition, internal compliance systems such as ISO 14001 should be upgraded, with responsibility matrices established and quarterly internal audits maintained. Finally, firms should strengthen top management commitment, empower middle management, and foster a culture of "green operational transformation" through factory-level continuous improvement initiatives.

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FACTORS INFLUENCING BRAND IDENTITY OF SMALL AND MEDIUM-SIZED ELECTRICAL EQUIPMENT MANUFACTURING ENTERPRISES IN VIETNAM: EMPIRICAL EVIDENCE FROM A CLUSTERED SEM MODEL

MSc. Le Minh Thanh* - PhD. Duong Thanh Ha**

Abstract: ***This study aims to identify factors affecting the Brand Identity Strength (BIS) of small and medium-sized electrical equipment manufacturing enterprises (SMEs) in Vietnam. The research model consists of four factors: quality & compliance (QC), brand orientation (BO), innovation & new product (IN), and visual & communication (VC). The primary data was collected from 200 respondents from 40 enterprises and analyzed using SEM model combined with cluster SEM technique to control intra-group error. The results show that all factors have a positive and statistically significant impact on BIS, in which BO (β = 0.338) and VC (β = 0.300) show a stronger impact than QC (β = 0.266) and IN (β = 0.219). The model explains 53.5% of the variation in BIS (R^2 = 0.535), confirming its appropriate explanatory value. The research results emphasize the role of brand orientation, identity communication, quality assurance and innovation in strengthening the brand identity of manufacturing SMEs in emerging markets.***

• Keywords: *brand identity; cluster SEM; brand orientation; innovation; quality.*

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1. Introduction

In the current context of globalization and fierce competition, brand identity plays a central role in helping businesses improve their competitiveness, create customer loyalty and recall. For small and medium-sized electrical equipment manufacturing enterprises (SMEs), building brand identity strength (BIS) becomes even more urgent when the market has the strong participation of large corporations and imported goods, requiring SMEs to affirm their own value and sustainable competitiveness (Acar et al., 2024).

In Vietnam, many electrical equipment manufacturing enterprises are still limited in financial resources, brand management skills and access to modern communication technology. Despite many efforts to innovate, many businesses still face difficulties in forming a clear, consistent brand strategy and creating a brand impression in the market (Thi, 2022). This raises an urgent need for research on core factors affecting BIS in the context of Vietnamese SMEs.

Recent studies have shown that brand orientation plays a particularly important role for SMEs in exploiting brand assets, promoting innovation, and creating competitive advantages through consistent brand positioning and management (Mijan, 2020). In parallel, innovation and new product development are considered strategic drivers to help small businesses adapt quickly to the market and strengthen brand image (Tran & Vu, 2024). In addition to these two factors, aspects of quality and compliance, as well as visual and brand communication play a key role in increasing customer recognition and trust in electrical equipment manufacturing enterprises.

However, studies applying advanced quantitative models such as Structural Equation Modeling (SEM), especially in clustered SEM design, for SMEs in the electrical equipment manufacturing sector in Vietnam are still limited. The research gap is reflected in the lack of studies integrating the factors of quality & compliance, brand orientation, innovation & new product, and visual & communication in explaining the strength of brand identity in this sector.

Therefore, this study was conducted with the goal of testing the cluster SEM model on a sample of 200 respondents from 40 SME enterprises in the electrical equipment industry in Vietnam (5 respondents per enterprise). The research results are expected to contribute to filling the existing academic gap and provide some practical management

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recommendations to support Vietnamese small and medium-sized electrical equipment manufacturing enterprises in strengthening their brand identity, gradually improving their competitiveness in the domestic and international markets.

2. Literature Review

2.1. Brand Identity Strength (BIS)

Brand identity strength (BIS) refers to the degree of clarity, distinctiveness, and consistency in how a business expresses its values, philosophy, and brand image. BIS directly affects customer trust, market recognition, and loyalty (Mahdiraji et al., 2024). In the context of fierce competition and globalization of electrical equipment manufacturing, BIS plays a particularly important role in building sustainable competitive advantage.

Recent studies show that BIS is reinforced by consistency in brand communication, strategic positioning, and overall customer experience (Juntunen, 2025). For manufacturing SMEs, clarity and consistency in brand messaging helps businesses increase credibility, attract partners, and reduce the risk of competition from cheap goods.

2.2. Quality & Compliance (QC)

QC represents the ability of a business to maintain production standards, ensure technical reliability and comply with safety regulations. In the electrical equipment industry - where technical requirements are strict - QC is considered the foundation for building brand trust (Li & Ye, 2023).

According to Fu et al. (2021), stable product quality and standard compliance help SMEs enhance their reputation and increase brand strength by reinforcing trust and positive expectations from customers. Thus, QC plays an important role in developing BIS of manufacturing SMEs in emerging economies.

2.3. Brand Orientation (BO)

Brand orientation (BO) reflects the extent to which a business orients all activities according to its brand strategy. BO helps businesses focus on long-term brand value, instead of competing purely on price or production capacity (Li et al., 2023).

Flührer (2025) argues that SMEs with high BO tend to invest in brand identity, brand culture and communication management, thereby creating a solid foundation for BIS. BO is especially necessary in the context of Vietnamese SMEs transforming their model from "processing production" to "brand building".

2.4. Innovation & New Product (IN)

Innovation and new product development (IN) are the driving force for differentiation, value enhancement and brand competitive advantage. Fu et al. (2021) point out that innovation capabilities play a central role in promoting SME performance and image.

In the electrical equipment industry, product innovation, technology optimization and feature improvement help businesses improve quality, meet market demand and increase brand trust. This contributes to strengthening the BIS through adaptability and creating new value for customers.

2.5. Visual & Communication (VC)

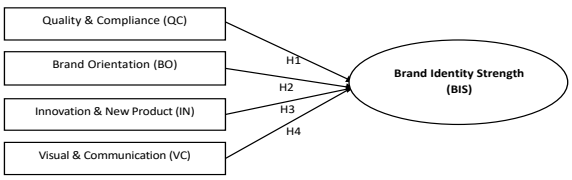
Visual & Communication (VC) includes brand identity, product design, logo, messaging and integrated communication strategy. VC plays a role in creating emotional connections and identification with customers, especially in the less emotional technical market (Flührer, 2025).

Recent research shows that a strong, consistent identity system and effective communication help SMEs increase brand recall, increase awareness and strengthen the BIS (Juntunen, 2025).

2.6. Proposed Model and Hypotheses Development

Based on the theoretical foundation and empirical evidence, the study proposes a model linking the four main components of brand capabilities (QC, BO, IN and VC) with brand identity strength (BIS). The model reflects the assumption that product quality, brand orientation, innovation and visual communication play a core role in strengthening BIS in the context of electrical equipment manufacturing SMEs. Figure 1 illustrates the proposed research model.

Figure 1. Proposed Research Model



Based on the proposed research model, the research hypotheses are stated as follows:

H1: QC positively influences BIS.

H2: BO positively influences BIS.

H3: IN positively influences BIS.

H4: VC positively influences BIS.

These hypotheses will be empirically tested using clustered SEM based on data collected from 200 respondents across 40 electrical equipment manufacturing SMEs in Vietnam.

3. Research Methodology

The study employed a quantitative research design to examine the relationship between four brand competence factors and brand identity strength (BIS) among small and medium-sized electrical equipment manufacturing enterprises in Vietnam. Data were collected through a structured questionnaire adapted from previous studies, using a 5-point Likert scale (1 = completely disagree, 5 = completely agree).

A total of 200 respondents from 40 enterprises (five per enterprise) participated, including managers and staff knowledgeable about branding, marketing, and production. Data were gathered via direct and online surveys using convenience sampling while ensuring anonymity and voluntariness.

The constructs included Quality & Compliance, Brand Orientation, Innovation & New Product, Visual & Communication, and Brand Identity Strength, with measurement items adapted from Li & Ye (2023), Fu et al. (2021), Flührer (2025), Mahdiraji et al. (2024), and Juntunen (2025).

Data analysis was conducted using SPSS 24 for descriptive statistics and reliability testing (Cronbach's Alpha), and AMOS 24 for Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). To account for clustered data (five respondents per enterprise), the study applied a clustered SEM model, which adjusts for intra-group correlations and enhances the accuracy and reliability of statistical inferences.

4. Results

4.1. Descriptive statistics of enterprises

Table 1: Enterprises' Profile (n = 40)

Variable	Frequency	Percent (%)
Type of firm		
Sole proprietorship	5	12.5
Limited liability company	16	40.0
Joint stock company	19	47.5
Length of operation		
Less than 5 years	6	15.0
From 5 years to 10 years	12	30.0
More than 10 years	22	55.0
Number of employees		
Fewer than 50 people	9	22.5
From 50 to 200 people	23	57.5
More than 200 people	8	20.0
Main product		
Household electrical equipment	21	52.5
Industrial electrical equipment	12	30.0
Basic household appliances	7	17.5
Major distribution channel		
Traditional trade	13	32.5
E-commerce	16	40.0
Direct-to-Consumer	8	20.0
Export	3	7.5

Source: Compiled by the author

Table 1 presents the characteristics of 40 electrical equipment manufacturing enterprises participating in the survey. The results show that the joint stock company and limited liability company models account for the largest proportion in the sample, 47.5% and 40.0% respectively, reflecting the development trend towards a modern legal model and a relatively systematic management scale of enterprises in the industry. Private enterprises account for the lowest proportion (12.5%), consistent with the reality that the electrical equipment manufacturing sector requires relatively high investment capital and technology.

In terms of operating time, more than half of the enterprises (55.0%) have been operating for over 10 years, showing stability and long-term experience in the industry. The group of new enterprises operating for less than 5 years accounts for only 15.0%, showing relatively high barriers to entry in the industry. In terms of labor scale, enterprises with 50 to 200 employees account for the majority (57.5%), reflecting the medium-sized characteristics of the industry. Micro-enterprises (under 50 employees) account for 22.5%, while large-scale enterprises (over 200 employees) account for 20.0%.

In terms of main product lines, 52.5% of enterprises focus on household electrical appliances, 30.0% on industrial electrical equipment production and 17.5% on basic household appliances production. This shows that the output market orientation is mainly towards end consumers, in addition to the presence of a group of enterprises serving industrial production.

Finally, the distribution channel is mainly e-commerce (40.0%) and traditional channels (32.5%), reflecting the trend of shifting to digital platforms in electrical equipment business activities. Direct sales channels to consumers account for 20.0%, while exports account for the lowest proportion (7.5%), showing that the potential for international market development of businesses in the industry still has a lot of room.

4.2. Descriptive Analysis of Factors

Table 2: Descriptive Statistics and Correlation Matrix

Construct	Mean	SD	IN	VC	BO	QC	BIS
IN	3.475	0.641	1.000				
VC	3.517	0.762	0.230**	1.000			
BO	3.361	0.757	0.084	0.440**	1.000		

Construct	Mean	SD	IN	VC	BO	QC	BIS
QC	3.515	0.770	0.027	0.170*	0.180*	1.000	
BIS	3.525	0.574	0.294**	0.536**	0.529**	0.390**	1.000

** p < 0.05; ** p < 0.01*

Source: Compiled by the author

The results show that the research variables have an average value ranging from 3.36 to 3.53, reflecting a fairly positive assessment of the respondents. The standard deviation is at an average level, indicating relative consistency in responses. The correlation matrix shows that BIS is positively and significantly correlated with VC, BO, QC and IN, in which VC and BO have a stronger correlation. The correlation coefficients are all below 0.8, indicating that there is no significant multicollinearity problem in the model.

4.3. Reliability and Convergent Validity of Constructs

Table 3: Reliability and Convergent Validity

Construct	No of Items	Cronbach's α	CR	AVE
QC	4	0.870	0.874	0.638
BO	4	0.879	0.881	0.650
IN	4	0.814	0.815	0.525
VC	4	0.849	0.851	0.590
BIS	3	0.973	0.974	0.926

Note: α ≥ 0.70 indicates acceptable internal consistency; CR ≥ 0.70 and AVE ≥ 0.50 indicate convergent validity

Source: Compiled by the author

The results of reliability and convergent validity tests showed that all scales met the standards. Specifically, Cronbach's Alpha ranged from 0.814 to 0.973, exceeding the threshold of 0.70, demonstrating good internal consistency. At the same time, the CR coefficients (0.815-0.974) were all greater than 0.70 and the AVE values (0.525-0.926) exceeded the threshold of 0.50, confirming the convergent validity of the measurement constructs. Thus, the scales used in the study ensured the reliability and validity necessary to conduct subsequent SEM analyses.

4.4. Discriminant Validity (Fornell-Larcker Criterion)

To assess the discriminant validity between the concepts in the model, the study applied the Fornell-Larcker criterion, according to which the square root of the AVE of each variable must be greater than the correlation coefficient between that variable and the remaining variables. This helps to ensure that each measurement construct is clearly differentiated from other constructs in the research model.

Table 4: Discriminant Validity

	BIS	BO	IN	QC	VC
BIS	0.962	0.560	0.309	0.400	0.577
BO	0.560	0.806	0.082	0.203	0.502
IN	0.309	0.082	0.725	0.012	0.220
QC	0.400	0.203	0.012	0.799	0.225
VC	0.577	0.502	0.220	0.225	0.768

Note: Diagonal values represent the square roots of AVE, all of which are greater than the corresponding inter-construct correlations, satisfying the Fornell-Larcker criterion.

Source: Compiled by the author

The results in Table 4 show that the square root of AVE (diagonal value) of all variables is larger than the correlation coefficient between that variable and other variables in the matrix. Specifically, BIS reached 0.962, higher than the remaining correlation values (maximum 0.577), while BO, IN, QC and VC also showed a clear level of discrimination compared to other variables. This confirms that the scales in the study achieved discriminant validity according to the Fornell-Larcker criterion. Thus, the research variables represent separate concepts and can be used to test the SEM structural model in the next step.

4.5. Goodness-of-Fit Indices for Confirmatory Factor Analysis

To assess the adequacy of the measurement model, the study used common indices in CFA analysis, including χ^2/df, CFI, TLI, RMSEA, and SRMR. The assessment thresholds were referenced according to the recommendations of Byrne (2016) and Hair et al. (2019), to ensure the reliability and scientific value of the model.

Table 5: Model Fit Indices for Confirmatory Factor Analysis

Fit Index	Value	Threshold	Assessment
χ^2(df)	147.704 (142)	p > 0.05	Good Fit
p-value	0.354	≥ 0.05	Good
CFI	0.998	≥ 0.90	Excellent
TLI	0.997	≥ 0.90	Excellent
RMSEA	0.014	≤ 0.08	Excellent
SRMR	0.038	≤ 0.08	Excellent

Note: CFA model meets all recommended thresholds, indicating excellent model fit.

Source: Compiled by the author

The results in Table 5 show that all indices meet or exceed the recommended level, confirming that the measurement model has a very high level of fit. Specifically, p-value = 0.354 (> 0.05) and χ^2/df = 1.04 both reflect that the model fits the data well. At the same time, CFI = 0.998 and TLI = 0.997 far exceed the threshold of 0.90, indicating an excellent level of fit. The RMSEA = 0.014 and SRMR = 0.038 values are lower than 0.08, further strengthening the model's suitability. Thus, the measurement model has the reliability and appropriate value to conduct SEM structural model testing.

4.6. Structural Model and Hypotheses Testing

To test the research hypotheses, the SEM linear structural model was estimated with both the

traditional planar model and the cluster SEM model to control for intragroup bias. Table 6 presents the standardized path coefficients, standard errors, and corresponding p-values. The analysis results show that there is no significant difference between the two estimation methods, confirming the stability and reliability of the research model.

Table 6: Structural Model Results (Flat vs. Clustered SEM)

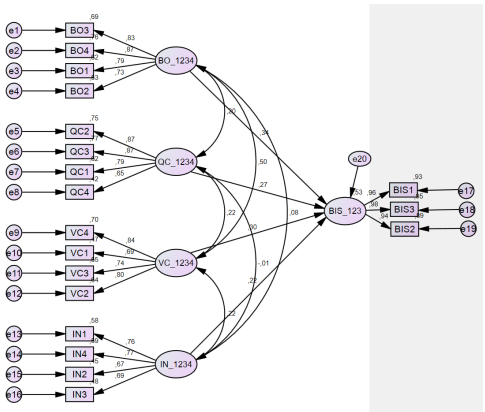
Hypothesis	Path	β (Flat)	β (Clustered)	S.E.	p-value	Supported
H1	QC → BIS	0.266	0.266	0.038	0.000	Yes
H2	BO → BIS	0.330	0.338	0.042	0.000	Yes
H3	IN → BIS	0.219	0.219	0.051	0.000	Yes
H4	VC → BIS	0.300	0.300	0.061	0.000	Yes
	R^2 (BIS) = 0.535					

Note: Note: All paths are significant at $p < 0.05$. $R^2 = 0.535$ indicates that 53.5% of the variance in BIS is explained by QC, BO, IN, and VC.

Source: Compiled by the authors

The results show that all four independent variables have a positive and statistically significant impact on brand identity strength (BIS). Specifically, brand orientation (β = 0.338, p < 0.001) and visual & communication (β = 0.300, p < 0.001) have the strongest impact, emphasizing the important role of brand orientation and visual communication in strengthening the brand identity of the enterprise. Quality & compliance (β = 0.266, p < 0.001) and innovation & new product (β = 0.219, p < 0.001) also have a significant impact, indicating the necessity of product quality and innovation in brand development. The R^2 value = 0.535 shows that the model explains 53.5% of the variation in BIS, reflecting the good explanatory power and suitability of the model.

Figure 2. Structural Equation Model with Standardized Path Coefficients



The SEM model results illustrated in Figure 2 show that the standardized path coefficients from the four brand competence components to brand identity strength (BIS) are all positive and statistically significant. Specifically, brand orientation (BO) and visual & communication (VC) show a stronger impact than quality & compliance (QC) and innovation & new product (IN), emphasizing the key role of brand strategic orientation and identity communication in strengthening the brand identity of electrical equipment manufacturing enterprises. In addition, the loading factors of the observed variables are all high (> 0.65), confirming the good representation of the scales for each theoretical concept. Thus, the research model is proven to be practical, stable and has high explanatory value in the context of SMEs in Vietnam.

5. Discussion

The study results confirm that all four brand capability components - quality & compliance, brand orientation, innovation & new product, and visual & communication - positively impact the brand identity strength (BIS) of small and medium-sized electrical equipment manufacturers (SMEs) in Vietnam. This is consistent with the view that strong brand identity requires a combination of core values, consistent positioning, and clear brand experience (Urde & Greyser, 2021). In this study, brand orientation and visual & communication showed the strongest impact, emphasizing the role of strategic brand orientation and identity communication in creating a clear, trustworthy, and distinctive brand image. This finding is consistent with Juntunen's (2025) study that brand orientation provides a strategic foundation for building a sustainable brand identity.

At the same time, the results also show that quality & compliance is significant, reflecting the fact that in the field of electrical equipment manufacturing, product quality, safety and compliance with technical standards are important factors in creating customer trust (De Giovanni, 2023). This shows that businesses need to not only invest in branding activities, but also ensure product quality as a prerequisite for brand identity.

Innovation & new product also has a positive influence, although at the lowest level of the four factors. This is consistent with the argument that innovation plays a supporting role in creating differentiated value, especially in manufacturing industries (Fu et al., 2021), but innovation performance may take time to translate into clearly recognized value in the market. This finding suggests that electrical equipment manufacturing SMEs need to combine innovation and quality consistency, while prioritizing effective brand-oriented and communication strategies to optimize brand identity strength.

In addition, the use of cluster SEM models shows stable and reliable results, reinforcing the evidence that the theoretical model is consistent and consistent with empirical data in the context of Vietnamese SMEs. This result is consistent with recent research trends that emphasize the role of hierarchical models and cluster data in assessing brand performance at the organizational level (Mahdiraji et al., 2024).

Overall, the study contributes to the field of SME brand management in emerging markets by confirming the importance of brand orientation, image communication, quality and innovation for brand identity strength, while providing empirical evidence from the electrical equipment industry - a sector that is under-examined in the context of developing economies.

6. Conclusion and Implications

6.1. Conclusion

This study examines the factors affecting the brand identity strength (BIS) of small and medium-sized electrical equipment manufacturing enterprises in Vietnam. The results from the cluster SEM model show that four factors including quality & compliance (QC), brand orientation (BO), innovation & new product (IN) and visual & communication (VC) all have a positive impact on BIS. Of which, BO and VC show a stronger influence than the other two factors, emphasizing the role of strategic brand orientation and consistent identity communication in building a sustainable brand identity. This result affirms the importance of brand management for manufacturing SMEs - a group of enterprises that focus heavily on technical and product capabilities. At the same time, the use of the cluster SEM model demonstrates the reliability and stability of the research model in the context of data grouped by enterprise.

6.2. Policy Implications

Academic Implications

The study contributes to the literature in three main ways.

First, the results reinforce and extend theoretical models of brand identity in emerging market SMEs, adding evidence that BIS is a multidimensional construct influenced simultaneously by brand strategy, product quality, innovation, and brand communication.

Second, the study highlights the importance of brand orientation and visual & communication - two factors that have not been frequently emphasized in the context of manufacturing SMEs in Vietnam. This finding is consistent with the view of Urde & Greyser (2021) and Mahdiraji et al. (2024) that strategic brand thinking and identity systems play a core role in sustaining long-term brand equity.

Third, the application of cluster SEM is an important methodological contribution, affirming the appropriateness of this method when data has multiple respondents in the same enterprise. This opens a reliable approach for other studies in the field of organizational branding and internal governance.

Managerial Implications

In terms of management practice, the research results suggest some important directions for SMEs in the electrical equipment industry:

- Build and maintain a clear brand orientation: Enterprises need to form a long-term brand vision, promote internal core values and ensure consistency in all marketing activities - from strategy to operation.

- Improve the effectiveness of identity communication: Focus on developing a visual identity, enhancing a professional image, clear messages and using digital platforms to strengthen brand presence.

- Ensure quality and compliance with standards: Apply a quality management system, technical certification and strict production processes to build trust and reputation in the market.

- Encourage innovation and product development: Innovation in design, technology, user experience and investment in R&D helps businesses maintain competitive advantage and adaptability.

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INTERNAL AUDIT EFFECTIVENESS: A STUDY IN VIETNAM

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Abstract: ***The study examines the relationship between factors that affect the effectiveness of internal audits. Data was collected from 169 questionnaires from enterprises in Hanoi. The results show that the professional qualifications of internal auditors, audit quality, career opportunities, and support from management have an impact on the effectiveness of internal audit. The independence of the organization does not affect the effectiveness of the internal audit. From there, the author proposes a number of recommendations to improve the effectiveness of internal audit at enterprises in Hanoi.***

• Keywords: *audit effectiveness, internal audit, internal auditor, accounting.*

JEL codes: M40, M41, F65

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1. Introduction

Internal audit is a tool to help the enterprise's managers to analyze the investment activities, business activities, and to control and evaluate the development strategies of the enterprise. In the current 4.0 industrial period, the internal audit is one necessary action to be able to control the working quality and financial–economic information quality, to make the right decisions for the enterprises to survive and develop. At the same time, the internal audit plays a significant role in the risk supervision of the company and in the identification of the areas where need to enhance risk management.

Reynolds (2000) considered that internal audit plays as an important link of the business procedure and the financial report of the nonprofit groups and suppliers. The study of Goodwin-Stewart & Kent (2006) showed that the internal auditors play an important role in the supervision of the company's risk documents and in the identification of the areas where they need to enhance the risk management. The internal audit has become an indispensable management tool in order to reach to effective control in both public and private organizations Que, Ha, Ha, Ha, & Duong (2024).

In the state's enterprises and in some banks in Vietnam, in the recent time, the Controlling Committee (CC) has been established. However, the activities of this part have not been effective because the role, function, responsibility is not clear and the tool for supervision are still missing.

In the other business types, the internal audit work somehow has been established when the enterprises implement the quality management system or environment (ISO). The enterprises who have ISO certificate must implement the internal evaluation which in fact the internal auditors have to do at least one time every year of checking, evaluating the compliance level of the ISO standard. This evaluation is usually done by a committee or a department – usually named of ISO committee or quality assurance committee – and reported to the enterprises' leaders. However, because the internal evaluation only limit within the ISO standard compliance (mostly regarding aspect of procedure and writing documents), it mostly does not help much for enhancement of the controlling system. In fact, many enterprises who apply ISO have found out this issue and has established an internal evaluation department at the higher level and more actual.

This research has been done to study the factors which decide the efficiency of the internal audit at the enterprises in Hanoi city. The structure of this research includes the Introduction (Item 1); Theoretical Basis (Item 2); research method (item 3); research results (item 4), recommendations (item 5). The research results show that professional qualifications of internal auditors, audit quality, career opportunities and support from management boards have an impact on the effectiveness of the internal audit. And the independence of the organization does not affect the effectiveness of the internal audit.

2. Theoretical basis

Quế et al. (2024) The study examines the relationship between variables such as internal audit quality, internal audit team capacity, internal audit independence, and

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leadership support to audit effectiveness. internal. Data is collected through a survey of 203questionnaires from joint stock companies in Vietnam. Quantitative researchmethods are applied to evaluate the influence of factors on the effectiveness ofinternal audits. The results indicate that the quality of the internal audit, thecapacity of the internal audit team, the independence of the internal audit, andthe support of the management have an influence on the effectiveness of theinternal audit. From there, the author proposes some recommendations toenhance the effectiveness of internal audits in joint stock companies in Vietnam.

The arrangement of suitable staffs for internal audit team and good management of those staffs are the key for internal audit to effectively work. An audit demands the staff who are professional with knowledge level, training experience and professional qualification which are necessary to fully implement the audit as required by the task. The auditors have to obey the requirements to update knowledge and the career standards of the relevant career organizations. Bou-Raad (2000) argued that the auditors must have high professional level in order to be able to be considered as the source of manpower. The diversity of necessary skills is a big challenge for the professional organizations, universities, and management boards

From this, the following hypothesis is proposed:

H1: Professional qualification of internal auditors will affect in the same direction to the internal audit effectiveness

In accordance with Vietnamese Standard on Auditing ref. 220 (VSA220) - Quality control of the audit work: "Quality of the audit work is the level of satisfaction of the objects using the audit results regarding the objectiveness and creditability to the audit comments of the auditors, at the same time satisfies the desire of the audited units regarding the auditors' comments in order to increase the effectiveness of the business work, within the time scale with a suitable cost".

On the other hand, the auditors must implement their role by an objective way and to follow the accepted criteria regarding the career ethic standard, so that the internal audit activities will evaluate and contribute to improve the risk management, control, and administration by using a systematic and standardized approaching way.

Bou-Raad (2000) considered that the quality of audit is not only important to the conformity of the legal requirements, but also is because the auditors task may relate to evaluate the aspects which relate to the high judgement level and the audit report may have direct impact to the audit decisions or process. The manager approves the activities. Therefore, it can be said that the high-quality audit means the conformity of the official standards, as well as the high effective level during the internal audit process will enhance effectiveness of the audit. From this, the following hypothesis is proposed:

H2: Quality of audit work affects in the same direction to the audit effectiveness

Van Peursem (2004) defined the ability of making big mistake in the relation between internal auditors and management board: internal auditors are expected to support the managers to implement the work, at the same time to independently evaluate the effectiveness of the management board. The internal auditors are appointed the task to maintain the highest interest for the business owner, but they can be against the management board, regardless of the consequences.

Bou-Raad (2000) argues that the strength of the internal audit team has to be evaluated based on the independence level which such team got from the management and operational responsibility. The American Institute of Certified Public Accountants (AICPA) also defined that the independence of the organization is very important to the survival ability of the internal audit function. The auditors must be sufficiently independent of the people for whom they are requested to do the audit for them to be able to do their work without interference, and – not less important – be seen to do such.

Together with objectivity, the independence of the organization contributes to the accuracy in the auditors' work and helps employers to trust that they can believe the results and reports.

Que & Duong (2023) The study examines the relationship between variables such as quality of internal audit work, independence, and professional qualifications of internal auditors with internal auditor performance at the enterprises in Hanoi city. The data was collected through a survey with 169 questionnaires from enterprises in Hanoi city. Quantitative research methods are applied to evaluate the influence of factors on the effectiveness of the internal audit. The results show that the professional qualifications of internal auditors, audit quality, have an impact on the effectiveness of the internal audit. The independence of the organization does not affect the effectiveness of the internal audit. From that, the author proposes some recommendations to enhance the effectiveness of internal audits at enterprises in Hanoi City.

They argued that the independence of the organization is more important to the efficiency of the internal auditors, because it protects the auditors against pressure or threats, at the same time to increase objectiveness of the audit work. Chevers, Lawrence, Laidlaw, & Nicholson (2016) defined four objective

and independent audit factors: approaching information or people, objectiveness, freedom, and meeting ability of the system.

Van Peursem (2004), based on the interviews with the Australian internal auditors, they concluded that the independence of the management board is a remarkable characteristic of the successful audit programs. The auditors can establish their own program, which seems strongest regarding this aspect because they select what to audit and when to be done, including the evaluations from high-level managers as well as their own evaluations. Similarly, Clark, Gibbs, & Schroeder (1981) found that the independence of the internal audit team and the authorized level reported by internal auditors are the two most important criteria that affect the objectiveness in their work. From this, the following hypothesis is proposed:

H3: The Organization's independence will affect the audit effectiveness

Therefore, they can argue that the independence of the organization will increase the efficiency of the internal auditors. This independence both reduces the conflict between loyalty to the employer and loyalty to the specific manager, and gives the auditor a supportive working environment in which to be able to do their task in an objective way and without pressure.

Goodwin & Yeo (2001) argued that, nationwide, the arrangement of staff for the internal audit team with the professional auditors is becoming less popular; many organizations use this function as a training place for the management staff in the future. This facility has been designed to help train comprehensive high-level managers. The internal auditors implement many different activities at various parts of the organization. Hence, they have the opportunity to understand the working way of these parts and the way they are managed.

Besides, the managers have experience in internal audit, so they understand the importance of internal control more clearly. The ability to use the internal audit role, which is the supporting step for the management positions, is considered one of the advantages of having an internal audit function instead of hiring an audit firm.

The audit job is becoming less popular than the people who follow collectivism, the people who are interested in management jobs. It may be said that in these conditions, internal auditors working in an environment where there are more career opportunities in the organization will give more effort to their work to increase the opportunity of promotion. The people who have fewer opportunities for promotion in the organization will give less effort to their work, so the efficiency will be lower. This may be right even when the individuals working in such environments are the people who follow internationalism, the people who do not much value the organization's career, because, according to the current trend, they have fewer opportunities than before to develop their careers in the role of internal audit experts.

From this, the following hypothesis is proposed:

H4: Career opportunities for the internal auditors in the organization effect in the same direction as audit effectiveness

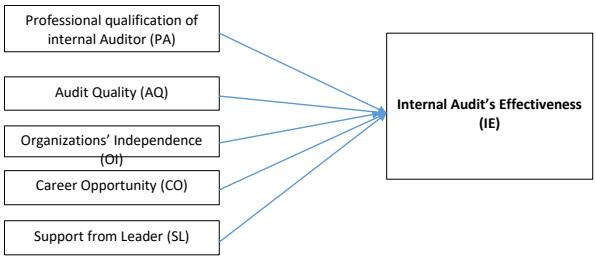
The documents about management show much evidence about the main role of support from the highest management board in the success of almost all programs and procedures of an organization. Fernandez & Rainey (2006) argued, based on careful checking of the documents, that the support and commitment to change from the highest management board play an important role in the renewal of the organization, because the high-level managers can mobilize the necessary and important quantity for implementation, according to the effort made by one or two people

Schwartz, Dunfee, & Kline (2005) have proved that the support for internal audit from the highest management board is an important factor that decides its effectiveness. Certainly, donation is one important scale of that support: the parts of internal audit need to have sources which employ the correct number of high-quality staff, update the training and development information, collect, and maintain the material sources such as computers. A survey was done for Australian internal auditors. They consider themselves as an important part of the management team and believe that they may affect the decisions; maintain enough objectiveness, integrity, and ability for their work; and provide good support to their staff. More importantly, they consider the support from the above-level managers as the main factor to ensure effectiveness for their role. From this, the following hypothesis is proposed:

H5: More support from the highest management board will relate to higher audit effectiveness

From that, the group of authors proposes the research model (Diagram 1) as below:

Diagram 1: The factors affecting to effectiveness of internal audit



In which: The variants are measured by a Likert scale from 1-5 (very disagree - very agree).

3. Researching method

3.1. Data collecting

From the affected factors which have been discovered in the general research, the quantitative questionnaire has been conducted for the survey objects which have been defined by: (i) Direct, (ii) Sending letter, (iii) Sending email, (iv) Via Google Docs, (v) Others. The survey results collected 189 sheets out of the total of 212 issued sheets. After filtering the invalid sheets because of many blank boxes or not enough information, the author selected 169 valid sheets, and the rate was 79.27%.

3.2. Data processing

The author uses software SPSS 22; the criteria to analyze include: Mean value (Mean), Median value (Median), Max value (Max), Min value (Min) of the researched variants and measurements. Measuring the variability of the data by using the standard deviation. The statistical descriptive analysis aims to collect information about the nature of the researched data according to the specific variants, central trend of the researched data.

Based on the EFA results, research method proposal, the factors are extracted into a key factor group and are coded according to the independent or dependent variants. To estimate the correlation level of the factors to the information technology appliance to internal audit, the author group uses the multiple regression analysis model to calculate the parameters used in the model.

4. Research results and discussion.

4.1. Description statistics

According to Table 1, the survey's objects are mostly males with a rate of 50.89%; meanwhile, the rate of females is 49.11%. The opinion of the survey objects mostly concentrates on the group having an audit profession, with the number of eighty-six people, which is the highest rate of 50.89%, the group having the accounting profession is in the second place with a rate of 32.54% and the last place is the group having the finance profession rate of 16.57%.

Table 1: Classification regarding gender and profession of the survey's objects

No.	Gender	Profession			Total	Survey's objects	Position	Number	Rate
		Audit	Accountant	Finance	Number				
1	Male	54	19	13	86	With CPA or ACCA, IACEW, others	Internal Auditor	65	38.46%
2	Female	32	36	15	83		Director/ Dept. Leader	30	17.75%
	Total	**86**	**55**	**28**	**169**	No certificate	Internal Auditor	74	43.79%
	Rate	**50.89%**	**32.54%**	**16.57%**	**100.00%**	**Total**		**169**	**100%**

Source: From the survey data

Besides, in the survey's objects, the internal auditors who have no accounting certificates take the highest rate of 43.79%, the internal auditors who have accounting certificates take the rate of 38.46%, and the Director/ Dept. The leader takes the rate of 17.75%.

4.2. Scale verification

Verification on the impact scale of information technology on the internal audit has been done by the credit coefficient Cronbach's Alpha and the analysis EFA. Table 2 shows that most of the factors have a coefficient Cronbach's Alpha bigger than 0.7; Corrected Item - Total Correlation of the scales are bigger than 0.3 after eliminating the observed variants, including AQ6, OI2, OI4, OI11, IE2, and IE6.

Table 2: Result of Coefficient Cronbach's Alpha of the scales

	Observed variants		Cronbach's Alpha	Min Corrected Item - Total Correlation
	Before	After		
Professional qualification of Internal Audit (PA)	3	3	.811	.783
Audit Quality (AQ)	6	5	.820	.852
Organization's Independence (OI)	11	8	.825	.836
Career Opportunity (CO)	3	3	.829	.826
Support from Leaders (SL)	4	4	.742	.731
Internal Audit Effectiveness (IE)	6	4	.765	.758

Source: Analyzed results from SPSS 22.0

4.3. Exploratory Factor Analysis and correlation between variants

4.3.1. Verification KMO and Bartlett

Factor analysis results (Table 3) show that index KMO is 0.743 and >0,5, which means the data for factor analysis is suitable.

Bartlett's verification result is 21263.69 with the meaning level (p-value) sig =0.000 <0.05, (declining hypothesis Ho: the observed variants have no mutual correlation in the total). So, the hypothesis about the correlation matrix between the variants is the declined unifying matrix, which means the variants are correlated and meet the factor analysis condition.

Table 3: Coefficient KMO and Bartlett

Criteria	Model
KMO	0.743
Bartlett's	21,263.69
Verification Bartlett having value sig	0.000
Total Variance Explained	59.326
Min. Eigen values	2.325

Source: Analysis results from SPSS 22.0

The results show that for the remaining observed variants after declining the scales that do not meet the credibility, the total variance explained is 59.326 % which meets the requirement >50%; so, it can be said that these factors explain 59.326% of the data's variance. Value of coefficient: Eigenvalues of the factor are high (>1), the factors having Eigenvalues (min.) of 2.325 are >1.

Hence, the EFA analysis is suitable for the data, and

the observed variants are mutually correlated in total, so they are used for the next analysis.

EFA analysis has been done by Component Analysis and Varimax methods; the analysis results have twenty-three observed variants of the scales for independent variants in Table 4.

Table 4: Factor Analysis EFA of the independent variants

Rotated Component Matrix						
	Component					
	1	2	3	4	5	6
PA1	.801					
PA2	.812					
PA3	.732					
AQ1		.792				
AQ2		.785				
AQ3		.932				
AQ4		.824				
AQ5		.721				
OI1			.826			
OI3			.835			
OI5			.756			
OI6			.795			
OI7			.839			
OI8			.820			
OI9			.863			
OI10			.882			
CO1				.873		
CO2				.796		
CO3				.737		
SL1					.862	
SL2					.895	
SL3					.836	
SL4					.821	
IE1						.823
IE3						.869
IE4						.831
IE5						.821
Extraction method: Principal Component Analysis						
Rotation method: Varimax with Kaiser Normalization						
a. Rotation converged in six iterations						

Source: Analysis results from SPSS 22.0

4.3.2. Correlative analysis between variants in the model

Table 5: Correlative matrix between the components

Variants		Internal Audit Effectiveness (IE)	Professional qualification of internal auditors (PA)	Audit Quality (AQ)	Organization's Independence (OI)	Career Opportunity (CO)	Support from Leaders (SL)
Internal Audit Effectiveness (IE)	Pearson Correlation	1	.321**	,415**	.406**	.224	.267
	Sig. (2-tailed)		0.000	0.000	0.000	0,.000	0.000
	N	169	169	169	169	169	169
Professional qualification of internal auditors (PA)	Pearson Correlation	.321**	1	0.000	0.000	0.000	0.000
	Sig. (2-tailed)	0,000		1.000	1.000	1.,000	1.000
	N	169	169	169	169	169	169
Audit Quality (AQ)	Pearson orrelation	.415**	0.000	1	0.000	0.000	0.000
	Sig. (2-tailed)	0.000	1.000		1,000	1.000	1.000
	N	169	169	169	169	169	169
Organization's Independence (OI)	Pearson orrelation	.406**	0,000	0.000	1	0.000	0.000
	Sig. (2-tailed)	0,000	1.000	1.000		1.000	1.000
	N	169	169	169	169	169	169
Career Opportunity (CO)	Pearson orrelation	.224	0.000	0.000	0.000	1	0.000
	Sig. (2-tailed)	0.000	1.000	1,000	1.000		1.000
	N	169	169	169	169	169	169
Support from Leaders (SL)	Pearson orrelation	.267	0.000	0.000	0.000	0.000	1
	Sig. (2-tailed)	0,000	1,000	1,000	1,000	1.000	
	N	169	169	169	169	169	169

Source: From the survey data

Table 5 gives the result of correlative coefficience between the variants, the purpose of checking the close correlation between the independent variants and dependent variants is to eliminate the factors which can lead to the multicollinearity before running regression model. The results show that 05 independent factors have coefficience sig < 5% so these 05 factors are correlative with the dependent variants. The correlative coefficince of the 05 factors is: PA: 0,321; AQ: 0.415; OI: 0.40, CO: 0.224, SL: 0.267. For the correlative coefficience between these 05 independent variants in the model, there is not any couple is bigger than 0.8 so when use regression model, the multicollinearity will be less. This shows that the dependent variants have the linear correlation with five factors, these variants have standard distribution.

4.4. Multivariant linear regression analysis

To define, measure and evaluate impact level of the factors to internal audit, the group of authors uses the multiple linear regression method between 05 impact factors taken from the above exploration factor analysis and correlative analysis.

Table 6: Multivariant regression results

	Unstandardized Coefficience		Standardized Coefficience	T	Sig	Multicollinearity	
	B	Standard deviation	Beta	Value t		Acceptance	VIF
Constant	3.354	0.073		47,82	0.000		
Professional qualification of internal auditors (PA)	0.221	0.026	0.354	4,556	0.000	0.728	1.161
Audit Quality (AQ)	0.364	0.032	0.19	4,342	0.000	0.823	1.435
Organization's Independence (OI)	0.264	0.013	0.238	3,654	0.542	0.653	1.345
Career Opportunity (CO)	0.227	0.024	0.231	3,646	0.000	0.524	1.332
Support from Leaders (SL)	0.214	0.028	0.357	1,352	0.006	0.662	1.232
R^2							0.537
Revised R^2							0.484
Sig. F Change							0
Durbin-Watson							2.122

According to regression results in Table 6, these results give value R^2 = 0,484; value R^2 says that the independent variants in the model may explain 48% of the changes of the dependent variants. At the same time, the analysis results show that the variance inflation factor (VIF) is small, smaller than two, is means that these independent variants do not have close relation, so the Multicollinearity does not happen. The verification on independence of the surplus part, means the statistic Durbin –Watson of regression function having value 2.122 < 3, shows that there is no class 1 serial autocorrelation phenomenon, or in other words, the estimated surplus of the independent model does not have the linear relation with each other. Value t which is equivalent to Sig. of the independent variants are smaller than 0.05 so having statistic meaning. Table 6 shows four factors which affect to the internal audit effectiveness. The regression equation for the variants having standardized coefficience is in the below form:

IE = 3.354+0.221*PA+0.364*AQ+0.227*CO+0.214*SL

Hypothesis H1, H2, H4, H5 have been accepted, H3 have been eliminated. It means that the professional qualification of internal auditors, audit quality, career opportunity, support from leaders have impact to the internal audit effectiveness. And the organization's independence does not have any impact to the internal audit effectiveness.

This is the same with that in the studies of Que et al. (2024); Bou-Raad (2000); Van Peursem (2004); Que & Duong (2023); Chevers et al. (2016); Goodwin & Yeo (2001); Goodwin & Yeo (2001)...

In contrast, Organization's Independence does not affect internal audit effectiveness. This is contrary to the studies: Que & Duong (2023); Goodwin & Yeo (2001); Goodwin & Yeo (2001).

5. Conclusions and recommendations

Based on the research results, professional qualification of internal auditors, audit quality, career opportunity and support from leaders have impact to the internal audit effectiveness. This proves that the internal audit has been cared and demands for it are increasingly increasing for the development of the companies.

Audit quality has the highest impact to internal audit effectiveness (β=0.364). Next, career opportunity also affects to internal audit effectiveness (β=0.227). It means that the audit quality (AQ) and career opportunity (CO) have impacts to internal audit effectiveness, in details, it can be seen through the survey that: when the audit quality is improved, it can satisfy the objects who use audit results regarding the objectiveness and creditability, at the same time satisfy the desire of the unit regarding comments from the auditors in order to increase the business effectiveness within a foreseen time. On the other hand, demand for internal auditors of the enterprises is higher and higher, the career opportunity for internal auditors is also increased, the internal auditors can choose the suitable enterprises to contribute their ability.

Another independent variant, professional qualification of internal auditors (PA), support from leaders (SL) also have positive impact to audit effectiveness. This result shows that the suitable professional qualification of internal auditors, much support for work from the company's leaders help to improve control effectiveness of the enterprises, to increase the audit quality.

Based on the research results, some recommendations are made as below:

Audit quality: audit quality control is being recognized as one management function of the audit work, as the legal responsibility, career and professional responsibility of each enterprise. Hence, the establishment and maintenance of one internal audit quality control system is one of the indispensable tasks of each enterprise.

Professional qualification of internal auditors: Enterprise need to invest to the establishment of internal auditor staffs. The enterprise needs to make plan for recruitment, training the internal auditors who are not only good at professional sector regarding the enterprise's activities but also good at audit work, then from that can help enterprise in evaluating, consulting, and ensuring for working of the enterprise. Besides, each auditor, by themselves, must update knowledge according to the current regulations, to attend the professional training courses. The learning together with practicing of each internal auditor must be done everyday in the work of the enterprise.

Career opportunity: at present, the enterprises have to aware the role and importance of the internal audit work. This is really an important and effective tool of the managers and cannot be missed in management work. In Vietnam, the decree drafts on internal audit have recommendations on the types of enterprises which need to have internal audit team. However, the enterprises need to establish for them the internal audit team but no need that they are the ones which is compulsory to have. From that, to make career opportunity for internal auditors for them to develop and contribute to the enterprise.

Support from leaders: the enterprises should always organize the discussions between the business administrators and internal audit team to evaluate the audit work, to report audit results, to make specific plan for the enterprise, to give comments to improve the work quality and activity of the unit, to improve and standardize the audit procedures and methods.

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FACTORS AFFECTING EXECUTIVE MANAGEMENT CAPACITY OF VIETNAMESE COMMERCIAL BANKS: RESEARCH ON THE CURRENT SITUATION AT SAIGON-HANOI JOINT STOCK COMMERCIAL BANK

PhD. Truong Thi Duc Giang*

Abstract: ***The study refers to subjective factors (on the satisfaction of bank employees with their jobs, superiors, as well as the bank's welfare policies to build survey forms). This is an important factor affecting the bank's management and administration capacity because only when bank employees feel satisfied with their jobs can they perform better. The study shows that there are 5 accepted hypotheses: H1, H2, H3, H5, H6 corresponding to the variables: Leaders and superiors; Training and promotion opportunities; Salary, bonus, welfare; Nature of work; Working conditions; only hypothesis H4 is rejected, the factor Colleagues does not affect employee satisfaction at work at SHB.***

• Keywords: *influencing factors, executive management capacity, commercial bank, Saigon-Hanoi joint stock commercial bank.*

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1. Introduction

A developing bank must always have strong governance from the bank's board of directors. The issue of banking governance is currently being regulated by the Law on Credit Institutions 2010, effective from January 1, 2011, and the Enterprise Law 2020. The practice of banking governance in Vietnam in recent times has revealed many limitations, such as: legal corridor and framework for governance activities, organizational and management models of banks in the system. This leads to the fact that the management and operational capacity at many commercial banks is still lacking. Saigon - Hanoi Joint Stock Commercial Bank is one of the large commercial banks in the system. Therefore, the research on the content: *"Factors affecting the management and operation capacity of Vietnamese commercial banks: research on the current situation at Saigon - Hanoi Joint Stock Commercial Bank"* meets the necessity and urgency.

2. Research models and methods

Research model: The research considers the reality and expects that the independent variables all have a positive impact on the dependent variable, so it will be marked with a (+) sign. Positive impact means that when the independent variable increases, the dependent variable also increases. There are 6 independent variables and 1 dependent variable.

• H1: Salary, bonus, and benefits have a positive (positive) impact on employee satisfaction at work.

• H2: Training and promotion opportunities have a positive (positive) impact on employee satisfaction at work.

• H3: Leaders and superiors have a positive (positive) impact on employee satisfaction at work.

• H4: Colleagues have a positive (positive) impact on employee satisfaction at work.

• H5: The nature of the job has a positive (positive) impact on employee satisfaction at work.

• H6: Working conditions have a positive (positive) impact on employee job satisfaction.

The research was conducted using a questionnaire survey. The questions on satisfaction level were on a 5-point Likert scale: 1 - very dissatisfied, 2 - dissatisfied, 3 - neutral, 4 - satisfied, 5 - very satisfied.

Research method:

After conducting the survey and receiving the response forms (received questions), the author coded and entered the data. The survey results were processed using SPSS version 20.0 software. The number of survey forms issued was 220; the forms were sent both directly and via the GG form link to bank employees

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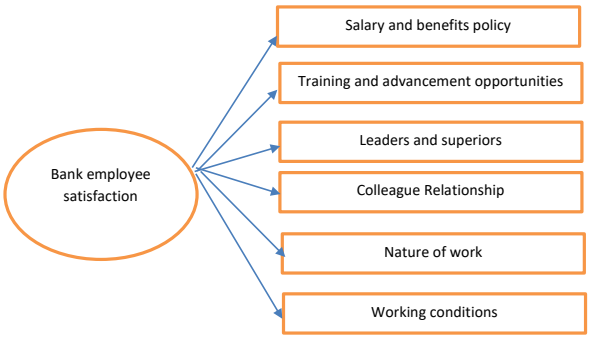
working at the branches (the position of the bank employee is not higher than the transaction office level leader to ensure objectivity).

Figure 1.1: Research model



Source: Author's compilation

3. Research results and discussion

With 220 ballots issued, the form of sending ballots is both directly and via the GG form link to bank employees working at branches (the position of bank employees is not higher than the transaction office level leader to ensure objectivity). There were 191 ballots collected (accounting for 86.81%). After cleaning the data, 171 ballots (reaching 90%) were used to analyze the results.

- Cronbach's Alpha test:

+ For TN variable:

The test results show that all observed variables have appropriate total correlation coefficients (≥ 0.3). Cronbach's Alpha coefficient = 0.790 ≥ 0.6, so it meets the reliability requirements. (Author's analysis results)

+ For the DT variable:

The test results show that all observed variables have appropriate total correlation coefficients (≥ 0.3). Cronbach's Alpha coefficient = 0.820 ≥ 0.6, so it meets the reliability requirements. (Author's analysis results)

+ For the LD variable:

The test results show that all observed variables have appropriate total correlation coefficients (≥ 0.3). Cronbach's Alpha coefficient = 0.818 ≥ 0.6, so it meets the reliability requirements. (Author's analysis results)

+ For the DN variable:

The test results show that the observed variables all have appropriate total variable correlation coefficients (≥ 0.3). Cronbach's Alpha coefficient = 0.623 ≥ 0.6, so it meets the reliability requirements. (Author's analysis results)

+ For CV variables:

The test results show that the observed variables all have appropriate total correlation coefficients (≥ 0.3). Cronbach's Alpha coefficient = 0.824 ≥ 0.6, so it meets the reliability requirements. (Author's analysis results)

+ For variable DK:

Table 1.1. Analysis results for variable DK

Reliability Statistics

Cronbach's Alpha	N of Items
.711	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
DK1	11.04	6.264	.173	.827
DK2	10.91	4.640	.627	.569
DK3	11.05	4.504	.640	.557
DK4	11.16	4.491	.615	.572

Source: Author's analysis results

The test results show that the observed variable DK1 has a total item correlation coefficient of 0.173 < 0.3. The Cronbach's Alpha if Item Deleted value of DK1 is 0.827 > 0.711. The author decided to remove the variable DK1 to increase the reliability of the scale. Re-running the test for the second time, we have the following results:

Table 1.2. Second analysis results for variable DK

Reliability Statistics

Cronbach's Alpha	N of Items
.827	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
DK2	7.23	3.199	.647	.798
DK3	7.37	2.964	.710	.736
DK4	7.48	2.908	.699	.748

Source: Author's analysis results

The test results show that all observed variables have appropriate total correlation coefficients (≥ 0.3). Cronbach's Alpha coefficient = 0.827 ≥ 0.6, so it meets the reliability requirements.

+ For the HL variable:

The test results show that all observed variables have appropriate total correlation coefficients (≥ 0.3). Cronbach's Alpha coefficient = 0.764 ≥ 0.6, so it meets the reliability requirements. (Author's analysis results)

Thus, after Cronbach's Alpha test, there is 1 observed variable, DK1, that needs to be removed before being included in the EFA exploratory factor analysis. The statistical table of the final test results of each group of variables is as follows Table 1.3.

Since variable DK1 was removed in the Cronbach's Alpha step, this variable will not be used again to perform subsequent tests and analyses.

Table 1.3: Final test results of each group of variables

sequence number	Factor	Initial observation variable	Remaining observed variables	Cronbach's Alpha	Eliminated variable
1	Material benefits	5	5	0.790	
2	Training and promotion opportunities	4	4	0.820	
3	Relationship with leaders	5	5	0.818	
4	Colleague	4	4	0.623	
5	Work nature	5	5	0.824	
6	Working conditions	4	3	0.827	DK1
7	Satisfaction	3	3	0.764	

Source: Author's analysis results - EFA test:

Table 1.4: EFA results for independent variables

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
TN2	.761					
TN4	.743					
TN5	.727					
TN1	.722					
TN3	.690					
CV2		.797				
CV1		.773				
CV5		.768				
CV3		.767				
CV4		.702				
LD3			.793			
LD1			.758			
LD2			.752			
LD4			.740			
LD5	.516		.644			
DT4				.824		
DT1				.759		
DT3				.759		
DT2				.748		
DK3					.879	
DK4					.867	
DK2					.769	
DN3						.762
DN1						.710
DN2						.703
DN4						

Source: Author's analysis results

From the results of the rotation matrix, variables LD5 and DN4 will be eliminated.

Table 1.5: Second EFA results for independent variables

CV1	.772					
CV5	.772					
CV3	.765					
CV4	.704					
TN2		.807				
TN1		.763				
TN4		.709				
TN5		.708				
TN3		.672				
DT4			.837			
DT3			.788			
DT1			.752			
DT2			.734			
LD3				.827		
LD2				.785		
LD1				.719		
LD4				.713		
DK3					.883	
DK4					.862	
DK2					.808	
DN3						.752
DN2						.736
DN1						.736

Source: Author's analysis results

Variable LD5 loaded on both factors, Component 1 and Component 3, violating the discriminant property in the rotation matrix with loading coefficients of 0.516 and 0.644, respectively; the difference in loading coefficients is less than 0.3.

Variable DN4 has a loading coefficient of less than 0.5, so this variable does not load on any factor. Conduct the second EFA after eliminating the two observed variables, LD5 and DN4.

The results of the rotation matrix show that 24 observed variables are grouped into 6 factors, and all observed variables have Factor Loading coefficients greater than 0.5. According to the results of the final rotation matrix table, we have the following systematized factors:

Table 1.6: Statistics of factors

Ordinal Number	Factor	Observed Variables	Type
1	CV	CV2, CV1, CV5, CV3, CV4 (5 biến)	Independent
2	TN	TN2, TN1, TN4, TN5, TN3 (5 biến)	Independent
3	DT	DT4, DT3, DT1, DT2 (4 biến)	Independent
4	LD	LD3, LD2, LD1, LD4 (4 biến)	Independent
5	DK	DK3, DK4, DK2 (3 biến)	Independent
6	DN	DN3, DN2, DN1 (3 biến)	Independent
7	HL	HL2, HL1, HL3 (3 biến)	Dependent

Source: Author's analysis results

Total number of independent observed variables: 24

Total number of dependent observed variables: 3

- Pearson correlation analysis

Pearson correlation r has a value ranging from -1 to 1:

• If r is closer to 1, -1, the linear correlation is stronger, tighter. Towards 1 is a positive correlation, towards -1 is a negative correlation.

• If r is closer to 0, the linear correlation is weaker.

• If r = 1: absolute linear correlation, when represented on the Scatter plot as shown above, the points will merge into a straight line. • If r = 0: there is no linear correlation. At this point, there will be 2 situations. One, there is no relationship between the 2 variables. Two, there is a nonlinear relationship between them.

Table 1.7: Correlation coefficient table

Correlations

		HL	TN	CV	LD	DN	DK	DT
HL	Pearson Correlation	1	.439**	.353**	.551**	-.015	.172*	.611**
	Sig. (2-tailed)		.000	.000	.000	.822	.011	.000
	N	220	220	220	220	220	220	220
TN	Pearson Correlation	.439**	1	-.002	-.008	.046	.090	.180**
	Sig. (2-tailed)	.000		.978	.908	.493	.184	.007
	N	220	220	220	220	220	220	220
CV	Pearson Correlation	.353**	-.002	1	.013	-.048	.195**	.028
	Sig. (2-tailed)	.000	.978		.846	.475	.004	.676
	N	220	220	220	220	220	220	220
LD	Pearson Correlation	.551**	-.008	.013	1	-.041	.002	.422**
	Sig. (2-tailed)	.000	.908	.846		.542	.978	.000
	N	220	220	220	220	220	220	220
DN	Pearson Correlation	-.015	.046	-.048	-.041	1	-.009	-.012
	Sig. (2-tailed)	.822	.493	.475	.542		.894	.857
	N	220	220	220	220	220	220	220
DK	Pearson Correlation	.172*	.090	.195**	.002	-.009	1	-.010
	Sig. (2-tailed)	.011	.184	.004	.978	.894		.879
	N	220	220	220	220	220	220	220

Source: Author's analysis results

The Pearson correlation coefficient of the independent variables TN, CV, LD, DN, and DK with the dependent variable HL is less than 0.05. Thus, there is a linear relationship between these independent variables and the variable HL. The strongest correlation between DN and HL is 0.611; the weakest correlation between DK and HL is 0.172.

The pairs of independent variables all have quite weak correlations with each other, so it is highly likely that there will be no multicollinearity.

- Multiple regression analysis:

After the Pearson correlation, we have 5 independent variables: TN, CV, LD, DK, and DT. Perform multiple linear regression analysis to assess the impact of these independent variables on the dependent variable HL.

Table 1.8: Linear regression analysis table

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.856[a]	.733	.726	.28735	1.998

a. Predictors: (Constant), DT, DK, CV, TN, LD

b. Dependent Variable: HL

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.856[a]	.733	.726	.28735	1.998

a. Predictors: (Constant), DT, DK, CV, TN, LD

b. Dependent Variable: HL

The adjusted R2 value of 0.726 shows that the independent variable introduced into the regression affects 72.6% of the change in the dependent variable; the remaining 27.4% is due to variables outside the model and random errors. The Durbin-Watson coefficient = 1.998, which is in the range of 1.5 to 2.5, so there is no first-order serial autocorrelation.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.441	5	9.688	117.337	.000[b]
	Residual	17.669	214	.083		
	Total	66.111	219			

a. Dependent Variable: HL

b. Predictors: (Constant), DT, MT, CV, TN, LD

The F test sig is 0.00 < 0.05; thus, the multiple linear regression model fits the data set and can be used.

Table 1.9: Regression analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.185	.171		-1.079	.282		
	TN	.268	.026	.369	10.162	.000	.950	1.053
	CV	.224	.025	.323	8.960	.000	.960	1.041
	LD	.264	.026	.394	10.056	.000	.815	1.228
	DK	.052	.024	.079	2.169	.031	.953	1.050
	DT	.252	.027	.370	9.293	.000	.787	1.271

a. Dependent Variable: HL

Source: Author's analysis results

The regression coefficients are all greater than 0. Thus, all independent variables included in the regression analysis have a positive impact on the dependent variable. Based on the magnitude of the standardized regression coefficient Beta, the order of the impact from strongest to weakest of the independent variables on the dependent variable HL is: LD (0.394) > DT (0.370) > TN (0.369) > CV (0.323) > DK (0.079). Corresponding to:

The variable Leadership and superiors has the strongest impact on employee satisfaction at work.

The variable Training and promotion opportunities has the second strongest impact on employee satisfaction at work.

The variables Salary, bonus, and benefits have the third strongest impact on employee satisfaction at work.

The variable Nature of work has the fourth strongest impact on employee satisfaction at work.

The variable Working conditions has the weakest impact on employee job satisfaction.

Thus, with 6 hypotheses from H1 to H6, we initially set out in the Research Hypothesis section. There are 5 accepted hypotheses: H1, H2, H3, H5, H6 corresponding to the variables: Leadership and superiors; Training and promotion opportunities; Salary, bonus, benefits; Nature of work; Working conditions. Only hypothesis H4 was rejected; the factor Colleagues does not affect Employee satisfaction at work at SHB, or in other words, the variable Colleagues is not significant in the regression model.

Standardized regression equation:

*HL = 0.394*LD + 0.370*DT + 0.369*TN + 0.323*CV + 0.079*DK*

Employee satisfaction = 0.394 * Leadership and superiors + 0.370 * Training and promotion opportunities + 0.369 * Salary, bonus, benefits + 0.323* Nature of work + 0.079 * Working conditions.

4. Conclusion

To accurately assess the current status of executive management capacity at commercial banks in general and SHB in particular, the study has shown that the following factors: Leadership and superiors; Training and promotion opportunities; Salary, bonus, benefits; Nature of work; Working conditions are factors that have a positive impact on management and administration capacity.

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THE IMPACT OF THE FINANCIAL CONGLOMERATE MODEL ON BANK STABILITY: THE MEDIATING ROLE OF RISK-TAKING

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Abstract: ***This study develops a Financial Conglomeration Index (FCI) for Vietnamese banks (2015-2024). System GMM results show how conglomeration impacts stability. Critically, this effect is transmitted through the risk-taking channel: higher FCI drives aggressive loan growth, ultimately eroding the bank's Z-score. The paper provides crucial implications for consolidated supervision.***

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1. Introduction

The rise of financial conglomerates - organizations operating across multiple sectors such as banking, securities, and insurance - is one of the most prominent trends shaping the global financial industry in recent decades. In theory, this model promises numerous benefits through revenue diversification, exploitation of economies of scale and scope, and the creation of an efficient internal capital market, which can enhance stability (Filatie & Sharma, 2024; Xie et al., 2022; Laeven & Levine, 2007). However, the 2008 global financial crisis revealed a contrasting reality: structural complexity, operational opacity, and the risk of systemic contagion from these conglomerates can become sources of macroeconomic instability. The crisis exposed significant vulnerabilities, demonstrating how the opacity and interconnectedness of these large institutions create conditions where financial volatility can quickly transmit systemic risk across global markets, threatening economic stability (Spatt, 2020; Mieg, 2020). This event called into question the unalloyed benefits of full financial integration, revealing that without adequate governmental oversight, interconnectedness could also propagate systemic failures (Stiglitz, 2010). Even in the post-crisis landscape, while regulatory reforms have made systemically important banks more resilient, significant risks remain, particularly from non-bank financial entities (Tarullo, 2019), and the effectiveness of internal corporate governance in mitigating these risks has shown mixed results (Peni and Vähämaa, 2011).

In emerging markets like Vietnam, the trend of financial conglomeration presents unique and more pressing characteristics. Many commercial banks have been expanding their operations by establishing or acquiring subsidiaries in securities, insurance, and fund management, forming "de facto" financial conglomerates. However, this development is occurring within a context where the "de jure" legal and supervisory framework has not yet been clearly defined. This asymmetry between operational practice and legal framework creates a "supervisory gap," raising significant concerns about the safety of individual institutions and the stability of the entire financial system.

Despite the issue's importance, quantitative research on the impact of the financial conglomerate model in Vietnam remains extremely limited. The primary obstacle is the lack of a unified legal definition, which makes it difficult to identify and measure a bank's degree of "conglomeration." This research gap raises urgent questions: First, how does the degree of financial conglomeration actually affect the stability of Vietnamese commercial banks? Second, what is the mechanism behind this impact, and is risk-taking behavior a significant transmission channel?

This study is conducted to answer these questions. Our main objective is to construct a quantitative index to measure the degree of conglomeration and use it to test the impact on bank stability, while also exploring the mediating role of risk-taking behavior. The paper makes three main contributions. Methodologically, we propose a composite Financial Conglomeration Index (FCI) that can be applied to markets with similar contexts. Empirically, this is the first study in Vietnam to provide quantitative evidence of the risk-taking channel in the relationship between conglomeration and stability. Finally, the research findings offer important policy implications for policymakers regarding the necessity of establishing a consolidated supervision framework.

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The structure of the paper is as follows. Section 2 presents the literature review and develops the research hypotheses. Section 3 details the research methodology, including the data, variable construction, and econometric model. Section 4 presents and analyzes the empirical results. Finally, Section 5 discusses the results, provides policy implications, and concludes.

2. Literature review and Hypothesis development

The relationship between the financial conglomerate model and bank stability is subject to intense debate, with two main opposing theoretical viewpoints: diversification benefits versus complexity risks.

2.1. The Positive View: "Diversification-Stability"

This perspective argues that expanding into non-bank financial sectors enhances stability. The foundation rests on Modern Portfolio Theory (Markowitz, 1952), positing that diversifying income streams reduces return volatility. Operational benefits include economies of scale and scope, and the creation of an internal capital market (ICM), which provides efficient resource allocation and funding flexibility during constraints (Matvos & Seru, 2014). Empirical evidence often supports that affiliation with conglomerates can enhance financial strength and stability through ICM support (Doumpos et al., 2016; Raykov & Silva-Buston, 2020).

2.2. The Negative View: "Complexity-Fragility"

Conversely, this view holds that diversification benefits are negated by risks from the conglomerate's complex structure. Agency Theory suggests that multi-layered structures increase information asymmetry, reducing monitoring effectiveness (Jensen & Meckling, 1976). Complexity creates risks of internal contagion, regulatory arbitrage, and moral hazard related to "too-big-to-fail" bailout expectations. Recent theory emphasizes that the intricate financial network structure facilitates the "anti-social sharing of risk," where excessive risk-taking can spread rapidly, amplifying systemic instability (Allen and Carletti, 2013; Altinoglu & Stiglitz, 2023).

2.3. Risk-Taking as a Transmission Channel and Hypothesis Development

Synthesizing these views, the overall impact of the conglomerate model is ambiguous. A growing literature suggests that the structure primarily influences stability by altering a bank's risk-taking behavior (the risk-taking channel). This occurs because complex governance structures may incentivize managers to assume excessive risk (Laeven & Levine, 2009). Moreover, the pressure for income diversification (e.g., through fee-based income) can also encourage higher risk-taking to meet short-term targets (Abbas & Ali, 2021).

For Vietnam, we argue that the incomplete regulatory environment, combined with implicit "too-big-to-fail" guarantees and growth pressures, incentivizes banks to pursue high-risk strategies, often manifesting as aggressive loan expansion.

Based on these arguments, we hypothesize that: bank to relax its credit standards to expand lending, thereby sacrificing long-term safety.

To capture this proactive (*ex-ante*) risk-taking behavior - which reflects strategic management decisions rather than merely realized (*ex-post*) risk outcomes - we employ "Aggressive Loan Growth" (ALGR), a measure standardized by Foos et al. (2010).

Based on the preceding arguments, we develop the following research hypotheses:

H1: The degree of financial conglomeration has a negative overall impact on bank stability.

H2: The degree of financial conglomeration is positively related to a bank's risk-taking behavior.

H3: Risk-taking behavior is negatively related to bank stability.

H4: Risk-taking behavior mediates the relationship between the degree of financial conglomeration and bank stability.

3. Research Methodology

This section details the methodology used to test the research hypotheses, including data description, variable measurement procedures, and the econometric model.

3.1. Data and Sample

The study uses an unbalanced panel dataset of 30 Vietnamese commercial banks over a 10-year period from 2015 to 2024. The sample includes listed joint-stock commercial banks and several large unlisted banks with complete financial disclosures, representing the majority of the total assets of the banking system. This period captures significant changes in the banking industry's structure following a restructuring phase and the strong growth of non-credit activities.

Financial data were primarily collected from audited annual financial statements, including both consolidated and parent-only reports. Macroeconomic

data, such as GDP growth and inflation, were sourced from reputable institutions like the General Statistics Office and the State Bank of Vietnam. To mitigate the impact of outliers, all continuous variables in the model were winsorized at the 1% and 99% percentiles.

3.2. Variable Measurement

3.2.1. Dependent Variable: Bank Stability (Z-score)

Bank stability, or the distance to default, is measured by the Z-score, a widely used metric in banking risk studies (Laeven & Levine, 2009). The index is calculated as follows:

$$ZSCORE_{i,t} = \frac{ROA_{i,t} + EAT_{i,t}}{\sigma(ROA_{i,t})}$$

Where:

$ROA_{i,t}$ is the return on assets for bank i in year t.

$EAT_{i,t}$ is the Equity-to-Asset Ratio for bank i in year t.

$\sigma(ROA_{i,t})$ is the standard deviation of ROA,calculated over a 3-year rolling window to reflect profit volatility.

A higher Z-score indicates greater stability and a lower probability of insolvency.

3.2.2. Mediating Variable: Risk-Taking Behavior (ALGR)

To test the mediating role, we need a measure of proactive (ex-ante) risk-taking. Following Foos et al. (2010), "Aggressive Loan Growth" (ALGR) is a suitable proxy. It is calculated in the following steps:

(1) Calculate raw loan growth (LoanGrowth):

$$LoanGrowth_{i,t} = \frac{Loans_{i,t} - Loans_{i,t-1}}{Loans_{i,t-1}}$$

Where is the total gross loans to customers of bank i in year t.

(2) Calculate industry median loan growth (MedGrowth): For each year t, we calculate the median value of for all banks in the sample. This median () represents the "typical" industry growth rate, helping to filter out common macroeconomic shocks.

(3) Calculate aggressive loan growth (ALGR):

$$ALGR_{i,t} = LoanGrowth_{i,t} - MedGrowth_t$$

$ALGR_{i,t}$ measures the extent to which bank i's loan growth deviates from the industry trend. A large positive value indicates an aggressive growth strategy, reflecting a high risk appetite.

3.2.3. Independent Variable: Financial Conglomeration Index (FCI)

As Vietnam lacks an official legal definition of a "financial conglomerate," using a simple dummy variable is neither feasible nor reflective of the diverse operational structures. Therefore, we construct a composite index (FCI) to measure the "degree of conglomeration" based on functionally recognized components in international standards (Joint Forum, 2012; EU Financial Conglomerates Directive 2002/87/EC).

The FCI is constructed using a **formative model**, meaning the component indicators are considered to cause or form the "conglomeration" construct. The index is aggregated from five main dimensions:

(1) Scope: The breadth of business activities. Measured by n_sectors - the number of financial sectors (securities, insurance, fund management, financial leasing) in which the bank has a subsidiary.

(2) Non-bank Intensity: The importance of non-traditional banking activities. Measured by share_nba - the ratio of non-bank subsidiary assets to total consolidated assets.

(3) Income Diversification: The reliance on traditional interest income. Measured by share_nii - the share of non-interest income in total operating income.

(4) Structural & Financial Complexity: Organizational unwieldiness and capital dependence. This combines n_finsub (number of financial subsidiaries) and IE_solo (ratio of total investment in subsidiaries to the parent bank's equity).

(5) Scale & Systemic Footprint: The bank's market presence. Measured by size_lnTA - the natural logarithm of total consolidated assets.

To construct the FCI, the component indicators are first normalized using min-max scaling. They are then aggregated using an **equal-weighting** scheme as the baseline case for its transparency and simplicity. Principal Component Analysis (PCA) will be used for robustness checks.

3.2.4. Control Variables

To isolate the effect of the conglomerate model, we include a set of control variables, comprising bank-specific and macroeconomic factors:

Bank-specific: SIZE (log of assets), EAT (equity-to-asset ratio), LIQ (liquid assets to total assets ratio), and CIR (cost-to-income ratio).

Macroeconomic: GDPG (real GDP growth rate) and INF (inflation rate).

3.3. Econometric Model and Estimation Method

To test the mediating role of risk-taking behavior

(H4), we use the following two-equation system:

(1) $ALGR_{i,t} = \alpha_0 + \alpha_1 ALGR_{i,t-1} + a \cdot FCI_{i,t} + \beta\ X_{i,t} + \eta_i + \epsilon_{i,t}$

(2) $Z\ SCORE_{i,t} = \delta_0 + \delta_1 ZSCORE_{i,t-1} + c' \cdot FCI_{i,t} + b \cdot ALGR_{i,t} + \gamma' X_{i,t} + \theta_i + \mu_{i,t}$

Where $X_{i,t}$ is the vector of control variables, and η_i and θ_i are bank-specific fixed effects.

This model presents several endogeneity issues. First, the presence of the lagged dependent variable $ALGR_{i,t-1}$, $ZSCORE_{i,t-1}$ creates a correlation with the error term. Second, there may be two-way causality between FCI, ALGR, and Z-score. Third, there is a potential for omitted variable bias. To address these issues, we employ the System Generalized Method of Moments (System GMM).

To test the significance of the indirect effect (the product of coefficients a×b), we use a bootstrapping method with 1,000 repetitions. If the 95% confidence interval of the indirect effect does not contain zero, we can conclude that risk-taking behavior plays a statistically significant mediating role.

4. Empirical Results

This section presents the results of the data analysis, starting with descriptive statistics, followed by the main regression results and the mediation test.

4.1. Descriptive statistics and correlation analysis

Table 1 provides descriptive statistics. The average Z-score is 4.25, suggesting a moderate level of stability, though the large standard deviation (1.58) indicates significant variation. The mean ALGR is close to zero, as expected by construction. The FCI has an average of 0.48, ranging from 0.12 to 0.85, showing a clear differentiation in the degree of conglomeration.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ZSCORE	285	4.25	1.58	1.89	7.92
ALGR	285	0.01	0.08	-0.15	0.22
FCI	285	0.48	0.19	0.12	0.85
SIZE	285	19.55	1.22	17.21	21.88
EAT	285	0.09	0.03	0.04	0.18
LIQ	285	0.24	0.07	0.11	0.45
CIR	285	0.41	0.09	0.28	0.65
GDPG	300	6.15	1.05	2.58	7.5
INF	300	3.2	0.88	1.84	4.5

Table 2: Correlation Matrix

Variable	ZSCORE	ALGR	FCI	SIZE	EAT	LIQ	CIR
ZSCORE	1						
ALGR	-0.31	1					
FCI	-0.28	0.35	1				
SIZE	0.15	-0.05	0.45	1			
EAT	0.55	-0.12	-0.18	0.05	1		
LIQ	0.21	0.08	-0.1	-0.25	0.15	1	
CIR	-0.45	0.15	0.22	0.1	-0.3	-0.2	1

Table 2 shows the correlation matrix. The preliminary results are consistent with our hypotheses, showing a negative correlation between FCI and Z-score (-0.28) and a positive correlation between FCI and ALGR (0.35).

4.2. Main Regression Results

Table 3 presents the System GMM estimation results. In Column (1), the FCI coefficient is positive and significant at the 1% level (a = 0.152), supporting **H2** by confirming that conglomeration encourages risk-taking. In Column (2), the ALGR coefficient is negative and significant at the 1% level (b = -5.871), confirming **H3**. The FCI coefficient (c') in this model is negative but insignificant.

Table 3: System GMM Regression Results

Variables	(1) ALGR	(2) ZSCORE
L.ALGR	0.215*** (0.071)	
L.ZSCORE		0.458*** (0.092)
FCI	0.152*** (0.054)	-0.855 (0.612)
ALGR		-5.871*** (1.325)
SIZE	-0.008** (0.003)	0.124* (0.071)
EAT	-0.112* (0.065)	5.102*** (1.544)
LIQ	0.054 (0.041)	1.889** (0.852)
CIR	0.098** (0.048)	-2.015*** (0.688)
GDPG	0.005*** (0.001)	0.089** (0.040)
INF	0.003 (0.002)	-0.157* (0.091)
Constant	0.122 (0.088)	1.985*** (0.551)

Diagnostics: AR(1) p=0.000; AR(2) p=0.214-0.271; Hansen p=0.312-0.487; Instruments=24-26; bank & year FE; clustered SEs

*Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

4.3. Mediation Analysis

Table 4 shows the results for the mediation test. The indirect effect (a×b) is -0.892 and statistically significant at the 1% level, providing strong evidence for **H4**. This indicates that risk-taking behavior is a significant channel through which financial conglomeration negatively affects bank stability. The total effect is -1.747, supporting **H1**. The indirect effect accounts for approximately 51.1% of the total effect.

Table 4: Decomposition of Effects and Mediation Test

Effect	Coefficient	95% CI (Bootstrap)
Indirect Effect (a×b)	-0.892***	[-1.215; -0.569]
Direct Effect (c')	-0.855	[-2.085; 0.375]
Total Effect	-1.747***	[-2.615; -0.879]

Clustered bootstrap (1,000 replications)

5. Discussion and Conclusion

5.1. Discussion of Key Findings

This study provides crucial insights into the complex relationship between financial conglomeration, risk-taking, and bank stability in Vietnam.

First, we find strong evidence that a higher degree of financial conglomeration has a negative overall impact on bank stability (supporting H1). This finding challenges the view that diversification always yields stability benefits, particularly in the context of an emerging market. Our results align with

the "Complexity-Fragility" perspective, suggesting that in Vietnam, the costs associated with structural complexity, information asymmetry, and potential moral hazard appear to outweigh the theoretical benefits of activity diversification.

Second, and the core finding of this study, we clarify the mechanism behind this negative relationship. The mediation analysis reveals that the conglomerate model impacts stability not just directly but also indirectly by encouraging risk-taking behavior (supporting H2, H3, and H4). Specifically, banks with higher FCI scores tend to pursue more aggressive loan growth strategies, and it is this behavior that is the primary driver of eroding stability. Significantly, this indirect effect accounts for over half of the total impact, underscoring the importance of the risk-taking channel. This suggests that the conglomerate structure itself is not the sole issue, but rather how that structure alters the incentives and behaviors of bank managers. In an incomplete regulatory environment, growth pressures and the expectation of being "bailed out" may have created a fertile ground for excessive risk-taking.

5.2. Policy Implications

Our findings offer several important and detailed policy implications for regulatory authorities, particularly the State Bank of Vietnam, aimed at mitigating the risks identified.

First, there is an urgent need to establish a formal and comprehensive legal framework for financial conglomerates. This framework should move beyond simple definitions to create legal certainty and a solid foundation for supervision. Key components should include: (i) clear quantitative and qualitative criteria for identifying a financial conglomerate, potentially using metrics similar to our FCI; (ii) group-wide capital adequacy requirements that account for correlated risks across different business lines; and (iii) stringent corporate governance standards, including regulations on the composition of the board, risk management committees at the group level, and rules to prevent conflicts of interest.

Second, the study's results strongly advocate for a decisive shift from entity-based supervision to effective consolidated supervision. This involves more than just aggregating financial statements. Regulators must develop the capacity to (i) assess the group-wide risk profile, including risk concentrations and correlations between banking, securities, and insurance activities; (ii) actively monitor and regulate intra-group transactions to prevent the transfer of risks from non-bank subsidiaries to the parent bank; and (iii) foster robust inter-agency cooperation between the State Bank, the State Securities Commission, and the insurance supervisory authority to ensure a seamless and holistic view of the conglomerate's activities, thus eliminating supervisory gaps.

Third, given that risk-taking is the main transmission channel, regulators should enhance their toolkit for monitoring and curbing excessive risk appetite. This involves (i) paying close attention to forward-looking risk indicators, such as aggressive loan growth (ALGR), and incorporating them into early warning systems; (ii) developing and implementing group-wide stress tests that simulate shocks affecting multiple sectors simultaneously to assess the resilience of conglomerates; and (iii) considering the introduction of counter-cyclical capital buffers that could be tightened for rapidly expanding conglomerates to temper their risk-taking during economic booms.

5.3. Conclusion

In summary, this study provides the first empirical evidence from Vietnam that the financial conglomerate model negatively affects bank stability. Crucially, this impact is primarily transmitted through the risk-taking channel, where the conglomerate structure, combined with an incomplete supervisory environment, incentivizes aggressive loan growth (ALGR) that erodes stability. These findings emphasize the necessity of completing the legal framework and strengthening consolidated supervision to safeguard macroeconomic stability.

The primary limitation remains the lack of public data on intra-group transactions, preventing direct analysis of contagion channels. Future research should focus on collecting more granular data to examine internal risk transfer mechanisms, investigate non-linear relationships of conglomeration, and extend the analysis to other ASEAN markets.

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THE IMPACT OF THE COVID-19 PANDEMIC ON EARNINGS MANAGEMENT: EMPIRICAL EVIDENCE FROM VIETNAM

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Abstract: ***The COVID-19 pandemic caused a severe impact on the global society and economy. Human losses and lockdown activities during the pandemic led to a sluggish economy, and companies faced many difficulties. This paper examines the impact of the pandemic on earnings management in a sample of 104 listed companies in Vietnam from 2018 to 2021. The findings reveal a significant positive relationship between the pandemic and earnings management. Furthermore, the results also indicate that firms engage in more upward earnings management during the pandemic period compared to the pre-pandemic period, while there is no significant change in downward earnings management between the two periods.***

• Keywords: *Covid-19 pandemic, earnings management.*

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1. Introduction

The outbreak of the COVID-19 pandemic led to global intense economic and social effects. Due to a number of human losses and actions to prevent the spread of this disease, such as social distancing and self-isolation, COVID-19 slowed down economic activities all over the world and brought many challenges to enterprises. Many companies went into bankruptcy after the pandemic, and surviving companies faced a lot of financial and operational pressure. Managers were also put under high pressure; therefore, they may have manipulated earnings by using accounting discretion to achieve their targets (Abdullah et al., 2023; Liu & Sun, 2022). Therefore, to gain a deep, insightful, practical knowledge of this subject, it is interesting to seek an answer to the following research question: Were firms more likely to engage in earnings management due to the effect of the COVID-19 pandemic? If yes, what was the direction of earnings management (upward or downward)?

This study uses a large sample of 104 listed companies in Vietnam for the period from 2018 to 2021. The results of the study contribute to the existing literature and practice in the following aspects. First, this study attempts to find whether there is a correlation between the pandemic and earnings management practices in Vietnam. Second, this study provides evidence that if firms engage in earnings management during the pandemic, this would be income-increasing earnings management or income-decreasing earnings management.

The remaining of the paper is structured as follows. Section 2 presents a literature review and hypotheses development. Section 3 describes the research methodology. Section 4 discusses the results and findings, and Section 5 gives a conclusion.

2. Literature review

2.1. The impact of the COVID-19 pandemic on earnings management

The sudden outbreak of the COVID-19 pandemic led to global intense economic and social effects. Several studies have examined earnings management practices during the pandemic and showed inconsistent findings.

Many studies have found an increase in earnings management practices during the pandemic (Yan et al., 2022; Taylor et al., 2023; Chen et al., 2023; Hsu & Yang, 2022; Abdullah et al., 2023; Liu & Sun, 2022). This behavior is explained to be motivated by managers' interests of meeting targets, by the need to keep the trust of stakeholders, and/or to raise and retain investments. Abdullah et al. (2023), Yan et al. (2022), Liu & Sun (2022), and Taylor et al. (2023) examined the relationship between the pandemic and earnings management in China and Taiwan, respectively, and found an increase in earnings management during the pandemic. Chen et al. (2023) and Hsu & Yang (2022) investigated the impact of the pandemic on financial reporting quality and found a decline in the quality of financial reports during the period of COVID-19.

On the other hand, Azizah (2021) concluded that Indonesian enterprises are more likely to reduce earnings management practices because managers are more careful to avoid potential issues. This is consistent with a finding of Chintrakarn et al. (2018) in the context of a financial crisis.

Furthermore, findings on the direction of earnings management during the pandemic are also inconsistent. While Liu & Sun (2022) reported that firms engaged in more downward accruals-based earnings management to

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take a big bath in reporting earnings in the pandemic years in the USA, Abdullah et al. (2023) found a significant increase in upward accruals-based earnings management during the pandemic in China. Yan et al. (2022) found that both upward and downward accruals-based earnings management increased during COVID-19.

2.2. Hypotheses development

Under positive accounting theory, managers' choice of accounting policies and their responses to crisis, such as engaging in earnings management practices, are explained (Watts and Zimmerman, 1990). Specifically, Watt and Zimmerman (1986) hypothesized that managers are more likely to increase current earnings to improve their compensation packages if they depend on reported earnings. Healy (1985) found that managers defer income recognition when they achieve the bonus cap based on the bonus plan, hence, save that income for the following year. In addition, managers are predicted to increase current earnings if the firm is close to the violation of debt covenants so that they will not breach the debt covenants (Watts and Zimmerman, 1990).

Under signaling theory, investors are more sensitive to good news in an economic slowdown; therefore, firms would try to release positive signals to the market so that firms could receive benefits such as additional investments, increases in firm stock price, etc. (Spence, 1978). Therefore, in the context of the COVID-19 pandemic that caused a severe economic recession, managers were motivated to send good news to the market by applying income-increasing earnings management practices.

Under agency theory, the separation of ownership and management gives managers the opportunity to act for their own interests rather than for the owners of the company (Watts and Zimmerman, 1986). One of the agency issues is opportunistic earnings management practices so that managers can gain higher bonus packages and a personal reputation.

The hypotheses are therefore presented as follows:

H1: Firms are more likely to engage in earnings management due to the effect of the COVID-19 pandemic.

H2: Firms are more likely to engage in income-increasing earnings management compared to income-decreasing earnings management during the COVID-19 pandemic.

3. Research methodology

3.1. Data and sample

This paper focuses on non-financial firms listed in the Ho Chi Minh stock exchange (HOSE) during a four-year period from 2018 to 2021. Insurance firms and banks are excluded from the sample because these firms apply different accounting processes and regulations. As the first case of COVID-19 in Vietnam was found in January 2020, the sample period is divided into the pre-pandemic period (2018 and 2019) and the pandemic period (2020 and 2021).

For this research, 150 non-financial firms listed firms are included in the sample. After removing firms with missing data, the final sample comprises 124 firms, leaving 496 firm-year observations.

3.2. Explained variable: accrual-based earnings management (DA)

This paper applies the performance-adjusted discretionary accruals model, which is developed by Kothari et al. (2005). This model includes the effect of firm performance because this could mitigate the heteroscedasticity and misspecification problems (Kothari et al., 2005).

$$\frac{AC_{i,t}}{TA_{i,t-1}} = \frac{\alpha}{TA_{i,t-1}} + \beta_1 \times \frac{\Delta Rev_{i,t} - \Delta Rec_{i,t}}{TA_{i,t-1}} + \beta_2 \times \frac{PPE_{i,t}}{TA_{i,t-1}} + \beta_3 \times \frac{ROA_{i,t}}{TA_{i,t-1}} + \varepsilon_{i,t}$$

In which:

$AC_{i,t}$ total accrual of company i, which is calculated by the difference between net income before extraordinary items and net cash flow from operating activities;

$\Delta Rev_{i,t}$ change in total revenue of company i from year t-1 to year t;

$\Delta Rec_{i,t}$ change in total receivable of firm i from the end of year t-1 to the end of year t;

$PPE_{i,t}$ gross depreciable assets of firm i in year t;

$ROA_{i,t}$ the financial performance, measured by the return on total assets ratio of firm i in year t;

$TA_{-i,t-1}$ total asset of firm i in year t-1;

$\varepsilon_{i,t}$ estimated discretionary accruals of firm i in year t.

3.3. Explanatory variables (COVID)

COVID is a dummy variable that takes a value of 1 if the observation is from 2020 to 2021 (pandemic period) and takes a value of 0 if the observation is from 2018 to 2019 (pre-pandemic period)

3.4. Control variables

Control variables are described as follows:

Table 1: Control variables

Variable	Abbreviation	Measurement	References
Firm size	lnSIZE	The logarithm of total assets	Roychowdhury, 2006
Operating cash flow	OCF	The cash flow from operations scaled by total assets	Yoon & Miller, 2002; Jones & Sharma, 2001
Financial leverage	LEV	Total liabilities to total assets	Dichev & Skinner, 2002; Jones & Sharma, 2001
Financial performance	ROA	Return on assets	Ahmed and Zhou, 2000
Board independence	IND	The percentage of independent board directors	Klein, 2002
Audit quality	BIG4	Dummy variable that takes 1 if the firm's auditor is one of Big 4 firms, and 0 otherwise	Becker et al., 1998

3.5. Research model

The following regression model is estimated in this paper:

$$DA_{i,t} = \alpha + \beta_1 COVID_{i,t} + \beta_2 lnSIZE_{i,t} + \beta_3 OCF_{i,t} + \beta_4 LEV_{i,t} + \beta_5 ROA_{i,t} + \beta_6 IND_{i,t} + \beta_7 BIG4_{i,t} + \varepsilon_{i,t}$$

In which, for the full sample, DA is measured by the absolute value of discretionary accruals. The absolute value focuses on the extent of earnings management rather than the direction of earnings management.

In addition, to identify whether firms use discretionary accruals for income increasing or income decreasing during the pandemic, the impact of the Covid-19 pandemic on the direction of earnings management (upward versus downward) will be examined separately.

4. Results and discussion

4.1. Descriptive statistics

Table 2: Descriptive statistics

Variable	N	mean	sd	min	max
DA	496	0.0796	0.1025	0.0003	1.6513
upEM	375	0.0823	0.9804	0.0003	1.6513
downEM	121	-0.0762	0.1000	-1.1206	-0.0000
COVID	496	0.5000	0.4886	0	1
lnSIZE	496	23,0183	1,5178	21,7610	26,4525
OCF	496	0.0515	0.0623	-0.1672	0.2890
LEV	496	0.4192	0.2201	0.0720	0.8810
ROA	496	0.0802	0.2128	-0.2004	0.3228
IND	496	0.1520	0.1728	0.0000	0.3567
BIG4	496	0.7018	0.4532	0	1

Table 2 presents the descriptive statistics for all variables in the model. The absolute value of discretionary accruals (DA), as a proxy of earnings management, shows a mean of 0.0796. Concerning the direction of earnings management, the upward and downward earnings management have a mean of 0.0823 and -0.0762, respectively.

4.2. Correlation analysis

Table 3: Correlation matrix

Variable	COVID	lnSIZE	OCF	LEV	ROA	IND	BIG4
COVID	1						
lnSIZE	-0.102	1					
OCF	-0.073*	0.024	1				
LEV	-0.027	0.353	-0.209*	1			
ROA	-0.033	0.104	0.378	-0.255	1		
IND	0.015	0.022	-0.001	0.002	-0.011	1	
BIG4	0.000	0.356*	0.062	0.093	0.039	0.044	1
** denotes statistical significance at the 5%*							

Table 3 presents the correlation matrix among all independent variables. There is no severe multicollinearity issues in the model, which is further supported by the unreported low VIF.

4.3. The impact of the COVID-19 pandemic on earnings management

Table 4: Regression results

Variables	DA	upEM	downEM
COVID	0.0035***	0.0020**	0.0046
Control variables			
Constant	-0.0919*	-0.0778**	0.1102**
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Observations	496	375	121
R-squared	0.434	0.406	0.315
Robust t-statistics in parentheses.			
**** p < 0.01, ** p < 0.05, * p < 0.1.*			

From the regression results, we find that the pandemic has a significantly positive effect on the absolute value of discretionary accruals (DA), which is significant to the extent of 1% with a coefficient of 0.0035. This finding suggests that firms were more likely to adopt accrual-based earnings management practices during the pandemic. Therefore, H1 is verified. This finding is consistent with many prior studies (Yan et al., 2022; Taylor et al., 2023; Chen et al., 2023; Hsu & Yang, 2022; Abdullah et al., 2023; Liu & Sun, 2022)

Regarding the direction of earnings management, the income-decreasing earnings management (downEM) is insignificant, while the pandemic has a significantly positive impact on income-increasing earnings management (upEM), with a coefficient of 0.002 at 5% significance level. This result supports H2.

5. Conclusion

The COVID-19 pandemic caused a severe impact on global social and economic systems. Businesses went through a lot of challenges due to human losses and lockdown activities. This paper examines the effect of the pandemic on the earnings management practices in a sample of 104 listed companies in Vietnam, especially on the Ho Chi Minh stock exchanges from 2018 to 2021.

The study measures earnings management by discretionary accruals, and the findings reveal a significant positive relationship between the pandemic and earnings management. Furthermore, the results also indicate that firms engage in more upward earnings management practices during the pandemic period compared to the pre-pandemic period, while there is no significant change in downward earnings management practices between the two periods.

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AGRIBANK AND NON-FINANCIAL BUSINESS PERFORMANCE INDICATORS

Do Nam Hung*

Abstract: ***Agribank, as a major state-owned bank in Vietnam, has consistently achieved strong business results. In addition to financial indicators, Agribank has placed significant emphasis on non-financial metrics, particularly in sustainability and social responsibility. The bank has actively implemented ESG (Environmental, Social, and Governance) practices, focusing on sustainable banking initiatives, digitalization and expanding its product offerings. These combined efforts have contributed to Agribank's continued success, both in terms of financial growth and its broader role in supporting the socio-economic development of Vietnam.***

• Keywords: *agribank, business performance, non-financial.*

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1. Introduction

Agribank, a leading state-owned bank in Vietnam, has consistently achieved strong business results while navigating economic challenges. In 2023, the bank surpassed its financial goals, with total assets exceeding 2 trillion VND and a loan portfolio of 1.55 trillion VND, 65% of which was allocated to agriculture and rural development. Agribank maintains a robust credit profile with low non-performing loans and increasing service fee revenues, showcasing its effective management. Beyond financial growth, Agribank emphasizes sustainability and corporate responsibility through ESG (Environmental, Social, and Governance) initiatives. The bank focuses on sustainable banking, digital transformation, and diversifying product offerings, supporting small and medium-sized enterprises (SMEs), and fostering financial inclusion via modern banking technologies. Agribank also seeks to improve customer experience and promote financial education, partnering with fintech, e-commerce platforms, and other sectors. These efforts not only drive its financial success but also support Vietnam's socio-economic development.

2. Literature review

Non-financial performance measures evaluate intangible factors that significantly impact the long-term success of businesses and organizations, such as innovation, management capabilities, human relations, and brand value. These factors are not reflected on the balance sheet but crucial to a company's market value (Ittner, 2000).

Using non-financial indicators offers many benefits. They help businesses identify and address issues related to internal processes or customer satisfaction that financial metrics cannot reveal. Furthermore, non-financial indicators can serve as a forecasting tool for future financial performance. Investments that enhance customer satisfaction and research development may improve long-term financial results, even if they don't generate immediate profits (Ittner, 2000).

Common non-financial indicators include customer retention rates, employee satisfaction, product defect rates, process performance, and social and environmental responsibility criteria. Additional significant non-financial indicators include innovation in new products or services, employee retention rates, and commitment to ethical and social standards. These indicators help businesses focus on creating long-term value and reducing dependence on short-term profits (Ittner, 2000).

Despite their advantages, the application of non-financial indicators also presents challenges. One of the biggest issues is the cost and time involved in their implementation. Systems tracking non-financial indicators can be expensive and complex, requiring significant investment in technology infrastructure and data management. Moreover, non-financial metrics often lack standardization, making it difficult to compare companies (Ittner, 2000). Additionally, businesses may struggle to link non-financial indicators with financial objectives or actual outcomes, potentially leading to resource wastage if not managed effectively.

Non-financial performance measures in the banking sector play a key role in understanding the success of business activities beyond financial profits. These measures often include customer satisfaction, customer loyalty, and factors related to processes and service quality. Here are some analyses of these metrics:

Customer Satisfaction: One of the most important metrics for banks, reflecting customers' perceptions of the services provided. Metrics such as Client Survey Scores help banks capture customer feedback on aspects like communication, product variety, and service speed. Customer satisfaction not only drives loyalty but also acts as an indicator of future financial performance (Eklof et al., 2017).

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Customer Loyalty: This metric is crucial for determining how likely customers are to continue using a bank's services long-term. Research indicates that improving digital experiences and offering personalized products can enhance the Net Promoter Score (NPS), a common measure of loyalty. Factors like proactive ESG initiatives can also affect customer loyalty.

Process Quality: Other service quality indicators include average resolution time for issues and error rates in setting up new accounts. These factors directly impact customer experience and can diminish satisfaction if not well-managed. Banks often monitor and continuously improve internal processes to minimize mistakes and reduce issue resolution times.

Employee Engagement and Development: Metrics like turnover rates, average time to hire, and internal promotion rates measure a bank's success in attracting, retaining, and developing talent. High engagement levels typically lead to better customer service, innovation, and organizational growth. Additionally, monitoring compensation structures helps banks maintain competitive positions in a tight labor market, which is critical for maintaining a motivated and productive workforce (Ittner, 2000).

Sustainability Commitment (ESG Performance): ESG performance has become an increasingly important non-financial factor as more customers prioritize banks with strong environmental and social responsibility practices. A bank with a solid sustainability strategy is more likely to attract and retain a large, loyal customer base, particularly from younger generations.

Factors Affecting the Implementation of Business Performance Evaluation Systems in Banks

The competitive business environment reflects the complexity of the industry in which an organization operates (Thong, 1999). Each industry has unique characteristics, and in the banking sector, the competition for products is intense, with customers easily changing their service preferences. Cao Thị Huyền Trang (2020) discusses competition, including the need to address both input and output challenges related to raw materials, human resources, product quality, service, pricing, distribution channels, and product diversification. In a highly competitive environment, businesses must improve decision-making processes and operational control to better meet customer needs (Abdel-Kader & Luther, 2008). The level of competition in the business environment positively impacts the implementation of business performance evaluation systems in the banking sector. Thus, the research proposes the following hypothesis:

Hypothesis H1: The competitiveness of the business environment positively affects the implementation of the business performance evaluation system at Agribank.

Corporate structure is a crucial aspect that the contingency theory addresses when it comes to business issues. Companies with clear hierarchical structures and decentralization allow for better operational control and flexibility in decision-making, which enhances the efficiency of business performance evaluation systems (Ghorbel, 2017). The organic structure of a company facilitates better information flow across departments, helping ensure that the performance evaluation system effectively supports decision-making. The research proposes the following hypothesis:

Hypothesis H2: A higher degree of decentralized corporate structure positively impacts the implementation of the business performance evaluation system at Agribank.

Implementing a business performance evaluation system requires significant initial and ongoing costs related to technology, equipment, consulting services, and employee training. Organizations need to carefully assess the costs versus the benefits of implementing the system. If the technology investment is low but the short- and long-term benefits are high, businesses will more easily proceed with implementation. In contrast, when high investment is required, especially in the banking sector's digital transformation, the long-term benefits justify the allocation of resources. Generally, when a bank allocates a higher budget for performance evaluation system investments, the implementation level will be higher. Hence, the research proposes the following hypothesis:

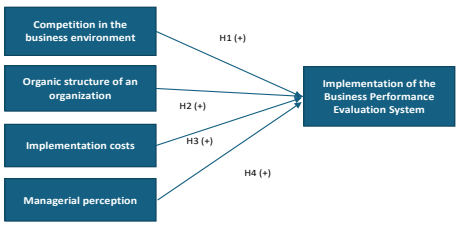
Hypothesis H3: The higher the investment in implementing the performance evaluation system, the higher the level of implementation at Agribank.

Management awareness in organizations reflects knowledge, skills, and the attention of management levels to the implementation of business performance evaluation systems. High-level managers play a pioneering role in guiding the implementation, and it is essential to raise awareness among all management levels for successful execution (Ngô Thế Chi & Ngô Văn Lượng, 2018). To successfully implement the performance evaluation system at Agribank, it is crucial to enhance the awareness of managers about the benefits and effectiveness of the system. Therefore, the following hypothesis is proposed:

Hypothesis H4: The awareness of managers positively affects the implementation of the performance evaluation system at Agribank.

A research model

Figure 1. Research model



3. Agribank's Business Performance Based on Non-Financial Indicators

With the results of the business performance measurement system implementation at Agribank, some

applications are widely used, while others are less frequently applied (Table 1 and Figure 2). This reflects the fact that in different localities, branch sizes, or organizational units, there are variations in the level of implementation of various management systems for efficiency. This study is based on the Contingency Theory (also known as the Random Theory, etc.) to explain and analyze the influencing factors (Phan Thanh Tú, Vũ Mạnh Chiến, Phạm Văn Kiệm, Lưu Đức Tuyên, & Nguyễn Thị Hồng Nga, 2018).

3.1. Measurement of Research Variables

Table 1. Measuring Research Variables

Variable Code	Scale	Sources
	Level of Implementation of the Business Performance Evaluation System	*5-Point Likert Scale*
TKHT1	Activity-Based Costing (ABC)	Developed by author
TKHT2	Benchmarking	
TKHT3	Performance Pyramid	
TKHT4	Process Type Theory	
TKHT5	Customer Survey/Investigation	
TKHT6	Integrated Management System (MM)	
TKHT7	Customer Observation	
TKHT8	Life Cycle Theory	
TKHT9	Balanced Scorecard	
TKHT10	Cost-to-Income Ratio/Cost Estimation Ratio	
	Competition in the Business Environment	*5-Point Likert Scale*
MTKD1	Competition in the industry regarding raw materials is increasing.	Cao Thị Huyền Trang (2020)
MTKD2	Competition in the industry regarding human resources is increasing.	
MTKD3	Competition in the industry regarding product/service quality is increasing.	
MTKD4	Competition in the industry regarding the diversity of products/services is increasing.	
MTKD5	Competition in the industry regarding pricing is increasing	
	Organizational structure	*5-Point Likert Scale*
CTDN1	The unit has a management hierarchy for developing new products/services.	Cao Thị Huyền Trang (2020)
CTDN2	The unit has a management hierarchy for hiring and firing employees.	
CTDN3	The unit has a management hierarchy for purchasing assets.	
CTDN4	The unit has a management hierarchy for setting the pricing of products/services.	
CTDN5	The unit has a management hierarchy for distributing products/services.	
	Cost of implementing the performance evaluation system	*5-Point Likert Scale*
CP1	High cost of technology investment for implementing the performance evaluation system at the unit.	Cao Thị Huyền Trang (2020)
CP2	High consulting fees from organizations/experts for implementing the performance evaluation system at the unit.	
CP3	High cost of training human resources to implement the performance evaluation system at the unit.	
	Management's Perception	*5-Point Likert Scale*
NQL1	Managers perceive the usefulness of the business performance evaluation system.	Cao Thị Huyền Trang (2020)
NQL2	Managers perceive the ease of use of the business performance evaluation system.	
NQL3	Managers are aware of the effectiveness of the business performance evaluation systems of other companies.	
NQL4	Managers have high trust in the implementation of the business performance evaluation system.	

Source: Compilation by the author

3.2. Findings and discussion

As for the explanation, the study uses the Cronbach's alpha test to evaluate the reliability of the scale. The results are presented in Table 2.

Table 2. Results of the Cronbach Alpha analysis

Name of variables	Measurement indicator	Cronbach Alpha
Level of implementation of the business performance evaluation system	TKHT1, TKHT2, TKHT3, TKHT4, TKHT5, TKHT6, TKHT7, TKHT8, TKHT9, TKHT10	0,973
Competition in the business environment	MTKD1, MTKD2, MTKD3, MTKD4, MTKD5	0,819
Organizational structure	CTDN1, CTDN2, CTDN3, CTDN4, CTDN5	0,872
Cost of implementing the performance evaluation system	CP1, CP2, CP3	0,875
Manager's awareness	NTQL1, NTQL2, NTQL3, NTQL4	0.890

Source: Compilation by the author

The results show that all the scales ensure reliability, as the Cronbach's alpha coefficients of all the variables are > 0.6 and the correlation of total variables is greater than 0.3. The measurement indicators for the study variables are all used in the following analysis.

Exploratory Factor Analysis (EFA) Results:

The study conducted the analysis for both independent and dependent variables with the Varimax rotation method for two separate runs for the two groups of variables.

Results of the Independent Variables Analysis:

The EFA results for the independent variables are presented in Table 3. The result with the KMO coefficient = 0.730 > 0.5 and the sig. coefficient = 0.000 indicates that the data fits the theoretical model. The Eigenvalue stopped at 1, loading onto 3 factor groups. These factor groups are represented as follows:

Organizational Structure Group (CAUTRUC): from CTDN1 to CTDN5

Business Environment Group (MOITRUONG): from MTKD1 to MTKD5

System Implementation Cost Group (CHIPHI): from CP1 to CP3

Management Awareness Group (NTNQL): from NTQL1 to NTQL4

Results of the Dependent Variables Analysis:

The EFA results for the dependent variables are presented in Table 3. The result with the KMO coefficient = 0.753 > 0.5 and the sig. coefficient = 0.000 indicates that the data fits the research model, and the indicators load onto only one factor group.

The study conducted to calculate the representative value for the factor group:

System Performance Evaluation Implementation (THUCHIEN): From TKHT1 to TKHT10 (Table 3, 4)

Multivariate correlation and regression analysis

The results of the multivariate correlation and regression analysis are presented in Table 5.

Table 3. Results of the Independent Variables EFA Analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.730
Bartlett's Test of Sphericity	Approx. Chi-Square	957.195
	df	136
	Sig.	.000

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.944	23.203	23.203	3.944	23.203	23.203	3.356	19.742	19.742
2	3.418	20.105	43.308	3.418	20.105	43.308	3.136	18.449	38.192
3	2.836	16.683	59.991	2.836	16.683	59.991	3.000	17.648	55.840
4	1.754	10.318	70.309	1.754	10.318	70.309	2.460	14.470	70.309
5	.941	5.538	75.847						
6	.761	4.474	80.322						
7	.570	3.352	83.674						
8	.459	2.699	86.372						
9	.409	2.407	88.779						
10	.398	2.338	91.117						
11	.339	1.997	93.114						
12	.297	1.746	94.860						
13	.228	1.343	96.204						
14	.213	1.251	97.454						
15	.177	1.040	98.494						
16	.172	1.012	99.506						
17	.084	.494	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
CTDN5	.900			
CTDN1	.828			
CTDN4	.825			
CTDN2	.777			
CTDN3	.725			
NTQL4		.885		
NTQL2		.878		
NTQL3		.848		
NTQL1		.806		
MTKD3			.877	
MTKD4			.865	
MTKD2			.734	
MTKD5			.703	
MTKD1			.575	
CP2				.929
CP1				.901
CP3				.825

Extraction Method: Principal Component Analysis.
a. Rotation converged in 5 iterations.

Source: Author's calculations from SPSS

Table 4. Results of EFA analysis for dependent variables

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.753
Bartlett's Test of Sphericity	Approx. Chi-Square	1909.514
	df	45
	Sig.	0.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.081	80.808	80.808	8.081	80.808	80.808
2	.709	7.093	87.901			
3	.444	4.436	92.337			
4	.373	3.732	96.069			
5	.175	1.747	97.816			
6	.101	1.013	98.829			
7	.058	.584	99.414			
8	.048	.476	99.889			
9	.008	.079	99.968			
10	.003	.032	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component 1
TKHT5	.922
TKHT8	.921
TKHT10	.917
TKHT4	.916
TKHT6	.916
TKHT7	.894
TKHT3	.886
TKHT2	.883
TKHT1	.818

Extraction Method: Principal

a. 1 components extracted.

Source: Author's calculations from SPSS

The results show that the explanatory power of the research model is 42.1% with an R-square of 0.421. The F-test result is 16.888 with a significance level of 0.000, indicating that the model is entirely suitable for analysis.

The regression results show that two independent variables, including the competitiveness in the business environment (MOITRUONG) and the perception of managers (NTNQL), have a statistically significant positive impact on the implementation of the business performance evaluation system. This confirms that the competitive business environment in the banking sector, with competitors in terms of products, services, and business processes, has driven the implementation of the performance evaluation system to provide Agribank with quick information for system control and business decision-making. Notably, the Beta coefficient for the manager's perception variable is $\beta = 0.539$, which has the most significant impact on the implementation of the business performance evaluation system at the units. These results are consistent with previous studies by other authors regarding the implementation of systems at different units.

Table 5. Results of correlation and regression analysis

Correlations

		MOITRUONG	CAUTRUC	NTNQL	CHIPHI	THUCHIEN
MOITRUONG	Pearson Correlation	1	.050	.282**	.215*	.391**
	Sig. (2-tailed)		.626	.005	.033	.000
	N	98	98	98	98	98
CAUTRUC	Pearson Correlation	.050	1	.007	.087	-.077
	Sig. (2-tailed)	.626		.942	.395	.454
	N	98	98	98	98	98
NTNQL	Pearson Correlation	.282**	.007	1	-.119	.594**
	Sig. (2-tailed)	.005	.942		.243	.000
	N	98	98	98	98	98
CHIPHI	Pearson Correlation	.215*	.087	-.119	1	.053
	Sig. (2-tailed)	.033	.395	.243		.605
	N	98	98	98	98	98
THUCHIEN	Pearson Correlation	.391**	-.077	.594**	.053	1
	Sig. (2-tailed)	.000	.454	.000	.605	
	N	98	98	98	98	98

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

*. Correlation is significant at the 0.05 level (2-tailed).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.649[a]	.421	.396	.54322	1.752

a. Predictors: (Constant), CHIPHI, CAUTRUC, NTNQL, MOITRUONG

b. Dependent Variable: THUCHIEN

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.934	4	4.983	16.888	.000[b]
	Residual	27.443	93	.295		
	Total	47.376	97			

a. Dependent Variable: THUCHIEN

b. Predictors: (Constant), CHIPHI, CAUTRUC, NTNQL, MOITRUONG

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.107	.536		2.064	.042		
	MOITRUONG	.232	.087	.227	2.668	.009	.857	1.167
	CAUTRUC	-.102	.082	-.099	-1.243	.217	.991	1.009
	NTNQL	.529	.082	.539	6.436	.000	.867	1.128
	CHIPHI	.067	.072	.077	.930	.355	.913	1.095

a. Dependent Variable: THUCHIEN

Source: Author's calculations from SPSS

The research did not find a statistically significant relationship between the organizational structure factor and the cost of implementing the system in relation to the implementation of the business performance evaluation system at Agribank.

The results of the research hypotheses are summarized as follows:

Table 6. Summary Table of the Results of the Research Hypotheses

Hypotheses	Content of the Hypothesis	Results
H_1	The competitiveness of the business environment has a positive impact on the implementation of the business performance evaluation system at Agribank	Accepted
H_2	A high degree of organic hierarchical structure in the organization will have a positive impact on the implementation of the business performance evaluation system at Agribank.	Rejected
H_3	The higher the costs incurred to implement the system, the greater the degree of implementation of the business performance evaluation system	Rejected
H_4	The managers' perception has a positive impact on the implementation of the business performance evaluation system at Agribank	Accepted

4. Conclusion

From the research results above, the regression equation can be written as follows:

TRIENKHAI = 1,107 + 0,232 MOITRUONG + 0,529 NTNQL

The findings indicate that both the competitiveness of the business environment and managers' perceptions have a positive impact on the implementation of the business performance evaluation system at Agribank. Specifically:

Competitiveness of the Business Environment: The competitive pressures from rivals in terms of products, services, and business processes encourage Agribank to adopt a performance evaluation system to quickly gather information for decision-making and control. This competitive environment prompts the bank to use performance evaluations to improve efficiency and stay competitive.

Managers' Perception: Managers' awareness of the utility, ease of use, and effectiveness of the business performance evaluation system significantly influences its adoption. A higher level of trust in the system's effectiveness boosts the likelihood of its successful implementation across different branches or units within Agribank.

These results are consistent with previous studies that highlight the role of both external market pressures and internal managerial support in driving the adoption of performance management systems.

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IMPACT OF RESPONSIBILITIES ACCOUNTING ON THE FINANCIAL EFFICIENCY OF ENTERPRISES: CASE STUDY IN VIETNAM

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Abstract: ***The study aims to determine the influence of the application of responsibility accounting on the financial performance of construction enterprises listed on the Vietnam stock exchange. Research is carried out by combining quanitative techniques with survey data of managers at 34 construction companies listed on HOSE. The study has shown 7-component scale on the level of application of responsibility accounting that effect on the financial performance of the enterprises: Division of organizational structure, Decentralization for managers, Budgeting, Evaluation of achieved, Reporting responsibility, Appropriate reward system.***

• Keywords: *impact, application of responsibility accounting, financial performance, Vietnam.*

JEL codes: M41; C58; B26; G39

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1. Introduction

Responsibility accounting is a part of management accounting, aiming to improve the efficiency of each responsibility center, contributing to the achievement of the overall goals of the organization. Responsibility accounting contributes to improving the operational efficiency of each department and each manager. Good responsibility accounting contributes to improving the efficiency in general and the financial efficiency in particular of businesses.

The relationship between the application of responsibility accounting and the financial performance of enterprises is shown in many studies. This research focuses on the effect of responsibility accounting application on financial performance in construction companies listed on Vietnam stock exchange according to SEM linear structure model.

2. Literature review and hypothesis development

2.1. Literature review

The relationship between the application of responsibility accounting and the financial performance of enterprises has been studied a lot in the world and in Vietnam. Some typical studies are as follows:

According to Atkinson et al. (2001), responsibility accounting is an accounting system with the function of collecting, synthesizing and reporting accounting data related to the tasks of each individual manager within an organization, providing information for assessing each manager's responsibility and performance, generating reports that include both controllable and non-controllable objects for a management level. According to the author's point of view, responsibility accounting is a part of management accounting, which is the job of receiving, processing, analyzing, providing information, and evaluating the management responsibility for handling. to achieve the overall goals of the organization. Responsibility accounting has an active role in improving the management and profitability of companies (Lin and Yu, 2002). Casey et al. (2008) studied the influence of organizational processes on responsibility accounting and the level of information security of managers. Research has shown that the most effective factor is the responsibility center, followed by performance measurement techniques, reward systems, performance measurement standards, and assignment of responsibilities.

The financial performance of an enterprise is assessed through 3 criteria: ROA, ROE, ROS (Hult and Izumida, 2008; Almajali et al, 2012). Okoye et al. (2009) research the application of responsibility accounting to improve the performance of production enterprises and confirmed the relationship between the application of responsibility accounting and corporate performance. Research by Amajali et al. (2012) has shown the impact of firm size on financial performance. Research by Tran (2015) determines the factors affecting the level of application of responsibility accounting in cement enterprises. It shows that the larger the company, the higher the financial performance. Nguyen (2018) studies corporate governance and corporate financial performance on the Vietnamese stock market with 789 companies listed on HOSE in the period of

* *Academy of Finance*

2013-2015. The author builds a regression model with variables depending on financial performance (ROA, ROE, TBQ, SRD). The results show that a company with a good corporate governance system will help increase financial efficiency. Saleh and Nimer (2022) study to determine the intermediate role of management accounting information systems in the relationship between innovation strategy and financial performance of industrial companies in Jordan. Research on application of responsibility accounting and financial efficiency. Author Mojgan (2012) found that to evaluate company performance, these following criteria should be used: ROI, RI, ROS, EVA, and balance scorecard. It is also important to use additional accounting information for the financial aspects (Hanini, 2013). Afifa and Saleh (2021) study Jordan's industrial companies and show that the management accounting system has a significant impact on financial performance. Al-Khasawneh et al. (2020) show that the application of modern management accounting techniques has a strong positive impact on the financial performance and performance of Jordan 's industrial companies listed on the Amman Stock Exchange. Research by Tran (2015) determines the factors affecting the level of application in cement enterprises. The study also shows that the correlation between the level of application and business performance is positive.

2.2. Research hypotheses development

According to Fowzia (2011), responsibility accounting has an impact on enterprise performance.

According to Almajali (2012), financial performance indicators are divided into two main groups: (i) using accounting figures: ratio between achieved results (net income, net profit) and other inputs (assets, capital, investment capital, equity); (ii) using economic models based on market value.

This paper uses accounting financial performance indicators including ROA, ROE and ROS.

$$\mathbf{ROA} = \frac{Profit}{Total\ asets\ average}$$

$$\mathbf{ROE} = \frac{Profit}{Average\ equity}$$

$$\mathbf{ROS} = \frac{Profit}{Turn\ over}$$

Based on the research of Hanini (2013), Tran (2015), the authors build a 7-component scale on the level of application of responsibility accounting. The study expects the relationship between the level of application of responsibility accounting and the financial performance of enterprises to be a positive correlation.

Research hypothesis:

Hypothesis H1: Division of organizational structure into responsibility centers is positively correlated to financial performance.

Hypothesis H2: Decentralization for managers at all levels has a positive correlation with financial performance.

Hypothesis H3: Appropriate allocation of expense and income is positively correlated to financial performance.

Hypothesis H4: Construction of estimated budget has a positive correlation with financial performance.

Hypothesis H5: Evaluation of achieved results compared with estimations has a positive correlation with financial performance.

Hypothesis H6: Reporting responsibility has a positive correlation with financial performance.

Hypothesis H7: Appropriate reward system has a positive correlation with financial performance.

The author consulted experts and added 2 more control variables: business size and operating time.

3. Research methods and design

3.1. Data collection

According to the data of vietstock.vn (2022), Vietnam has 34 construction companies listed on the HOSE stock exchange. 600 survey questionnaires were sent to department managers of 34 companies. The number of responses is 480, at rate of 80%, the number of usable responses is 451.

The questionnaire was designed according to a 5-point Likert scale on the level of responsibility accounting application and was sent to managers by email and post.

3.2. Measurement of variables

Table 1. Observable variables in the study

Group factor	The meaning of variables
Division of organizational structure into responsibility centers (SHARE)	Four observed variables include: Division of organizational structure into divisions according to operational functions (SHARE1), description of the part function in writing (SHARE2), clear division of work (SHARE3), Relationship between responsibility centers (SHARE4).
Decentralization of management (DECENTR)	Four observed variables include: There is a dedicated manager in each department (DECENTR1), managers in each department are specified in terms of rights and responsibilities (DECENTR2), department managers have full authority to make decisions within their management without being influenced by outside influences (DECENTR3), department manager with appropriate professional qualifications (DECENTR4).
Allocation of expense and income (ALLOT)	Four observed variables include: Recording income and expenses at the responsibility center (ALLOT1), system for allocating income and expenses (ALLOT2), cost allocation by responsibility center (ALLOT3), construction of cost plan (ALLOT4), allocation of indirect costs (ALLOT5).
Construction of estimated budget (ESTIM)	Four observed variables include: Construction of estimated budget for each department (ESTIM1), construction of estimated budget according to financial targets (ESTIM2), construction of estimated budget, according to non-financial targets (ESTIM3), all departments are involved in the construction of the estimate budget (ESTIM4).
Evaluation of achieved results compared with estimations (EVALU)	Four observed variables include: Comparison of the results achieved with the estimated budget (EVALU1), adjustment of operation after evaluation (EVALU2), comparison of the results to assess the performance of the responsibility center (EVALU3), comparison of the results to evaluate the effectiveness of managers (EVALU4).

Group factor	The meaning of variables
Reporting responsibility (REPO)	Three observed variables include: Periodically, each department makes its own report (REPO1), involvement of departments when making reports (REPO2), reports reflect volatility, is there a method to handle discrepancies in the report (REPO3).
Reward system (REWARD)	Four observed variables include: Material rewards for employees who achieve the plan (REWARD1), reward and encourage morale for employees who achieve the plan (REWARD2), employees are satisfied with the reward system (REWARD3), Increased operational efficiency (REWARD4).
Financial performance of the business (ACHIE)	Three observed variables include: ROS (ACHIE1), ROA (ACHIE2), ROE (ACHIE3).
Scale (SIZE)	Five control variables include: Under 1000 billion VND (SIZE1), From 1000 billion VND - Under 10,000 billion VND (SIZE2), From 10,000 billion VND -Under 20,000 billion VND (SIZE3), From VND 20,000 billion- Under VND 30,000 billion (SIZE4), From VND 30,000 billion or more (SIZE5).
Operating time (AGE)	Five control observed variables include: Under 10 years (AGE1), From 10 years - Under 20 years (AGE2), From 20 years - Under 30 years (AGE3), From 30 years - Under 40 years (AGE4), From 40 years or more (AGE5).

3.3. Research model

The following regression model is estimated in this paper:

$$ACHIE_{i,t} = \alpha + \beta_1 SHARE_{i,t} + \beta_2 DECENTR_{i,t} + \beta_3 ALLOT_{i,t} + \beta_4 ESTIM_{i,t} + \beta_5 EVALU_{i,t} + \beta_6 REPO_{i,t} + \beta_7 REWARD_{i,t} + \beta_8 SIZE_{i,t} + \beta_9 AGE_{i,t} + \varepsilon_{i,t}$$

4. Results and discussion

4.1. Cronbach's Alpha test

Table 2. Cronbach's Alpha Tests

Component	N of Items	Cronbach's Alpha
SHARE	4	0.839
DECENTR	4	0.855
ALLOT	4	0.872
ESTIM	4	0.846
EVALU	3	0.865
REPO	4	0.873
REWARD	4	0.854
ACHIE	3	0.856

In the process of running the model on AMOS 20 software, we see that the variable type ALLOT2 due to Corrected Item-Total Correlation is less than 0.3. Run it again, we get Table 2.

Table 2 shows the Corrected Item-Total Correlation of all variables is greater than 0.3 and the Cronbach Alpha coefficient is greater than 0.6. Hence, we do not eliminate any observable variables.

4.2. EFA exploratory factor analysis

When performing KMO and Bartlett's Test, the authors found that the variable EVALU3 was uploaded by this variable in both factors, then the author run it again and present the results in Table 3.

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.878
Bartlett's Test of Sphericity	Approx. Chi-Square	7499.264
	df	465
	Sig.	.000

Table 3: KMO and **Bartlett's Test show that** KMO = 0.878, so factor analysis is appropriate. Sig. (Bartlett's Test) = 0.000 (sig. < 0.05) shows that the observed variables participating in the EFA analysis are correlated with each other.

Table 4. Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.410	24.699	24.699	7.047	23.489	23.489	3.595
2	2.946	9.820	34.518	2.575	8.584	32.074	3.170
3	2.739	9.130	43.649	2.342	7.806	39.879	3.783
4	2.321	7.737	51.386	1.957	6.523	46.402	3.862
5	2.012	6.705	58.091	1.617	5.390	51.792	4.362
6	1.709	5.695	63.786	1.318	4.392	56.184	2.959
7	1.540	5.132	68.918	1.189	3.964	60.148	3.842
8	1.032	3.440	72.358	.696	2.322	62.470	5.127
9	.566	1.887	74.245				
10	.523	1.743	75.988				
11	.491	1.637	77.625				
12	.480	1.599	79.224				
13	.467	1.558	80.782				
14	.452	1.506	82.288				
15	.419	1.396	83.684				
16	.413	1.376	85.060				
17	.395	1.317	86.378				
18	.385	1.284	87.661				
19	.377	1.256	88.917				
20	.370	1.235	90.152				
21	.356	1.187	91.338				
22	.342	1.139	92.477				
23	.330	1.101	93.578				
24	.325	1.083	94.661				
25	.305	1.017	95.678				
26	.289	.964	96.642				
27	.274	.914	97.556				
28	.263	.876	98.432				
29	.247	.822	99.254				
30	.224	.746	100.000				

Extraction Method: Principal Axis Factoring.

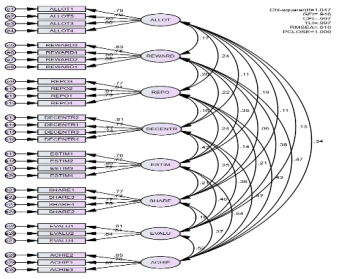
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

According to Table 4, there are 8 factors extracted based on the criterion eigenvalue of 1.032 > 1, so these 8 factors summarize the information of 30 observed variables included in EFA in the best way. The total variance of these factors extracted is 62.470% > 50%, thus, the 8 extracted factors explain 62.470% of the data variation of 30 observed variables participating in EFA.

4.3. Analysis of CFA

The author uses AMOSS 20 software to perform CFA analysis, the results of CFA analysis are shown in Figure 3.

Figure 3. CFA analysis results from AMOS 20 software



The results of CFA analysis on AMOSS 20 software in Figure 3 show that the Model Fit numbers are all within acceptable thresholds: CMIN/DF = **1.047**< 3; GFI = **0.946** > 0.9; CFI = **0.997** > 0.9; TLI = **0.997** > 0.9; RMSEA = **0.010** < 0.08; PCLOSE =

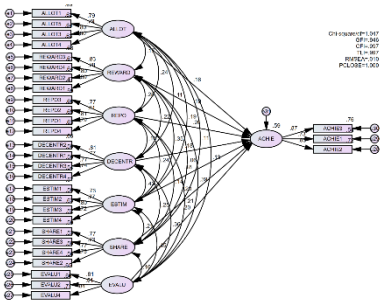
1.000 > 0.05. Thus, the model has a good fit. At the same time, all observed variables are significant in the model because the p-value is less than 0.05.

4.4. Structural Equation Model Analysis SEM

The results of SEM structural equation modeling analysis show that Chi-square/df = 1.047 < 3, GFI criteria = 0.946, CFI = 0.997, TLI = 0.997, RMSEA = 0.10 < 0.080, thus, meeting the compatibility requirements. .

All effects in the model are significant because the p-values are less than 0.05.

Figure 4. SEM model



The analysis results on AMOSS 20 in Table 6 show the R2 value of the dependent variable ACHIE is 0.592. Thus, the independent variables affecting ACHIE explain 59.2% of the variation of this variable.

Table 6. Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
ACHIE	.592

4.5. Summary of results and discussion

The analysis results show that the variable that divides the organization into responsibility centers is positively correlated to financial performance (mean estimate coefficient is 0.200). This result is consistent with the study of Tran Trung Tuan (2015), which proves that a clear division of responsibilities between departments will promote financial efficiency. Dividing the organizational structure into responsibility centers is a premise to implement and promote the role of responsibility accounting.

The decentralization variable is positively correlated to financial performance (mean estimate coefficient is 0.180). This proves that enterprises that clearly decentralize management to department managers have a positive impact, contributing to increasing financial efficiency.

The cost-income distribution variable also has a positive correlation (mean estimate is 0.159). When businesses allocate income - expenses in more detail, it will positively affect financial performance, contributing to increasing financial efficiency.

The positive impact estimation variable has a positive correlation with financial performance (mean estimate is 0.182). The level of estimation in accordance with the needs of using and controlling information will make businesses operate more efficiently.

The estimated evaluation variable compared with the actual one has a positive correlation with financial performance (mean estimate coefficient is 0.199). Thus, evaluating the results achieved against the estimates will make the departments work harder to achieve the estimates, making the business operate more efficiently.

Reporting variables has a positive correlation with financial performance (mean estimate is 0.201). Therefore, making reports to evaluate the results achieved compared to the estimate will make the departments work harder to achieve the plan, making the business operate more efficiently.

The reward variable has a positive correlation coefficient with financial performance (mean estimate coefficient is 0.194). This proves that enterprises with an appropriate and useful reward system will positively affect employees, department management, increase operational and management efficiency, and improve financial performance.

Conclusion: The research results show that all 07 factors of responsibility accounting positively correlate with financial performance. Therefore, businesses need to strongly apply responsibility accounting to improve financial efficiency. Dividing the organizational structure into clear responsibility centers is a starting condition for enterprises to well implement responsibility accounting, follows up by the application of other 6 factors to establish an efficient responsibility accounting system in enterprises.

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DIVIDEND PAYMENTS AND CORPORATE FINANCIAL PERFORMANCE: A VIETNAMESE MARKET PERSPECTIVE

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Abstract: ***This study examines the impact of cash dividend payments on the financial performance of Vietnamese listed firms from 2018-2024, using data from 835 non-financial companies. The analysis evaluates how the cash dividend payout ratio influences key performance indicators and how these effects differ between the COVID-19 period and the post-pandemic phase. The results provide updated evidence on the dividend-performance relationship in an emerging market and highlight the role of market conditions in shaping dividend decisions. The study offers practical implications for managers and investors in formulating dividend strategies that balance shareholder returns with sustainable financial stability.***

• Keywords: *dividend rate; cash dividend payout; financial performance; Vietnam market.*

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1. Introduction

Dividend policy remains one of the most debated issues in corporate finance due to its influence on firm value and financial performance. In emerging markets with concentrated ownership, weak investor protection, and limited enforcement such as Vietnam dividends play a particularly important role by mitigating agency conflicts, signaling financial strength, and supporting firms facing financing constraints (Vo & Ellis, 2017). As a result, dividend decisions are closely tied to investment capacity and long-term profitability.

Although Vietnam's capital market has expanded rapidly, empirical evidence on the dividend-performance relationship remains limited. Existing studies (e.g., Vu et al., 2021; Truong et al., 2023) provide mixed findings and often rely on older datasets, narrow samples, or simplified measures such as dividend yield or payout ratio. They also overlook structural factors firm size, industry characteristics, and capital structure that may shape how dividends affect performance.

Given Vietnam's ongoing financial reforms and dynamic market conditions, updated research is required to clarify how dividend payments influence profitability, investment opportunities, and firm value. This study contributes by: (i) providing recent evidence from firms listed on HOSE, HNX, and the OTC market between 2018 and 2024; (ii) incorporating firm size and industry differences to capture structural heterogeneity; and (iii) applying robust econometric techniques, including fixed effects, random effects, and instrumental variable models, to address endogeneity. The findings are expected to enrich the literature and offer practical implications for managers, investors, and regulators in formulating balanced and effective dividend policies.

2. Literature review and hypothesis development

2.1. Theoretical Framework

2.1.1. Dividends and Dividend Payments

Dividend policy refers to how a company determines the amount and form of profit distribution to shareholders (Do, T. L. V. H., 2024). Firms with stable earnings usually maintain consistent dividend payments, while those with volatile profits adopt flexible policies to protect investor confidence (Ahmad Yahaya, 2024). The Dividend Irrelevance Theory (Modigliani & Miller, 1961) suggests that dividends do not affect firm value in perfect markets; however, this view is limited in Vietnam due to information asymmetry and transaction costs (Nguyen, 2021). Conversely, the Bird-in-Hand Theory (Gordon & Lintner, 1963) argues that investors prefer current dividends for their certainty, especially in markets where liquidity is valued. Overall, in emerging markets like Vietnam, dividend policy plays an essential role in improving financial performance and maintaining investor trust (Nguyen & Bui, 2017).

2.1.2. Dividend term

Dividend metrics are essential for evaluating a firm's dividend-paying capacity and investment attractiveness. Key indicators include Dividend Yield, Dividend Payout Ratio, Dividend per Share (DPS), Dividend Growth Rate, and Dividend Cover (Jensen et al., 1992; Lintner, 1956). Dividend Yield indicates the return from dividends relative to share price (Black & Scholes, 1974), while the Dividend Payout Ratio shows the proportion of earnings distributed as dividends, reflecting sustainability (Miller & Modigliani, 1961). DPS represents the dividend paid per share (Fama & French, 2001), and Dividend Growth Rate measures dividend increases over time (Gordon, 1959). Lastly, Dividend Cover compares net income to

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dividends paid, showing the firm's capacity to maintain payments (Grinblatt & Titman, 2002).

2.1.3. Theories on Financial Performance

Financial performance reflects a firm's operational efficiency and its capacity to generate sustainable returns. Common indicators include Return on Assets (ROA), Return on Equity (ROE), Earnings per Share (EPS), and Tobin's Q, which together capture both accounting-based and market-based performance. ROA measures how effectively assets generate profits, while ROE assesses returns attributable to shareholders; as noted by Jensen (1986), dividend policy may enhance ROE by reducing agency conflicts. EPS reflects profitability per share, and Tobin's Q indicates how the market values a firm's assets relative to their book value.

2.2. Financial Leverage (LEV)

Leverage refers to the ratio of debt to equity in a company's capital structure. It plays a vital role in determining financial risk and return. The Pecking Order Theory (Majluf, 1984) suggests an inverse relationship between leverage and profitability, whereas the Trade-off Theory (Kraus & Litzenberger, 1973) emphasizes balancing tax benefits from debt against potential financial distress. Similarly, the M&M Theory (Modigliani & Miller, 1958) highlights that interest tax shields can enhance firm value. Debt financing can stimulate profit growth but also increase risk exposure (Van, 2018). Empirical studies show mixed results: Xu, Mou, and Banchuenvijit (2015) found a positive effect of leverage on performance, while Myers and Turnbull (1977) noted that high-growth firms tend to adopt lower leverage. Berger and Bon (2006) further indicated that higher debt ratios may reduce external equity costs, improving efficiency. In Vietnam, evidence shows that leverage often negatively affects performance, particularly reducing ROE for highly profitable firms (Pham Thi Hong Van, 2016). Overall, leverage remains a crucial determinant of firm performance, structure, and financial stability.

2.3. Total Asset Turnover (TAT)

The Total Asset Turnover (TAT) is a key financial indicator that measures how efficiently a company uses its assets to generate revenue.

$$Total\ Asset\ Turnover = \frac{Net\ Revenue}{Average\ Total\ Assets}$$

A higher TAT reflects effective asset utilization, stronger operational performance, and improved profitability. Dang and Nguyen (2018) found a positive relationship between TAT and profitability, indicating that firms with higher turnover often achieve better margins through efficient asset use. Similarly, Phan and Nguyen (2020) emphasized that high TAT enhances financial performance, liquidity, and overall efficiency. However, Vo (2020) noted that higher fixed asset turnover may increase financial risk due to greater leverage or aggressive utilization strategies. Therefore, while TAT is an important determinant of profitability and efficiency, firms should balance asset utilization with financial stability to ensure sustainable growth

2.4. Growth Rate (GROWTH)

The growth rate (GROWTH) is included to capture a firm's expansion potential and its influence on dividend decisions. Under the Pecking Order Theory (Myers & Majluf, 1984), high-growth firms typically retain earnings to finance new investments, while mature firms are more likely to distribute dividends. Growth is closely associated with financial performance, as firms with strong reinvestment prospects often achieve higher profitability and market valuation. Conversely, maintaining high dividend payments despite low growth may weaken reinvestment capacity and long-term stability. Therefore, controlling for GROWTH is essential to more accurately assess the relationship between dividend policy and firm performance in the Vietnamese market.

2.5. Company Size (SIZE)

Company size, typically measured by total assets or market capitalization, is a key factor in understanding how dividend policy influences financial performance. Larger firms often have more financial resources, enabling them to maintain stable dividend payouts without harming investment potential (Amidu, 2007; Onanjiri & Korankye, 2014). However, evidence also suggests that size does not guarantee superior performance; larger firms may struggle with inefficiencies and reduced flexibility, which can lower profitability (Amidu, 2007).

Overall, while large firms have the capacity to maintain dividends, their actual financial outcomes depend on internal governance, operational efficiency, and their ability to navigate complex, often volatile, market environments.

2.6. Return on Equity (ROE)

Return on Equity (ROE) is a key financial ratio that measures how effectively a company generates profits from shareholder equity, thereby serving as an essential indicator of financial performance. A high ROE demonstrates efficient use of equity capital, enhances investor confidence, and often supports dividend distribution. However, the relationship is not always straightforward (Khan et al, 2016) argue that excessive dividend payouts may reduce retained earnings available for reinvestment, potentially lowering future ROE, particularly in firms requiring high capital expenditures. Evidence from Vietnam also highlights its significance: Hoang Thi Kim Thoa (2021), analyzing real estate firms listed on the Vietnamese stock market between 2015 and 2019, found that ROE positively influences capital structure, indicating that higher profitability motivates firms to strategically adjust their financing mix.

2.7. Return on Assets (ROA)

Return on Assets (ROA) assesses a firm's ability to generate profits from its total assets and is widely

used as a performance measure in relation to dividend policy (Murekefu & Ouma, 2012). A high ROA suggests effective asset utilization, enabling firms to distribute dividends while sustaining reinvestment in growth opportunities. Nonetheless, Amidu (2007) and Khan et al. (2016) emphasize that this relationship is not linear: low-ROA firms often retain earnings for reinvestment, while high-ROA firms typically maintain a positive relationship with dividends, though some may still withhold payouts to pursue expansion or preserve financial flexibility. In the Vietnamese context, Ha Nguyen (2023) examined commercial banks and found that ROA is strongly affected by credit risk, with higher bad debts reducing profitability and lowering banks' financial resilience. Conversely, banks with high ROA are better equipped to manage risks and sustain profitability, underscoring the dual role of ROA as both a profitability measure and a stability indicator.

2.8. Cash Dividend Payout (DCASH)

Cash dividends are central to corporate finance, explained by the Bird-in-the-Hand Theory (Gordon, 1963), Agency Theory (Jensen & Meckling, 1976), and Signaling Theory (Bhattacharya, 1979), which view dividends as investor assurance, a tool to reduce agency costs, and a signal of financial strength. Empirical studies (Arnott & Asness, 2003; Gill et al., 2010) show that higher dividend payouts are associated with better financial performance. In Vietnam, Nguyen Kim Phuoc and Pham Minh Tien (2021) found that earnings growth increases dividend payments while leverage reduces them, and Nguyen Phuc Hien and Ngo Thi Thuy Huyen (2023) reported that cash dividends enhance firm value, especially during crises like COVID-19. However, in developing markets, high payouts may limit reinvestment opportunities for smaller firms, making the impact of dividends dependent on market and firm characteristics.

2.9. Hypothesis Development

The relationship between dividend payments and financial performance remains inconclusive across markets. Some studies find a positive impact on firm value and investor trust (Imad Jabbouri, 2016; Hussainey, 2011), while others report negative or insignificant effects (Hasan et al., 2015; Amidu, 2007). In Vietnam, research remains limited and often methodologically constrained, with studies such as Dang et al. (2018) and Truong et al. (2023) focusing more broadly on dividend policy rather than direct payout behavior. Furthermore, moderating variables like firm size, industry classification, and capital structure are often overlooked, even though they significantly shape performance outcomes in emerging economies. This study therefore investigates how dividend payments influence financial performance in Vietnamese listed firms and examines the moderating roles of firm size and industry type. Accordingly, the study proposes the following hypotheses:

Hypothesis 1 (H1): The dividend payments rate has a detrimental effect on the financial performance of businesses.

Hypotheses 2 (H2): Financial leverage negatively affects firms' profitability.

Hypotheses 3 (H3): Firm size positively influences profitability.

Hypotheses 4 (H4): Total asset turnover has a positive impact on financial performance.

Hypotheses 5 (H5): Sales growth positively influences firm profitability.

3. Methodology

3.1. Data collection

Data collection for this study was collected through FiinPro software. The data was collected from publicly listed companies in Vietnam across various industries listed on HOSE; HNX and OTC from 2018 to 2024. By the end of 2024, a total of 3,165 firms were listed on Vietnam's official stock exchange. The financial statements of all these companies from 2018 to 2024 were collected and compiled into a multi-column Excel file, in which ratios for the variables of each company in the research sample were calculated.

3.2. Variable measurement

The literature review of previous research models indicates that the majority of studies have successfully demonstrated the impact of dividend payment on a company's financial performance based on five variables, of which four control variables are (1) LEV; (2) TAT; (3) SIZE; (4) GROWTH and one independent variable is (5) DCASH.

Variables are represented through: Financial Leverage (1); Total Asset Turnover (2); Firm Size (3); Growth Rate (4) and Cash Dividend Payout (5)

3.3. Empirical approach

The research model is developed using Tobin's Q, ROA (Return on Assets), and ROE (Return on Equity) as key indicators of firms' financial performance. The model incorporates five variables listed above to examine their influence on financial performance.

The model has also been demonstrated similarly through studies such as (Nguyen, 2021). The models are presented as follows:

1. $ROA_{it} = \beta + \beta_1 LEV_{it} + \beta_2 TAT_{it} + \beta_3 SIZE_{it} + \beta_4 GROWTH_{it} + \beta_5 DCASH_{it} + \varepsilon_{it}$
2. $ROE_{it} = \beta + \beta_1 LEV_{it} + \beta_2 TAT_{it} + \beta_3 SIZE_{it} + \beta_4 GROWTH_{it} + \beta_5 DCASH_{it} + \varepsilon_{it}$
3. $Tobin's\ Q_{it} = \beta + \beta_1 LEV_{it} + \beta_2 TAT_{it} + \beta_3 SIZE_{it} + \beta_4 GROWTH_{it} + \beta_5 DCASH_{it} + \varepsilon_{it}$

ROA_{it} is Return on average total assets of the company i period t; ROE_{it} is Return on average equity of company i period t; Tobin's Q_{it} is a measure of firm assets in relation to a firm's market value (the company i, period t).

Descriptive statistics (minimum, maximum, median, mode, and standard deviation) are used to summarize the characteristics of the sample, offering an overview of firm size, growth, leverage, cash dividends per share, and dividend payout ratios. Correlation analysis is then

conducted to examine linear relationships between dividend payments (DCASH) and performance indicators (ROA, ROE, Tobin's Q), as well as among control variables. This step provides preliminary evidence of whether dividend policy is associated with firm performance while signaling potential multicollinearity issues typically indicated by correlation coefficients approaching ±1.

Multicollinearity is further assessed through Variance Inflation Factor (VIF) values to ensure the robustness of the regression models after controlling for firm-specific factors such as LEV, TAT, SIZE, and GROWTH. Model selection is based on the F-test (Pooled OLS versus Fixed Effects Model) and the Hausman test (FEM versus Random Effects Model). Finally, the significance and direction of estimated coefficients (β) are interpreted to determine the impact of dividend payments and control variables on firm performance.

4. Results and discussion

4.1. Results

The descriptive statistics in Table 1 show that the sample firms exhibit an average ROA of 7%, an average ROE of roughly 13%, and an average Tobin's Q of 1.17. A Tobin's Q above 1 suggests that the market values these firms more highly than their book value, reflecting investor confidence in future growth prospects. Between 2018 and 2023, over 75% of listed firms paid cash dividends annually; however, by 2024, the proportion of non-paying firms rose sharply to nearly 80%, driven by economic uncertainty, rising cost pressures, and the need to preserve liquidity.

Table 2 presents the correlation coefficients among key variables, providing initial evidence on the relationships between dividend payments and financial performance.

Table 1: Statistics description of dependent and independent variables

Variable	Obs	Mean	Std. dev.	Min	Max
DCASH	4,401	0.8020	2.9064	-145.1	47.87
ROA	5,533	0.0714	0.0746	-0.2795	1.0283
ROE	5,533	0.1329	0.1778	-4.9019	6.7888
LEV	5,660	0.4480	0.2238	0.01	1.25
TAT	5,528	1.4668	1.5186	0	16.75
GROWTH	5,533	0.1082	1.7620	-0.9787	119.0059
SIZE	5,660	11.7514	0.6794	10.14	14.35
TOBINQ	5,660	1.1669	0.6612	0.05	11.26

Source: The result of research

Table 2: Correlation matrix between independent variables

	TOBINQ	ROA	ROE	DCASH	LEV	TAT	GROWTH	SIZE
TOBINQ	1.0000							
ROA	0.5166	1.0000						
ROE	0.2930	0.7258	1.0000					
DCASH	0.0096	-0.0498	-0.0582	1.0000				
LEV	-0.2115	-0.4197	-0.0116	-0.0349	1.0000			
TAT	-0.0389	0.0391	0.1118	-0.0063	0.1450	1.0000		
GROWTH	0.0082	0.1169	0.1243	-0.0232	0.0312	0.0902	1.0000	
SIZE	0.1880	0.0107	0.0960	-0.0456	0.2204	-0.1494	0.0301	1.0000

Source: The result of research

The results show that financial variables have a certain relationship with the performance of the company as measured by ROA, ROE and Tobin's Q. Specifically, ROA and ROE are strongly and positively correlated with Tobin's Q, implying that higher profitability enhances firm value. LEV shows a negative correlation with both ROA and Tobin's Q, suggesting that high leverage harms performance. In addition, other independent variables such as DCASH, TAT, and GROWTH also show weak correlations with firm performance, consistent with the assumption that there is no excessive relationship between the variables. The reported results show that all variables have VIF less than 2 (specifically, Mean VIF is 1.05), so there is no serious multicollinearity problem in our research model.

Table 3: Result for multicollinearity phenomenon

Variable	VIF	1/VIF
SIZE	1.09	0.9149
LEV	1.09	0.9185
TAT	1.07	0.9362
GROWTH	1.01	0.9894
DCASH	1.00	0.9968
Mean VIF	1.05	

Source: The result of research

After checking for correlation, autocorrelation and multicollinearity issues, we further evaluate the suitability of the regression model for the panel data. To do this, we first conduct Pooled OLS and Fixed Effects Model (FEM). The results from the F-test show that FEM is more suitable than OLS. This leads to a test to compare FEM and Random Effects Model (REM) using the Hausman test and this shows that FEM is more suitable than REM for analyzing the data in this study.

There search model for ROA could be presented as the following equation:

$$ROA_{i,t} = -0.0236 - 0.0014DCASH - 0.1568LEV + 0.0057TAT + 0.0158GROWTH + 0.0140SIZE + \varepsilon_{i,t}$$

The cash dividend payout ratio (DCASH) has a negative and statistically significant effect on ROA at the 1% level, indicating that higher dividend payments reduce asset profitability. This finding aligns with Khan et al. (2016) but contrasts with Amidu (2007), who found a positive effect. Financial leverage (LEV) also shows a strong negative impact, implying that excessive debt lowers asset returns through higher interest costs. In contrast, total asset turnover, sales growth, and firm size positively and significantly affect ROA, suggesting that efficient, growing, and larger firms achieve higher profitability.

The regression results show that R-squared = 0.2193, meaning that the model explains about 21.93% of the variation in ROA.

The following equation might be used to represent their ROE search model:

$$ROE_{i,t} = -0.1845 - 0.0027DCASH - 0.0431LEV + 0.0131TAT + 0.0301GROWTH + 0.0283SIZE + \varepsilon_{i,t}$$

Similar to the ROA model, DCASH has a negative and significant effect on ROE, indicating that dividend payments lower equity returns by reducing reinvestment capacity. Financial leverage also negatively and significantly affects ROE, reflecting the impact of financial costs and risks. In contrast, total asset turnover,

sales growth, and firm size positively influence ROE, suggesting that efficient, expanding, and larger firms utilize equity more effectively.

The R-squared value = 0.0436, meaning that the model only explains 4.36% of the variation in ROE, indicating that there are many other factors affecting equity performance.

The following equation could be used to represent the search model for Tobin's Q:

$$\text{Tobin's } Q_{i,t} = -1.4899 + 0.0028DCASH - 0.3828LEV + 0.0172TAT + 0.0073GROWTH + 0.2587SIZE + \varepsilon_{i,t}$$

The DCASH variable shows a positive coefficient but insignificant effect (p = 0.402), indicating that dividend payouts do not significantly influence firm market value. Financial leverage has a strong negative and significant impact, suggesting that highly leveraged firms are undervalued due to increased financial risk. Among control variables, total asset turnover and firm size positively and significantly affect Tobin's Q, implying that investors favor efficient and larger firms. However, sales growth is positive but is not significant, reflecting that sales growth is not a significant factor affecting market value in this context.

The R-squared value = 0.1042 shows that the independent variables explain 10.42% of the variation in Tobin's Q.

4.2. Discussion

The regression results indicate that the cash dividend payout ratio (DCASH) has a negative and statistically significant impact on both ROA and ROE, while its effect on Tobin's Q is positive but not statistically significant. This suggests that cash dividend payments do not enhance firm performance; on the contrary, they may reduce the efficiency of asset utilization and equity returns.

Table 4: Hypothesis analysis result

No	Hypothesis	Finding	Supported references
H1	The dividend payments rate has a detrimental effect on the financial performance of businesses.	Supported	Hasan, Ahmad, Rafiq and Rehma (2015); Tran et al. (2015); Khan et al. (2016)
H2	Financial leverage negatively affects firms' profitability.	Supported	Tran et al. (2015); Khan et al. (2016)
H3	Firm size positively influences profitability.	Supported	Tran et al. (2015); Khan et al. (2016)
H4	Total asset turnover has a positive impact on financial performance.	Supported	Tran et al. (2015)
H5	Sales growth positively influences firm profitability.	Supported	Khan et al. (2016); Tran et al. (2015)

Source: The result of research

These findings are consistent with the study (2015) in Pakistan and the research by Tran et al. (2015) in Vietnam, both of which concluded that the dividend payout ratio negatively affects financial performance. Moreover, this study finds that dividend payments may deplete internal financial resources for reinvestment, thereby reducing profitability. The results are also aligned with the conclusion of Khan et al. (2016), who emphasized the adverse effect of dividend payments on financial performance, and contrast with the findings of Amidu (2007), who suggested that dividends could enhance financial efficiency.

From a theoretical perspective, these results are supported by the Pecking Order Theory, which posits that firms prefer to use internal financing before resorting to external sources. Cash dividend payments reduce retained earnings, weaken the firm's capacity for internal financing, and potentially force the firm to rely more heavily on external capital (e.g., debt), thereby increasing financial risk and diminishing performance.

5. Conclusion

This study examines the impact of dividend payments on corporate financial performance in the Vietnamese stock market from 2018 to 2024. Using panel data regression and a robust quantitative approach, it analyzes the effect of the cash dividend payout ratio (DCASH) and other financial variables on three key performance indicators.

The study highlights that the cash dividend payout ratio negatively and significantly affects both ROA and ROE, indicating that high dividends can reduce internal financial resources and hinder profit generation. Accordingly, firms should reassess dividend policies, particularly during economic volatility, and consider lowering cash dividends to retain earnings for reinvestment in value-adding activities, especially in emerging markets like Vietnam, where internal financing is often more sustainable than external capital.

The effect of dividend payouts on Tobin's Q is positive but not statistically significant, suggesting market valuation may not be directly affected by dividend policy in Vietnam. To attract investors and enhance market perception, firms should ensure transparent financial reporting, manage financial risks, and clearly communicate dividend strategies, helping to prevent negative investor sentiment from policy changes.

Financial leverage strongly negatively affects all performance metrics, while total asset turnover and sales growth consistently contribute positively. Firm size shows a slight positive effect, highlighting the importance of operational efficiency and scale. The negative impact of leverage underscores the need for prudent debt management; firms should avoid overreliance on debt and pursue balanced capital structures that prioritize long-term stability, enhancing both profitability and firm valuation.

In conclusion, this study contributes to corporate finance literature in emerging markets and offers managerial and policy implications. The findings emphasize the importance of strategic dividend decisions and efficient internal resource use for sustaining long-term financial performance in Vietnam's dynamic economic environment.

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ASSET VOLATILITY ANALYSIS USING THE STRUCTURAL APPROACH EVIDENCE FROM LISTED CONSUMER GOODS FIRMS IN VIETNAM

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Abstract: ***This paper investigates asset volatility (σA) and probability of default (PD) in Vietnam's consumer goods sector using the structural approach pioneered by Merton (1974). The study employs panel data from 101 listed firms on the Ho Chi Minh Stock Exchange (HSX) and Hanoi Stock Exchange (HNX) during the period 2015–2024. Results show that asset volatility is highly cyclical, with peaks during crises such as the COVID-19 pandemic and normalization during recovery years. Sub-sectoral analysis reveals strong heterogeneity: defensive industries such as Household & Personal Products and Essential Retail maintained stable profiles, while cyclical industries such as Consumer Services, Fashion & Durables, and Non-Essential Retail faced elevated risks. Furthermore, the relationship between volatility and default probability is non-linear, highlighting the role of leverage and capital structure in amplifying or mitigating credit risk. These findings have important implications for investors, regulators, and corporate managers in emerging markets, emphasizing the need for sector-specific credit risk monitoring, portfolio diversification strategies, and prudent financial management.***

• Keywords: *asset volatility; probability of default; structural approach.*

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1. Introduction

Vietnam's stock market has developed rapidly since the establishment of the Ho Chi Minh City Stock Exchange (HSX) in 2000, becoming a key channel for capital mobilization, privatization of state-owned enterprises, and private sector growth. By 2024, market capitalization exceeded 90% of GDP, with more than 1,600 listed firms and a diversified structure including derivatives such as futures, warrants, and corporate bonds.

The consumer goods industry plays a critical role, contributing substantially to GDP and employment. Between 2015 and 2024, the sector expanded due to urbanization, rising incomes, and multinational participation. However, firms also faced challenges from input cost pressures, intense competition, shifting consumer behavior, and macroeconomic shocks such as COVID-19 and global financial volatility (Nhung, Le, & Hoang, 2018). These factors highlight the need for accurate measurement of asset and credit risk.

Conventional accounting-based risk measures are often backward-looking and less responsive to real-time conditions in emerging markets. The Structural Approach (Merton, 1974) addresses this by modeling equity as a call option on firm assets, enabling estimation of Distance-to-Default (DD) and Probability of Default (PD) directly from market data (Bharath & Shumway, 2008). Combined with the Geometric Brownian Motion (GBM) model, which captures expected return (μ) and volatility (σ) (Hull, 2018), this provides a comprehensive framework linking stock price dynamics to credit risk.

This paper applies the integrated GBM-Structural Approach to 101 consumer goods firms listed on HSX and HNX from 2015-2024, aiming to deliver empirical insights on asset volatility, default risk, and sectoral heterogeneity that are relevant for investors, regulators, and policymakers.

2. Geometric Brownian Motion (GBM)

Geometric Brownian Motion (GBM) is a widely used model in finance for describing the stochastic behavior of asset prices under continuous time, assuming constant drift and volatility. It underpins option pricing frameworks such as the Black-Scholes-Merton model (Hull, 2018). The stochastic differential equation is:

$$dS_t = \mu S_t dt + \sigma S_t dB_t$$

where S_t is the asset price, the drift (long-term growth rate), the volatility, and B_t standard Brownian motion.

Built on the Efficient Market Hypothesis (EMH), GBM assumes asset prices fully reflect available information, ensuring no long-run arbitrage. It captures randomness in returns while providing a tractable basis for risk and return estimation. Empirical evidence Reddy and Clinton (2016) for Australia, Son (2025) for Vietnam confirms GBM's

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suitability for modeling volatility, especially in large-cap, liquid stocks.

3. Estimating Drift and Volatility of Stock Returns

To apply GBM and the Structural Approach, the first step is to compute the logarithmic return (log return) of stock prices. The log return is calculated as:

$$u_{i,t} = ln\left(\frac{S_{i,t}}{S_{i,t-1}}\right)$$

where $S_{i,t}$ is the closing price at time t. Log returns are additive over time, making them suitable for financial time series analysis (Tsay, 2010).

The annualized stock return volatility (σ_E) is estimated from the standard deviation of daily log returns, adjusted by the number of trading days in a year. The formula is as follows:

$$\sigma_E = \sqrt{\frac{1}{\tau(n-1)}\sum_{t=1}^{n}(u_{i,t} - \overline{u_i})^2}$$

where n is the number of trading days in a year, and τ is the length of the time interval expressed in years. In most cases, with approximately 250 trading days annually, τ is assumed to be 1/250.

The drift parameter (μ_E) is derived from the average daily log return, adjusted for variance, and then annualized as:

$$\mu_E = \frac{\overline{u_i}}{\tau} + \frac{1}{2}\sigma_E^2$$

These measures of drift and volatility are critical inputs for asset risk models, enabling estimation of asset volatility () and probability of default (PD) (Hull, 2018; Tsay, 2010).

4. Structural Approach

The Structural Approach, based on Merton's (1974) model, treats equity as a call option on the firm's assets, where default occurs if asset value falls below debt at maturity. The market value of equity is expressed as:

$$E = V_A N(d_1) - De^{-rT}N(d_2)$$

$$d_1 = \frac{\ln\left(\frac{V_A}{D}\right) + (r + 0.5{\sigma_A}^2)T}{\sigma_A\sqrt{T}}, d_2 = d_1 - \sigma_A\sqrt{T}$$

where V_A is asset value, D debt, σ_A asset volatility, r the risk-free rate, and N(.) the cumulative normal distribution. Asset volatility is linked to equity volatility by:

$$\sigma_A = \frac{1}{N(d_1)} * \frac{E_t}{V_t} * \sigma_E$$

This framework leverages real-time market data, providing forward-looking measures of credit risk superior to accounting-based methods (Hull, 2018; Crosbie & Bohn, 2003). It underpins modern risk management systems, including Moody's KMV model, and has been widely applied to both developed and emerging markets for corporate default estimation.

5. Distance-to-Default (DD) and Probability of Default (PD)

In the Structural Approach, DD measures how many standard deviations a firm's asset value exceeds its debt at maturity, with higher DD indicating lower risk. It is defined as:

$$DD = \frac{\ln\left(\frac{V_A}{D}\right) + (\mu_A + 0.5{\sigma_A}^2)T}{\sigma_A\sqrt{T}}$$

where V_A is asset value, D, μ_A expected asset return, σ_A asset volatility, and T time to maturity.

Once DD is calculated, PD is determined as:

$$PD = N(-DD)$$

where N(.) denotes the cumulative standard normal distribution function.

This framework translates market-based measures of value and volatility into forward-looking credit risk indicators, outperforming traditional accounting-based models (Merton, 1974; Hull, 2018). It underpins systems such as Moody's KMV and Basel II/III IRB (Crosbie & Bohn, 2003; Kealhofer, 2003), and is especially valuable in emerging markets where accounting data are limited. By capturing both systemic and firm-specific risks, the DD-PD framework strengthens credit risk monitoring, financial stability analysis, and investment decision-making.

6. Application of the Model to Consumer Goods Firms Listed in Vietnam

This study analyzes stock return dynamics for 101 consumer goods firms listed on HSX and HNX during 2015-2024. The sector was chosen for its macroeconomic relevance, given its large scale, contribution to GDP, and sensitivity to domestic policy shifts and global financial shocks (Nhung, Le, & Hoang, 2018). To ensure accuracy, illiquid stocks and firms with missing data were excluded. Volatility and drift were calculated using the actual number of trading sessions each year, rather than the standard 252-day assumption, reflecting Vietnam's market conditions. Risk-free rates were proxied by annual yields of Vietnamese government bonds as reported by the State Bank of Vietnam, ensuring consistency with the Structural Approach framework.

Stock Return Drift and Volatility

Table 1: Descriptive Statistics of Stock Return Drift and Volatility

		Mean	Median	Max	Min	Standard Deviation
2024	Volatility	21.10%	20.35%	67.68%	1.45%	9.30%
	Drift	3.01%	1.57%	307.00%	-93.79%	42.69%
2023	Volatility	26.95%	26.99%	57.50%	7.04%	10.80%
	Drift	16.34%	11.01%	162.72%	-60.49%	38.28%
2022	Volatility	38.43%	33.03%	103.12%	4.99%	19.14%
	Drift	-13.36%	-13.62%	241.26%	-132.83%	54.10%
2021	Volatility	35.88%	33.37%	85.70%	10.29%	15.71%
	Drift	63.65%	40.65%	296.55%	-52.49%	79.43%
2020	Volatility	38.19%	31.74%	111.02%	1.76%	20.29%
	Drift	40.37%	26.38%	225.04%	-211.14%	68.75%

		Mean	Median	Max	Min	Standard Deviation
2019	Volatility	29.06%	22.82%	98.69%	0.00%	20.55%
	Drift	7.52%	2.00%	212.11%	-82.09%	50.34%
2018	Volatility	34.24%	31.99%	92.30%	1.74%	18.78%
	Drift	12.63%	2.48%	339.63%	-114.54%	72.51%
2017	Volatility	29.33%	24.70%	90.72%	7.14%	15.56%
	Drift	17.38%	4.98%	278.28%	-72.44%	60.63%
2016	Volatility	34.90%	31.84%	93.54%	8.44%	16.02%
	Drift	3.90%	3.31%	239.67%	-226.28%	72.03%
2015	Volatility	29.31%	26.21%	76.00%	6.48%	14.44%
	Drift	19.57%	10.35%	267.24%	-86.45%	58.96%

Source: Author's calculations based on listed firms' data

Table 1 summarizes stock return volatility (σ) and drift (μ) for 101 consumer goods firms from 2015-2024. The results show strong temporal variation, with volatility rising during crises and stabilizing during recovery. Between 2015-2019, volatility was relatively stable at 29-35% with positive returns, reflecting robust domestic consumption and investor confidence. In 2020, COVID-19 triggered volatility of 40.37% and returns of -18.19%, underscoring supply chain disruptions and market uncertainty. The market rebounded in 2021 with volatility of 63.65% and returns of 40.37%, but conditions deteriorated again in 2022 as volatility peaked at 83.43% and returns dropped to -13.86%. Recovery followed in 2023-2024, with volatility falling to 26.95% and 21.10% and returns stabilizing at 16.34% and 3.01%.

Cross-sectional heterogeneity was also pronounced. Maximum annual returns reached 212.11% in 2019, while the minimum fell to -138.73% in 2021, illustrating firm-specific vulnerabilities such as leverage and capital structure. Standard deviations exceeded 70% in 2015 and 2020, confirming wide dispersion of outcomes.

Overall, three insights emerge: volatility in Vietnam's consumer goods sector is cyclical and shock-sensitive; return dynamics follow alternating boom-and-bust patterns; and firm fundamentals amplify systemic shocks, with highly leveraged firms experiencing disproportionate losses. These findings highlight the sector's vulnerability to crises and the importance of market-based risk indicators for credit risk analysis.

Firm Asset Volatility and Probability of Default

To estimate asset volatility (σ_A), distance-to-default (DD), and probability of default (PD), the Structural Approach requires both market-based and macro-financial inputs. A key parameter is the risk-free rate, proxied by annual yields on Vietnamese government bonds with five-year maturity. Between 2015 and 2018, rates remained relatively stable at 4.5-5%. They declined to 3.2% in 2019 and further to 2.8% in 2020, reflecting monetary easing and liquidity injections during the COVID-19 crisis. The lowest level was observed in 2021 at 2.5%, after which rates recovered to 4.5% in 2022 and stabilized around 3.5% in 2023-2024, consistent with post-pandemic macroeconomic normalization. Other assumptions include a constant payout ratio of 2% and bankruptcy costs fixed at 50% of asset value, in line with established structural credit risk modeling practices (Hull, 2018).

The sample comprises 101 consumer goods firms listed on HSX and HNX, divided into 51 consumer discretionary and 50 consumer staples companies. To capture sectoral heterogeneity, the firms were classified into seven sub-sectors: Food, Beverage & Tobacco (46 firms), Household & Personal Products (2 firms), Retail-Essential (2 firms), Retail-Non-Essential (22 firms), Consumer Services (5 firms), Fashion & Durables (19 firms), and Automobiles & Components (5 firms). This classification highlights the structural diversity of Vietnam's consumer goods sector and enables a comparative analysis of risk profiles between cyclical and defensive industries. Examining these sub-sectors provides deeper insights into how asset volatility, distance-to-default, and probability of default vary with firms' economic functions and exposure to macroeconomic shocks.

Table 2: Descriptive statistics for asset volatility (σ_A) across the sample period

Year	Mean	Median	Max	Min	Standard Deviation
2024	12.35%	10.64%	66.39%	0.17%	8.74%
2023	14.89%	13.70%	48.99%	0.32%	8.95%
2022	20.14%	16.16%	93.88%	0.18%	14.73%
2021	21.90%	17.99%	71.03%	0.95%	13.97%
2020	19.67%	14.11%	93.99%	0.16%	16.27%
2019	13.76%	8.87%	90.62%	0.11%	13.82%
2018	15.65%	12.30%	66.46%	0.13%	13.09%
2017	13.66%	10.98%	58.62%	0.43%	11.32%
2016	17.02%	13.44%	80.10%	0.84%	15.19%
2015	13.23%	10.89%	55.64%	0.56%	10.55%

Source: Author's calculations based on listed firms' data

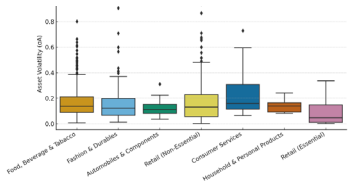
The descriptive statistics in Table 3 show that average σ_A fluctuated between 12.35% in 2024 and 21.90% in 2021, with a median consistently below the mean, confirming the right-skewed distribution of volatility. This indicates that while most firms exhibited moderate risk profiles, a subset of highly leveraged or distressed firms disproportionately elevated sectoral volatility. Maximum σ_A values reached 55.64% in 2015 and peaked near 98.12% in 2021, underscoring the influence of extreme outliers during crisis conditions. Standard deviations were highest in 2016 (15.19%) and 2020 (21.71%), coinciding with global trade tensions and the COVID-19 crisis.

Interestingly, during the relatively calm period of 2018-2019, σ_A averaged 15.65% and 13.76%, respectively, reflecting a stable macroeconomic environment prior to the pandemic (Reddy & Clinton, 2016). By contrast, volatility escalated to 19.20% in 2020, consistent with rising financial distress across emerging markets. By 2022-2024, σ_A gradually normalized, falling to 20.14% in 2022, 14.89% in 2023, and 12.35% in 2024, reflecting improved financial stability and investor confidence.

Figure 1 shows substantial heterogeneity in asset volatility (σ_A) across sub-sectors. Consumer Services and Fashion & Durables display the widest interquartile ranges and most outliers, with σ_A values exceeding 0.7-0.9, reflecting their cyclical and discretionary nature. In contrast, Household & Personal Products and Retail (Essential) exhibit tightly clustered, low volatility (medians around 0.13-0.17), confirming their defensive role. Food, Beverage & Tobacco occupies an intermediate position,

with moderate averages but occasional spikes linked to commodity price shocks. Automobiles & Components show mixed outcomes: some firms remain stable near σ_A = 0.1, while others face high volatility, underlining exposure to demand cycles and capital intensity.

Figure 1: Distribution of asset volatility across consumer-related sub-sectors



Source: Author's calculations based on listed firms' data

Using the Merton model, the Probability of Default (PD) was estimated for 101 firms during 2015-2024. Results reveal significant temporal variation, closely aligned with shifts in market volatility and macroeconomic shocks.

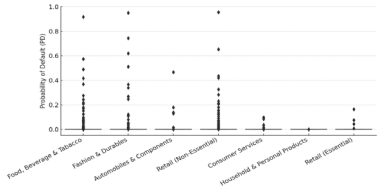
Table 3: Descriptive statistics for Probability of Default (PD) across the sample period

Year	Mean	Median	Max	Min	Standard Deviation
2024	0.3031%	0.0000%	12.2938%	0.0000%	1.5686%
2023	0.1565%	0.0000%	12.6656%	0.0000%	1.2772%
2022	5.3145%	0.0003%	65.2638%	0.0000%	12.3523%
2021	0.0154%	0.0000%	0.9077%	0.0000%	0.0945%
2020	1.3638%	0.0000%	94.8436%	0.0000%	9.5348%
2019	1.4183%	0.0000%	43.4786%	0.0000%	5.3942%
2018	2.5723%	0.0001%	41.9347%	0.0000%	7.8083%
2017	0.3365%	0.0000%	14.0377%	0.0000%	1.5813%
2016	5.6812%	0.0000%	95.5134%	0.0000%	17.6386%
2015	0.5819%	0.0000%	17.8939%	0.0000%	2.3545%

Source: Author's calculations based on listed firms' data

Between 2015 and 2019, average PDs remained modest (0.33%-2.57%), though outliers reached 14-43%, indicating that a minority of firms carried disproportionately high credit risk. Dispersion across firms was evident, with standard deviations up to 7.8% (Campbell, Lettau, Malkiel, & Xu, 2001). The COVID-19 crisis caused a sharp escalation: in 2020, PDs peaked at 94.84% with a mean of 5.68%, the highest in the sample. Elevated risks persisted in 2021-2022, with outliers again exceeding 90% and average values at 1.64% and 3.51%. These results confirm that discretionary sectors particularly Retail (Non-Essential) and Fashion & Durables were most exposed to credit distress due to reliance on household demand and supply chain stability.

Figure 2: Distribution of asset volatility across consumer-related sub-sectors



Source: Author's calculations based on listed firms' data

In contrast, Household & Personal Products consistently recorded near-zero PDs, confirming its defensive nature. Retail (Essential) also maintained low risk, reflecting the stabilizing role of staple goods. Food, Beverage & Tobacco showed intermediate outcomes, with occasional PD spikes linked to sector-specific shocks such as regulation or commodity price fluctuations.

Figure 2 shows that PD distributions are highly right-skewed: while most firms report near-zero PDs, a subset records extreme values. Outliers are concentrated in Retail (Non-Essential) and Fashion & Durables, where several firms reached PDs above 60% or close to 100%, reflecting their vulnerability to demand shocks and supply chain disruptions (Campbell, Lettau, Malkiel, & Xu, 2001). These sectors face not only greater operational volatility but also tighter liquidity constraints, amplifying default risk during downturns.

By contrast, Household & Personal Products consistently recorded negligible PDs, reinforcing its defensive nature. Retail (Essential) also showed stable, near-zero PDs, highlighting the protective effect of staple goods. Food, Beverage & Tobacco occupied an intermediate position: average PDs were low, but occasional spikes appeared due to regulatory shifts or commodity price shocks. Overall, defensive sectors remained resilient, while discretionary sectors amplified systemic credit risk.

To provide deeper insights into firm-level risk, asset volatility (σ_A) and probability of default (PD) were analyzed across sub-sectors of the Vietnamese consumer goods industry between 2015 and 2024.

Table 4: Summary Statistics of Asset Volatility and Probability of Default by Sub-sector

Consumer Services		Consumer Discretionary				Consumer Staples		
		Fashion & Durables	Retail (Non-Essential)	Automobiles & Components	Household & Personal Products	Food, Beverage & Tabacco	Retail (Essential)	
Asset Volatility σ_A	Average	22.8173%	15.2152%	16.9890%	12.1050%	13.6778%	16.5159%	9.0046%
	Max	73.0016%	93.8838%	93.9883%	31.1505%	24.1627%	80.0978%	33.5244%
	Min	6.5012%	1.2379%	0.1071%	3.6512%	8.1269%	0.6842%	0.1845%
	Medium	15.9502%	12.1438%	12.9769%	11.1696%	13.7684%	13.7303%	4.7159%
	Standard Deviation	17.3895%	13.7609%	16.0558%	5.2952%	4.3291%	11.5995%	10.0261%
Probability of Default PD	Average	0.6458%	2.5960%	2.4816%	1.8763%	13.6778%	1.3160%	9.0046%
	Max	9.6945%	94.8436%	95.5134%	46.7555%	24.1627%	91.7082%	33.5244%
	Min	0.0000%	0.0000%	0.0000%	0.0000%	8.1269%	0.0000%	0.1845%
	Medium	0.0000%	0.0000%	0.0000%	0.0000%	13.7684%	0.0000%	4.7159%
	Standard Deviation	1.9750%	11.3307%	9.7426%	7.4226%	4.3291%	6.8359%	10.0261%

Source: Author's calculations based on listed firms' data

Consumer Services consistently exhibited the highest volatility, with an average σ_A of 22.8% and a maximum of 73%. This volatility pattern reflects the cyclical and demand-sensitive nature of the sector, which is highly exposed to household consumption shocks. Firms such as DAH and NVT showed pronounced PD spikes during the COVID-19 crisis, at times exceeding 8.5%, confirming the sector's fragility when tourism, hospitality, and service-related activities contracted under lockdowns and demand restrictions. These results suggest that service-oriented firms face elevated systemic risk due to their dependence on discretionary spending and their limited capacity to absorb income shocks.

Fashion & Durables and Retail (Non-Essential) displayed similarly elevated σ_A levels (15-17%), coupled with extreme PDs surpassing 90% for some firms.

These values highlight the pro-cyclical character of discretionary retail, where firms' performance is closely tied to fluctuations in household disposable income and consumer sentiment. The volatility within these segments is magnified by inventory cycles, supply chain disruptions, and their reliance on non-essential demand, making them particularly vulnerable during macroeconomic downturns. The sharp PD outliers in these sub-sectors reinforce their role as amplifiers of systemic instability.

By contrast, defensive industries such as Household & Personal Products and Retail (Essential) demonstrated markedly lower risk profiles. Both recorded σ_A levels in the range of 8-9% and maintained near-zero PDs throughout the period, even during the COVID-19 crisis. This resilience reflects the relatively inelastic demand for necessities such as cleaning products, hygiene items, and staple goods, which tend to remain stable despite fluctuations in income levels or broader economic conditions (Hull, 2018). These results provide strong empirical support for the defensive sector hypothesis, where essential goods act as stabilizers for both consumers and investors during turbulent periods.

Food, Beverage & Tobacco firms occupied an intermediate position. While average σ_A stood at 16.5%, occasional PD spikes were observed, particularly in response to regulatory changes, commodity price volatility, and disruptions in agricultural inputs. This mixed performance illustrates the dual character of the sub-sector: demand for food and beverages is relatively stable, but exposure to external shocks in raw materials and taxation policies can destabilize firm valuations and credit profiles.

Finally, Automobiles & Components displayed the most heterogeneous outcomes. The sector recorded a moderate average σ_A of 12.1%, but PD values varied widely across firms. While some manufacturers maintained near-zero PDs, others experienced spikes above 40%, particularly during global trade frictions and supply chain disruptions in 2016 and 2022. This divergence reflects the capital-intensive nature of the industry, its reliance on imported inputs, and its sensitivity to cyclical demand shifts in both domestic and export markets.

Across all sub-sectors, the crisis period of 2020-2022 amplified both volatility and default risk. Several firms in discretionary industries recorded PDs exceeding 80-90%, confirming their vulnerability to systemic shocks. However, the recovery years of 2023-2024 showed a sharp reversal: volatility moderated, and PD values declined broadly, with most firms returning to PD = 0%. This normalization signals improved macroeconomic management, stabilization of household demand, and renewed investor confidence, consistent with the post-pandemic recovery trajectory of Vietnam's economy.

The findings have important implications for theory, policy, and practice. First, they confirm structural credit risk models (Merton, 1974), showing that higher asset volatility raises default probability, but also reveal strong sectoral heterogeneity. Ignoring these differences risks obscuring critical contrasts between defensive and cyclical industries. Second, results highlight the need for sector-specific risk assessment in emerging markets like Vietnam, where the COVID-19 crisis showed that essential retail and household goods remained resilient, while discretionary sectors faced disproportionate stress (Reddy & Clinton, 2016). Third, the relationship between volatility (σ_A) and default probability (PD) is non-linear: firms with high leverage and weak balance sheets may default under moderate volatility, while stronger firms remain stable despite higher σ_A (Crosbie & Bohn, 2003). Finally, joint evaluation of σ_A and PD provides valuable guidance for investors and policymakers. Defensive sectors strengthen portfolio resilience, while cyclical sectors amplify systemic risk. Sub-sector PD distributions can serve as stress-testing tools, helping identify fragile industries and supporting policies for capital structure optimization and financial stability (Hull, 2018).

7. Conclusion

This study applied the Structural Approach, using the Merton model, to assess asset volatility (σ_A) and probability of default (PD) for 101 Vietnamese consumer goods firms (2015-2024). Three main insights emerge. First, σ_A is cyclical and shock-sensitive, with crises such as COVID-19 driving sharp spikes in both σ_A and PD, followed by post-crisis stabilization. Second, strong sectoral heterogeneity was observed: defensive sub-sectors (Household & Personal Products, Retail-Essential) maintained low volatility and near-zero PDs, while cyclical sub-sectors (Consumer Services, Fashion & Durables, Retail-Non-Essential) showed elevated risk. Third, the σ_A-PD relationship proved non-linear: firms with moderate volatility but high leverage faced greater default risk, whereas firms with high σ_A but stronger asset bases remained secure.

These findings highlight the need for sector-specific risk assessment in emerging markets. For policymakers, sub-sector PD distributions can serve as stress-testing tools, while for investors, sectoral allocation is vital for portfolio resilience. From a corporate governance perspective, firms in cyclical industries should strengthen capital structures, extend debt maturities, and maintain liquidity buffers. Overall, the Structural Approach offers valuable insights into credit risk dynamics in Vietnam's consumer goods sector, underscoring the interaction between volatility, leverage, and default probabilities in shaping financial stability.

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PROMOTING VIETNAM'S EXPORT OF WOOD PRODUCTS TO THE EUROPEAN UNION (EU) IN THE CONDITIONS OF EVFTA IMPLEMENTATION

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Abstract: ***EVFTA, an agreement between Vietnam and the EU that takes effect from 2020, opens up many opportunities for exports due to tax incentives and a favorable trade environment, especially in the wood processing and recycling industry. However, businesses need to fully understand the agreement and improve their capacity to meet the high standards of the European market. This article analyzes the theoretical basis and current Vietnam's exports of wood products to the EU, especially assessing the multi-dimensional impact of EVFTA on this activity.***

• Keywords: *FTA, EVFTA, wood export.*

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1. Introduction

Vietnam's export of wood products plays an important role in the economy. In the context of integration and the implementation of the Vietnam-EU Free Trade Agreement (EVFTA), the industry faces both significant challenges and opportunities. EVFTA helps to expand opportunities for Vietnamese wood products to enter the EU market thanks to preferential tariff reduction policies, bringing direct competitive advantages over competitors. However, this opportunity comes with great challenges, especially strict requirements on rules of origin, technical standards, safety, environment (such as requirements for legal wood origin under VPA/FLEGT), and social responsibility. These factors are not only advantages but also mandatory conditions for businesses to maintain market share in the EU in the context of increasingly fierce competition.

Although the Vietnam's wood industry has made significant progress, the competitiveness of many enterprises remains limited, especially in the areas of deep processing technology, innovative design, branding and sustainable supply chain management. To maximize the benefits from EVFTA and overcome barriers, enterprises need to make strong efforts to improve these factors.

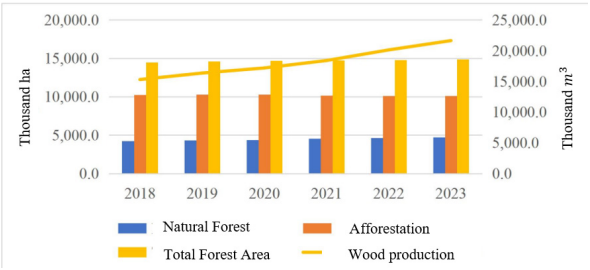
2. Research Methodology

Data is collected from domestic and international agencies, including the Ministry of Industry, Customs, and VIFOREST (Vietnam Wood and Forestry Association), to facilitate analysis. Applying PESTEL analysis to assess the political, economic, social, technological, environmental, and legal factors impacting wood exports. Comparing export data before and after EVFTA to assess the impact of the agreement. Employing statistical instruments to analyze data and formulate scientific findings.

3. Overview on Vietnam's wood and wood product industry

3.1. Overview on Vietnam forest areas

Figure 3.1. National Forest Area and Forest Production Chart (2018 - 2023)



Source: GSO

Vietnam's forest area has increased from 14.5 million hectares in 2018 to 14.9 million hectares in 2023. Post-harvesting reforestation helps maintain sustainability and boost the growth of the wood industry. Wood production will reach 21.6 million m^3 by 2023, with three provinces include: Quang

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Nam, Quang Ngai and Binh Dinh, as the main wood production centers.

Figure 3.2. Total forest areas across Vietnam in 2023 (thousand hectares)

Area	Natural Forest	Afforestation	Total Forest Area
Red River Delta	489.3	182.1	307.2
Northern midland and mountain region	5,439.6	3,738.4	1,701.2
North Central and Central Coast	5,621.2	3,777.5	1,843.7
Central Highlands	2,093.6	492.1	2,585.7
Southeast	479.7	258.9	220.8
Mekong River Delta	244.6	79.2	165.4

Source: GSO

Figure 3.3. 10 provinces with the largest forest area in Vietnam (thousand hectares)

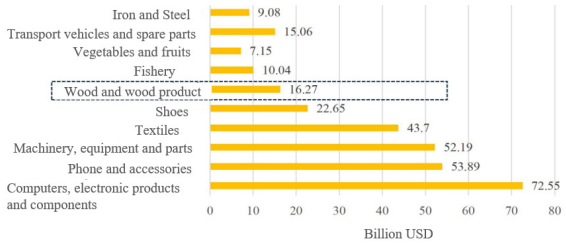
1	Nghe An	1,018.8
2	Quang Nam	681.1
3	Son La	676.9
4	Thanh Hoa	647.4
5	Gia Lai	650
6	Kon Tum	632.9
7	Quang Binh	591.4
8	Lang Son	578
9	Lam Dong	538
10	Dak Lak	506.7

Source: GSO

Forests in Vietnam are mainly distributed in three areas: the Northern Mountains, the Northern Central Sea, and the Western Seas. Some provinces have large forest areas, including Nghe An, Quang Nam and Son La.

3.2. Overview on Vietnam's wood and wood product industry

Figure 3.4. 10 major export products of Vietnam in 2024

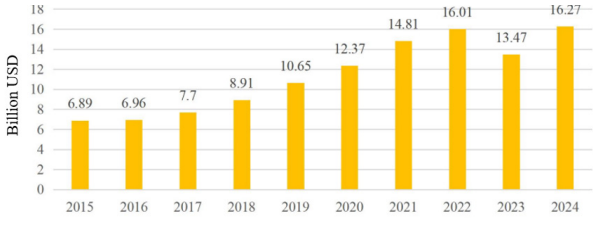


Source: General Department of Customs

Wood and wood products are one of Vietnam's main export goods, with a high rate of localization, reflecting the large participation of purely Vietnamese enterprises. This is in contrast to items such as computers and telephone components, where FDI businesses contribute primarily.

Vietnam's export of wood and wood products grew sharply, reaching USD 16.27 billion in 2024, an increase of 20.8% compared to 2023 (Table 3.5). Of this, FDI enterprises contributed more than $7.5 billion, accounting for about 46% of total export turnover. However, by January 2025, the export value dropped slightly to $1.42 billion compared to the same period in 2023. The Vietnam Wood and Forestry Association (Vifores) sets a goal of exporting wood industries to reach USD 18 billion by 2025, up 10.6% from 2024.

Figure 3.5. Export value of wood and wood products in the period 2015 - 2024



Source: General Department of Customs

According to figures provided by the General Department of Customs, the United States is the largest export market of Vietnamese wood products in 2024, reaching nearly $9 billion, accounting for 54.8% of the total export value. The next markets are China ($2.04 billion, 12.54%) and Japan ($1.72 billion, 10.56%). Other markets such as South Korea, Canada, the United Kingdom, India, and the Netherlands also contribute, but with exports worth less than $1 billion.

Regarding the structure of Vietnam's wood and wood products exported in 2024, the General Department of Customs reveals that wooden furniture accounts for the highest proportion of Vietnam's wood exports, reaching about 61% of export value in 2024, bringing great added value thanks to many stages of production. Products such as plywood (17%), wood and floorboards (13%), and compressed wood (5%) are intermediate products, requiring only a few steps from the raw wood.

4. Impacts of EVFTA on Vietnam's exports of wood products

4.1 Achievement

First, the export value of Vietnamese wood products has increased strongly recently. Before 2000, Vietnam's export wood processing industry had no position in the international market. However, due to the unremitting efforts of innovation and development, by 2019, Vietnam's wood export value had exceeded 10 billion US dollars, of which nearly 600 million US dollars came from the European market. Currently, Vietnam ranks among the best in the wood export group of ASEAN, surpassing competitors such as Malaysia, Indonesia, and Thailand, and Vietnam is

second only to China in the scale of Asia. Vietnamese wood products are sold to more than 120 countries and regions, mainly to the United States, Japan, China, and the European Union, which are the regions with the largest wood consumption in the world.

Second, the new market has the potential to expand Vietnam's wood product structure. The EU is one of Vietnam's five largest wood export markets. In 2019, Vietnam's wood exports exceeded 10.5 billion US dollars, of which the EU accounted for nearly 600 million US dollars, accounting for more than 5%. If Britain is included, the figure is close to $900 million. Vietnamese enterprises export mainly in the form of FOB, which requires close cooperation between Vietnamese and EU enterprises. Since 2013, the FLEGT license has been applied to EU countries, and it is required to control the legality of wood products. The Vietnamese government cooperates with enterprises to prove the origin of logs and issue FLEGT licenses to export enterprises. Export promotion policies and trade promotion activities also help expand the market, not only in big markets such as Britain and Germany also in small markets such as the Netherlands, Italy, and France.

The Free Trade Agreement and Voluntary Partnership Agreement (VPA/FLEGT) between Vietnam and the EU has made it easier for Vietnamese wood products to enter the EU market.

Third, Vietnamese enterprises produce all kinds of wood products, from general products to complex and elegant furniture, to meet the various needs of the EU market. Vietnamese wood products combine tradition and modernity, especially exquisite carving products, forming unique characteristics. Due to international cooperation and modern technology, Vietnam's wood products are becoming more and more diversified and better in quality, which meets the requirements of international partners.

4.2. Limitations and causes

4.2.1. Regarding the State

Although the government has made efforts to support exports to Vietnamese businesses, especially the wood industry, administrative processes and tax policies remain complex, overlapping, difficult, and costly for businesses. A typical example is the complex and protracted import tax refund policy. In addition, the process of importing raw wood may be delayed if the enterprise has not received a Certificate of Origin (C/O) to prove its origin. Even when exporting wood products, even if the records and licenses are complete, the enterprise can still be assigned to the yellow or red line, costing time and effort for the submission of detailed records or the actual inspection of the goods.

4.2.2. Regarding the businesses

4.2.2.1. The limited compliance with EU regulations

Vietnamese enterprises face many difficulties in complying with EU regulations such as:

- Ensure and prove the legality of using wood sources.

- Establish, maintain, and operate complex systems to control the legitimacy of the entire supply chain.

- Continuous monitoring to ensure compliance with the origin and laws of wood.

The main reason of this is the lack of initiative to learn and prepare. In addition, the lack of clear, synchronous, and comprehensive instructions from competent authorities has also made it difficult for businesses to implement these requirements.

4.2.2.2. The unstable supply of raw materials

Although the domestic wood supply has improved, it still does not meet the sufficient demand. According to Vifores, the annual demand for raw materials is 31 million cubic meters, while the reserves and quality of natural forests (10 million hectares) have declined, only a small part of artificial forests (4.6 million hectares, with a production of 3.19 million hectares) have obtained sustainable forest management certificates, with 226. By the end of 2021, 429 hectares had FSC certification.

As a result, companies that process wood for export have to rely on importing raw wood from about 100 countries. This reliance not only increases costs and complexity in logistics but also conceals significant risks related to demonstrating the legitimate origin of the wood.

At the same time, traditional sources of wood supply from Laos and Cambodia are decreasing sharply as these countries tighten management and implement forest closure policies.

Raw wood prices in Malaysia, an important source of supply for Vietnam, are also increasing rapidly. Wood import prices increased sharply in the first quarter of this year, with logs increasing by 52%, sawn pine increasing by 38%, and sawn oak increasing by 36%. In addition, the long import time has caused delays in production activities, creating many difficulties for Vietnam's wood industry.

Chinese companies are also increasing their investment and purchasing rubber and acacia wood in

Central Vietnam, with a volume of up to 4 million tons per year, creating great competition in the domestic market.

4.2.2.3. The limited financial capacity and technology

The majority of businesses in the industry are small in size (63% according to Forest Trends), which limits competitiveness and access to difficult markets such as the EU.

In the context of increasingly stringent requirements on quality standards and traceability of origin, investment in modern production lines, advanced technology, and quality raw material sourcing assurance become essential factors. However, the cost for these categories is very high, creating a financial barrier for most businesses in the industry.

The delay of technology investment and production modernization leads to low labor productivity in Vietnam's wood industry. According to VIFORES data, the labor productivity of this industry is only half that of the Philippines, less than half that of China (40%), and only one-fifth that of EU countries (20%), which will negatively affect the price competitiveness and negatively affect presents a significant challenge.

Enterprises are having difficulty accessing bank credit due to credit institutions tightening regulations on foreign currency lending, high interest rates, and large collateral requirements, creating barriers to capital mobilization, especially for working capital needs and production expansion.

Many wood-exporting enterprises to the EU are facing risks when partners suddenly reduce orders, forcing them to accept to maintain the relationship. This makes exporters dare to operate at a low level, reduce production scale, and wait for positive signals instead of investing in expansion.

4.2.2.3. The limited competitiveness

Although the export price is usually at a low level, it is still difficult to compete with large manufacturers from China and Indonesia.

Considering the main export mode to the EU, the challenge is even more obvious: instead of direct sales, Vietnamese enterprises usually have to go through large distributors in Britain, Germany, and France. The lack of reputable national brands of wood products is a major obstacle, which directly affects the competitiveness and market penetration potential.

Dependence on intermediary channels and lack of strong brands make Vietnamese enterprises passive in valuation and share most of the profits. Although the total export volume may increase, the profits of each product are disproportionate, which limits the reinvestment and sustainable development of enterprises.

The main reason for these issues is that the high financial costs, especially high lending interest rates and long-term maintenance, has increased production costs. To cope with the cost pressure, enterprises cut management costs, save production costs, and increase labor productivity. However, raw material prices and labor costs continue to rise, forcing businesses to stock up on raw materials, further straining capital flows.

The competitive advantage from simple machining and cheap labor is becoming less efficient as input costs rise, while selling prices are difficult to adjust. Many wood-processing enterprises have shifted to producing high-end products, but this strategy requires large investments in technology, high-quality manpower, and management skills, elements that many Vietnamese enterprises still lack. Also, the shift to high-end products makes it more difficult for Vietnamese enterprises to compete with countries such as Myanmar, Malaysia, and Indonesia, because these countries are rich in natural wood resources and have lower production costs.

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THE RELATIONSHIP BETWEEN EXPORT AND ECONOMIC GROWTH IN THE NORTHWEST OF VIETNAM

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Abstract: ***This paper examines the dynamic relationship between export activities and economic growth in the Northwest region of Vietnam over the period 2000–2017. Utilizing both qualitative and quantitative methods, with a focus on the Autoregressive Distributed Lag (ARDL) model, the study provides empirical evidence of a positive and statistically significant impact of exports on economic growth, both in the short term and long term. The results also confirm the existence of a long-run cointegrating relationship between exports and economic growth in the region. Based on these findings, the paper proposes several policy implications aimed at enhancing export competitiveness and promoting sustainable economic development in the Northwest region.***

• Keywords: *exports; economic growth; northwest region; ARDL model; trade policy.*

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1. Introduction

In recent years, exports have consistently been an important factor contributing to economic development and enhancing the position of Vietnam's economy. Export contributes to sustainable economic development by ensuring a balance between export and import values and promoting the growth of international payment services (Nguyen, T. M., 2020; World Bank, 2020). Export activities have also generated employment opportunities, improved household incomes, and contributed to poverty alleviation (Heo & Doanh, 2009). Moreover, the expansion of export-oriented industries has enhanced labor productivity, reduced income disparities between urban and rural areas, and accelerated structural transformation toward industrialization and modernization, particularly in underdeveloped regions.

The Northwest region, located in the mountainous western part of Northern Vietnam and bordering Laos and China, has made notable progress in commodity exports in terms of scale, growth rate, job creation, infrastructure development, and public budget contributions. These developments have positively influenced regional economic growth. However, the export structure continues to face challenges regarding product quality, efficiency and sustainability.

Furthermore, the prevailing export model carries potential environmental risks, including biodiversity loss, carbon emissions, and resource depletion. As a result, the relationship between export performance and economic growth in the region remains ambiguous and inconsistent.

This study aims to empirically examine the dynamic relationship between commodity exports and economic growth in the Northwest region during the period 2010-2017, assess both achievements and limitations, and propose evidence-based policy recommendations to promote sustainable economic development.

2. Literature review

Many studies have discussed the relationship between exports and economic growth with different research methods and approaches. Bahramian, P. et al. (2019) examined the dynamic causality between exports and economic growth in Turkey over the period from 1960 to 2018. Employing the causality-in-quantiles test, the study found evidence of positive causality from economic growth to export growth at low and high quantiles of export growth. In another study, Evans Kulu (2023) hypothesized that exports are the main driver of economic growth. This study tested this hypothesis and further analyzed the determinants of exports in the case of West African countries. Annual panel data spanning from 2008 to 2018 was used. The results also revealed that foreign direct investment, employment, remittances, land area, and infrastructure are significant drivers of exports

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while population, real effective exchange rate, and taxes on international trade are detrimental to exports in the region. Also using panel data, the study by Oscar Chiwira et al. (2023) employed the Autoregressive Distributed Lag (ARDL) Bounds to test for co-integration relationships, and the Generalized Least Squares (GLS) to determine the respective threshold level. This study demonstrated that exports positively support economic growth both in the short and long run in SACU and that there is a long-run bilateral causal relationship between exports and economic growth.

In Vietnam, Pham Mai Anh (2008) uses Var model to analyze four variables: GDP, investment, export and productivity, the results prove that investment is the basic factor affecting economic growth. Vietnamese economy in the period of 1986-2007. Nguyen Thanh Hai (2016) through research has proved that export plays an important role in the economic development of Vietnam by accelerating the process of industrialization and modernization of the country.

It seems that export is automatically recognized as having a positive relationship in the direction of positive impacts on economic growth, so most analyzes are oriented towards promoting exports instead of analyzing relationships between exports and economic growth. The impact of both short and long-term exports on economic growth needs to be assessed through some important attributes, in order to address the urgent issues in the context of today's international integration.

3. Research Methodology

In order to achieve the research results, this paper uses co-integrated test method, proposed by Perasan (Perasan and partner, 2001) and self-regression distribution delay model (Autoregressive Distributed Lag: ARDL). In addition, based on the research models of Fayissa and partner (2010) and Khalid (2012) the ARDL model allows the estimation with a mix of stationary and non-stop data series (non-stationary), comprehension for studying the relationship between exports and economic growth in Northwest of Vietnam.

4. Results and discussion

4.1. Current goods export and economic growth in Northwest Vietnam

According to Vietnam's economic zoning plan, the Northwest region includes the provinces of Dien Bien, Lai Chau, Lao Cai, Yen Bai, Hoa Binh, and Son La.

With the results of the GDP aggregation of the provinces in the Northwest region, Lao Cai province achieved the highest GDP in the region, while Lai Chau province had the lowest (Table 01). Although the GDP of the provinces in the region are lower than those of other economic regions in the country, they have consistently increased annually from 2000 to 2023.

Table 01: GDP of 6 provinces in the Northwest region (Billions dong)

Year	Dien Bien*	Lai Chau	Yen Bai	Son La	Lao Cai	Hoa Binh
2000	1.956,75		1.670,19	1.837,35	1.417,26	5·231,28
2001	2.455,61		1.828,42	1.976,98	1.584,59	5·533,14
2002	2.637,55		2.089,33	2.133,16	1.817,66	5.719,98
2003	2.860,72		2.325,95	2.865,43	2.150,29	6·166,39
2004	1.875,63	2.687,99	2.687,99	3.428,42	2.530,52	6.655,29
2005	2.008,14	1.058,07	3.118,88	4.090,84	2.944,96	7.171,21
2006	2.400,33	1.358,00	3.731,05	5.094,47	3.327,81	6·938,33
2007	2.862,54	1.809,61	4.483,07	6.128,08	4.501,82	8·811,73
2008	3.654,45	1.988,13	5.664,79	8.565,47	6.878,00	10·674,93
2009	4.187,25	2.574,39	6.801,15	11.345,86	7.958,20	11·767,37
2010	5.237,65	3.023,81	11.160,82	14.386,14	12.358,83	15·999,68
2011	7.042,35	4.073,46	12.611,72	18.333,70	13.709,65	16.712,34
2012	8.743,14	5.138,83	15.246,99	19.766,45	18.440,58	18.542,55
2013	9.465,35	6.252,56	17.113,88	22.854,42	21.235,58	20.961,62
2014	10.473,90	7.189,36	19.094,48	26.390,21	24.603,82	24.592,63
2015	11.327,39	7.859,06	20.035,83	27.861,15	27.069,26	26.665,27
2016	12.217,99	9.883,03	22.258,39	29.979,01	30.045,92	28.382,31
2017	13.084,25	10·970,16	23·638,41	32.853,99	32.092,05	37. 94,99
2018	18.099,19	15.028,03	27.590,50	25.129,99	44.811,70	40.196,13
2019	19.339,31	19.029,95	30.529,67	26.527,22	49.950,77	46.275,75
2020	20.302,45	20.357,47	33.151,94	28.179,86	53.163,12	46.733,27
2021	22.066,02	21.368,16	35.739,64	28.799,82	58.163,12	49.705,21
2022	25.119,17	23.389,15	40.211,64	31.308,28	68.045,36	51.225,21
2023	28.075,64	25.403,75	41.820,10	34.063,41	73.600,90	56.538,97

** On November 26, 2003, the National Assembly issued a Resolution dividing Lai Chau province into Lai Chau (new) province and Dien Bien province.*

Source: Statistical Yearbook of 6 provinces, calculation of the author

In the period from 2000 to 2023, the Northwest region of Vietnam faced many challenges in exports, due to limitations in human resources, capital, production levels, and the mountainous geographical location. However, with the attention and support from the Northwest Regional Steering Committee and the leaders of the provinces in the region, policies were implemented to mobilize various economic sectors to take advantage of natural resources to boost exports. As of now, the Northwest region has developed many key export products such as agricultural products (rice, coffee, tea), minerals, aquatic products, and processed goods from agricultural and forestry products. These products not only meet domestic demand but

are also exported to many countries, particularly large markets such as China, Japan, and European countries. In 2000, the export value of the region was USD 19.912 billion, which increased to USD 216.035 billion by 2010, and reached its highest level in 2023 with USD 2.520.163 billion.

State policies on border trade have helped promote exports from border provinces such as Lai Chau, Lao Cai, and Son La. This has created favorable conditions for businesses to export goods to neighboring countries, while also supporting the economic growth of local areas.

Table 02: Export value of 6 provinces in the Northwest region (Mill.USD)

Year	Dien Bien*	Lai Chau	Yen Bai	Son La	Lao Cai	Hoa Binh	Total
2000	275		3,296	2,809	7,177	6,355	19,912
2001	689		3,937	3,976	15,146	12,971	36,719
2002	988		4,021	4,863	19,732	5,444	35,048
2003	690		4,947	3,655	12,100	9,635	31,027
2004	325	258	7,593	3,860	16,472	16,940	45,448
2005	674	634	9,228	2,046	17,144	15,129	44,855
2006	764	366	10,752	4,849	22,956	24,478	64,165
2007	754	1,628	12,578	4,207	23,408	23,231	65,806
2008	3,186	1,929	13,772	5,653	73,863	24,928	123,331
2009	5,200	3,081	17,951	4,677	74,829	27,800	133,538
2010	8,500	3,964	29,332	2,333	134,930	36,976	216,035
2011	10,327	4,117	34,796	6,464	173,829	50,309	272,445
2012	13,885	5,927	46,858	5,481	205,556	65,243	342,950
2013	18,641	4,641	53,704	15,737	407,781	78,850	579,354
2014	24,101	5,584	55,089	104,303	341,274	119,640	649,991
2015	22,815	6,225	68,176	86,387	387,724	249,290	820,617
2016	30,272	5,350	75,853	40,377	296,411	287,460	735,723
2017	39,000	10,300	105,600	68,875	258,300	505,000	987,075
2018	67,001	31,539	130,000	130,000	129,993	116,270	616,150
2019	49,680	8,548	145,744	150,242	154,578	791,900	1.300,692
2020	46,000	3,362	166,000	112,000	160,772	1.032.000	1.520,134
2021	67,016	8,975	182,700	161,210	189,876	1.217,984	1.827,761
2022	73,123	15,411	297,306	174,800	195,435	1.437,230	2.193,305
2023	83,190	38,310	311,110	177,615	214,869	1.695,069	2.520,163
Average value of the period	15,394	16,912	74,597	53,184	147,256	327,088	632,593
Average growth rate (%)	15,5	8,21	21,86	19,76	15,93	27,49	23,43

Source: Statistical Yearbook of 6 provinces, calculation of the author

In addition to Hoa Binh province achieving high export value, Lao Cai province, which shares a border with China, has also achieved significant success in exports. In recent years, provinces in the region have focused on developing infrastructure projects, especially border roads, which have helped connect production areas with domestic and international markets, facilitating exports. The region has also diversified its export markets, not only exporting to neighboring countries but also expanding to global markets. Products from the Northwest are now present in many countries and regions, contributing to the increase in export value and enhancing the region's product branding.

Overall, the success of the Northwest region in exports is attributed not only to its natural resource advantages but also to supportive policies, infrastructure improvements, and efforts to diversify export markets.

The structure of heavy industrial and mineral products accounted for the highest value and proportion in the six commodity groups of the Northwest region, then the agricultural products.

Table 03: Export value of Vietnam and the Northwest region

Year	Viet Nam		Northwest region		Proportion of export value of Northwest / Vietnam (%)
	Total export value (Mill.USD)	Export increase (%)	Total export value (Mill. USD)	Export increase (%)	
2000	14.483	25,5	21,183	20,8	1,46
2001	15.029	3,7	37,905	78,9	2,52
2002	16.706	11,1	36,081	-2,7	2,15
2003	20.149	20,6	33,199	-7,9	1,64
2004	26.504	31,5	46,103	38,8	1,74
2005	32.447	22,5	44,855	-2,7	1,38
2006	39.826	22,7	64,165	43,1	1,61
2007	48.561	21,9	65,806	2,6	1,35
2008	62.685	29,1	123,331	87,4	1,96
2009	57.096	-8,9	133,538	8,3	2,33
2010	72.236	26,5	216,035	61,8	2,99
2011	96.905	34,2	272,445	26,1	2,81
2012	114.529	18,2	342,950	25,9	2,99
2013	132.032	15,3	579,354	68,9	4,38
2014	150.217	13,8	649,991	12,2	4,32
2015	162.016	7,9	820,617	26,2	5,06
2016	176.580	9,0	735,723	-10,3	4,16
2017	214.019	21,2	987,075	34,2	4,61
2018	244.700	14,3	616,150	-21,3	2,51
2019	264.190	15,4	1.300,692	111,1	4,92
2020	281.500	16,4	1.520,134	16,8	5,40
2021	336.310	19,5	1.827,761	20,2	5,43
2022	371.850	21,5	2.193,305	19,9	5,89
2023	356.600	20,6	2.520,163	14,9	7,06
Average growth rate (%)		18,0	-	28,0	-

Source: General Statistics Office

To better assess the export situation of the Northwest region, the table 3 shows the export value of the region compared to the whole country. Although the region's export share remains relatively low in the national export value, this share has increased significantly from 2000 to 2023.

4.2. The relationship between commodity exports and economic growth in Northwest Vietnam

To study the impact of exports on economic growth in the Northwestern region of Vietnam, the author used the co-integrated test method, which was proposed by Perasan (Perasan and parter, 2001). Autoregressive Distributed Lag: ARDL images are constructed as follows:

$$\Delta LGDP_t = \theta_0 + \delta_1 LGDP_{t-1} + \delta_2 LEX_{t-1} + \sum_{i=1}^{k} \lambda_{1i} LGDP_{t-i} + \sum_{i=0}^{k} \lambda_{2i} \Delta LEX_{t-i} + \varepsilon_t \quad (1)$$

According to Perasan and partner (2001), the application of ARDL model consists two steps as follows:

firstly, Using the AIC (Akaike Information Criterion) and SBC (Schwarz Bayesia Information Criterion) standards which select the latency option for the ARDL model. Test long-term co-integration relationship between ARDL model variables by using Wald (F- statistics) test to verify hypothetical pairs: H_0: $\delta_1 = \delta_2 = 0$ and H_1: $\delta_1 = \delta_2 \neq 0$ The Ho hypothesis depends on the statistical value F.

Secondly, if the long-term relationship between the variables has been confirmed through the Wald test, the long-term regression coefficients will be estimated in terms of equations (08) with the ARDL model latency. Then the short-term relationship between variables is also estimated with the Error correction model (ECM) as follows:

$$\Delta LGDP_t = \alpha_2 + \sum(i = 1)^k * \lambda_{1i} \Delta LGDP_{ti} + \sum(i = 0)^k * \lambda_{2i} \Delta LEX_{ti} + \Psi ECM_{t-1} + \varepsilon_{1t}$$

The ECM error correction is the remainder of the long-term regression results according to the previous ARDL model. Data used for the study are yearly data from 2000 to 2017, variables before being included in the calculation are adjusted by the author according to the original year price 2000.

Stopping tests are performed through a unit root test for variables in the model. The study used standards of Augmented Dickey-Fuller and Phillip Perron.

Table 04: Unit root test results

Variables	ADF		PP	
	I(0)	I(1)	I(0)	I(1)
LGDP	-3,840824**	-4,015944**	-3,840824**	-4,098287**
LEX	-2,053656	-5,319805***	-1,976434	-5,246424***

*Note: ***, **, * are stationary series corresponding to 1%, 5%, 10% significance*

The LGDP variable is the stop sequence I (0) according to ADF and PP standards with a significance level of 5%. With the variable LEX is the stop chain I (1) according to ADF and PP standards with a significance level of 1%.

Table 05: Results of Pearson co-integration test

F-statistics 22.532	90%		95%		99%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Critical value	3,17	4,14	3,79	4,85	5,15	6,36

Implementing Wald (F-statistic) test to calculate statistical value F = 22,532, hypothesis: H_0: δ_1 = δ_2 = 0 is rejected with a statistically significant level of 1% and has sufficient basis to conclude between variables in the model have a long-term co-existence relationship. Continue to estimate the ARDL (1.0,0) model to determine the regression coefficients that describe the long-term and short-term relationships between exports and economic growth in the Northwest during the study period. The estimated results are as follows.

Table 06: Estimating model of long-term coefficients

The dependent variable is LGDP

Variable name	Coef	Std. Err	t	P>
LEX	0,54492	0,0460	11,84	0,000
C	5,04444	0,23254	21,29	0,000
R^2 = 0,89 Serial Correlation LM Test: = 0,014 [0,9071] Heteroskedasticity Test: χ2 = 3,57 [0,0585]				

Table 07: Estimating model of short-term coefficients

The dependent variable is ΔLGDP

Variable name	Coef	Std. Err	T	P>
ΔLGDP(-1)	0,4044518	0,0561502	7,20	0,000
ΔLEX	0,1509376	0,0568475	2,66	0,021
ECM(-1)	0,1816361	0,083664	2,17	0,051
C	0,1153255	0,0204263	5,65	0,000
= 0,9 Serial Correlation LM Test: = 0,515 [0,431] Heteroskedasticity Test: χ2 = 0,53 [0,4658]				

The ARDL (1.0,0) model estimation results show that in long-term exports (LEX) have a positive relationship with economic growth (LGDP) with 1% statistical significance, if exports increase by 1%, the rate of economic growth also increases by 0.54%. In the study, the estimation results of the ECM model determine the short-term relationship between exports and economic growth in Northwest of Vietnam. The results show that in the short-term exports (LEX) have a positive relationship with economic growth (LGDP) with a 5% statistical significance. Finally, the coefficient of correction error (ECMt-1) of 0.181 is statistically significant at 10%, indicating a short-term correction rate of long-term equilibrium after impact shocks.

The results of this study have been clearly explained, through estimating the coefficients in the short and long term, exports all have a positive impact on economic growth, which is a new step compared to previous studies. The diagnostic tests of autocorrelation and variance error change show that the basic conditions of econometrics on the reliability of regression results are guaranteed.

5. Conclusions and policy implications

The economy in the Northwest of Vietnam has achieved many important targets, the structure

shifted in a positive direction, compliance with the trend of promoting the export of goods of the region. Although the scale and quality of goods in the provinces in the Northwest region have not developed as expected, the export value has prospered which increased every year. The region's share of export value compared to the whole country is still modest, but it plays an important role in Vietnam's export promotion strategy.

The results of ARDL model have explained clearly the positive impact of exports on economic growth. The assessment of this relationship is important in Vietnam's policy orientation in the coming years in order to improve the efficiency of international integration and expand export markets.

Several policies and strategies shall be proposed, with the aim of fostering an effective mutual relationship between exports and economic growth in the Northwest region of Vietnam, as follows:

Active export strategy combined with strengthening economic development: It is necessary to apply technology in production and use resources efficiently, protect the environment, and focus on developing high-quality human resources at the local level and more broadly across the Northwest region. Emphasis should be placed on promoting exports based on a sustainable and rational growth model that balances breadth and depth, quantity and quality, with a long-term vision and strategic focus.

Supply for goods export to stabilize the market: Diversifying the supply for export goods is indispensable to localize the added value of exports, reduce excessive dependence on some partners leading to high risks, to meet the objective requirements of rules of goods origin. Satisfying the requirements of customers in terms of quantity and quality of goods, improving the reputation of enterprises in the market, high growth. This will meet the needs, not only one or several small markets but also meet the needs of many other markets with high value orders.

Restructuring export products contributing to restructuring the economy: The structure of the economy in the Northwest shifted positively as a foundation to boost the restructuring of the export market, this is one of the key solutions to develop and expand the export market of the Northwest region next time. It is necessary to gradually reduce the growth model of production and export of raw products on the basis of exploiting the advantages of resources to switch to the export model of processed products with increasing economic value and added value.

Enhancing the image, branding, and affirmation of the quality of export products: Focusing on convincing customers to consume export products is an urgent requirement in the context of increasingly deep global integration. This involves not only enhancing product quality, design, and branding, but also ensuring compliance with international standards on safety, sustainability, and traceability. Exporters need to invest in technology, innovation, and green production processes, while strengthening value chains and building reputable brands in foreign markets. Additionally, expanding market research and customer insights, optimizing logistics, and actively participating in trade fairs and e-commerce platforms will significantly contribute to elevating the position of Vietnamese export products on the global stage.

Continue to effectively implement export support policies to promote sustainable economic growth: Exports not only bring in a substantial source of foreign currency, but also stimulate domestic production, expand business scale, create jobs, and improve people's living standards. When export activities grow steadily, the economy gains a solid foundation for long-term development. Export support policies help enterprises enhance their competitiveness, access market information, and meet technical standards and strict regulations set by importing countries. This is especially crucial in the context of globalization and the rise of protectionism.

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