CAN CIRCULAR ECONOMY PRACTICES, DIGITAL TRANSFORMATION AND FOREIGN OWNERSHIP BOOST FIRM PERFORMANCE? EVIDENCE FORM EXPORT-IMPORT FIRMS IN VIETNAM

Bui Le Vu* - Nguyen Viet Anh* - Le Quan - Nghiem Xuan Hoa* - Lai Thi Kim Anh*

Abstract: ***Since the implementation of its Doi Moi (Renovation) in 1986, the import-export sector has been playing a critical role in driving Vietnam's economic growth/development. However, Vietnam's export activities face high risks due to over-reliance on few key markets, vulnerability to global policy shocks and tremendous pressures to deal with climate change. Although prior studies have examined the effects of digital transformation or foreign ownership on firm performance, limited empirical evidence exists regarding how these factors jointly affect the performance of Vietnamese import-export firms. This study aims to clarify the role of digital transformation in driving firm's performance, especially foreign-invested enterprises. Empirical findings indicate that digital transformation has a significant, positive impact on firms' performance while the impact of foreign ownership is negligible. Results also confirm a statistically significant synergy between a firm's digital transformation and circular economy practices as well as between circular economy and firm's operational efficiency. Several policy implications and recommendations are given.***

• Keywords: *digitial transformation, foreign ownership, circular economy, firm performance, export-import sector.*

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1. Introduction

In recent years, the import-export sector has become one of the core drivers of economic growth, production expansion, and enhanced international integration in Vietnam. Being an export-oriented economy, Vietnam has been increasingly dependent on international trade for job-creation, attracting investment, and improving national competitiveness.

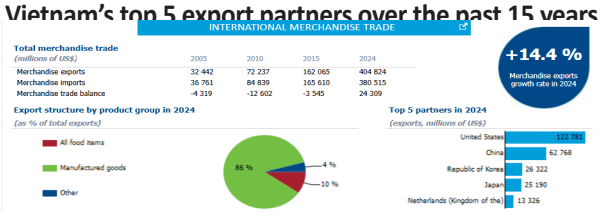
Import and export are not just economic activities but also a bridge connecting culture and technology between countries. However, in the context of strong globalization and increasing international competition, Vietnamese businesses are being confronted with growing pressure to adapt to technological advancements, new environmental standards, and rapidly changing market demands. In this context, digital transformation (DT) and foreign direct investment (FDI) are viewed as two strategic resources capable of improving business performance. Theoretically, DT helps businesses improve efficiency through process automation, resource allocation, enhanced data processing capabilities and decision-making in a volatile business environment. . For instance, studies based on Chinese listed firms provide evidence that DT improves return on assets (ROA), productivity, and resource allocation efficiency (Li et al., 2020; Zhang et al., 2021). Similar findings are also reported in broader digital economy studies, suggesting that digital technologies enhance operational efficiency through cost reduction, improved information processing, and better capital-labour allocation (Nambisan et al., 2017).

In parallel to DT, FDI not only provides financial capital but also access to advanced technology, global customer networks, and operational experience. It is well-established in the literature that higher foreign ownership is associated with improved firm performance (Duong et al., 2021; Ferreira and Matos, 2008; Lin and Fu, 2017). Moreover, evidence from export-oriented firms further shows that foreign ownership enhances firms' export participation and export intensity, highlighting its role in improving international market integration (Bena et al., 2017).

It is not overstated that the literature on DT-foreign ownership-firm performance is voluminous. Yet, existing empirical evidence primarily focuses on manufacturing, banking or overseas businesses, while studies on Vietnam's import-export sector are limited. This is a significant gap because the import-export sector is considered one of the main drivers of Vietnam's economic growth. Therefore, in-depth research to develop this sector will contribute to the country's economic progress.

** International School, Vietnam National University, Hanoi; email: builevu@gmail.com*

Figure 1: Total value of merchandise trade and Vietnam's top 5 export partners over the past 15 years



Source: UNCTAD

It can be inferred from Figure 1 that Vietnam's import and export industry remains heavily dependent on strategic markets such as the US, China, Japanwhich have introduced comprehensive transformation: stringent CE standards such as the EU's Carbon Border Adjustment Mechanism, green standards, sustainability, and social responsibility. While the relationship between DT and FDI is well-established in the literature, its correlation with CE pressures remain unresolved. Specifically, the regulatory role of CE constraints in shaping the relationship between DT, FDI, and business performance has not been fully explored. This paper aims to fill this void in the literature.

To address this gap, the current study examines the impact of DT, foreign ownership and especially CE practices on the performance of 66 Vietnamese listed import-export enterprises. Using panel data of 66 listed enterprises in Vietnam from 2018-2024, RBV theory and Agency Theory, the study focuses on answering three questions*: (1) Does DT improve firm performance? (2) How does foreign ownership affect enterprise performance? (3) Does CE practices regulate these relationships?*

2. Literature review and hypothesis development

2.1. DT and Firm performance

DT is emphasized as a strategy to bring Vietnam into a new stage of development, where knowledge, data, and technology become the foundation of sustainable growth. DT is the process of integrating digital technology into all aspects of a business's operations, from operational processes to business models, to optimize efficiency and create new value. DT utilizes technologies such as Big Data, the Internet of Things (IoT), cloud computing, and generative artificial intelligence (AI). For import and export businesses, this transformation is particularly crucial, as international trade is increasingly characterized by digital integration, data-driven decision-making, and tightly integrated global supply chains.

The existing literature provides ample empirical evidence on the DT-business performance relationship with inconclusive results. On the one hand, studies show that DT can significantly improve business performance. Specifically, Zhai et al. (2022) document that DT enhances business performance by reducing operating costs and optimizing resource allocation. Li et al. (2020) record that businesses adopting digital technology tend to improve ROA and profitability, thanks to enhanced resource utilization efficiency and reduced operating costs. Zhang et al. (2021) find that DT improves ROA and business productivity. On the other hand, other studies show that DT does not always have a positive impact on financial efficiency. Specifically, Jardak and Ben Hamad (2021) show that DT has mixed effects on firm's performance. Similarly, Guo et al. (2023) point out the digitalization paradox, in which over-investment in digital technology can increase operating costs, management costs and reduce asset utilization efficiency, thereby impairing a firm's short-term financial performance.

Given the fact that no consensus exists regarding the impact of DT on business performance, we have to rely on previous studies and RBV theory to develop hypotheses. These frameworks, widely used in organizational economics and management theory, offer valuable insights into how companies develop and leverage internal assets to achieve and maintain a competitive advantage. Resource-Based Value (RBV) theory, originating from Wernerfelt and formalized by Barney, emphasizes the strategic role of tangible and intangible resources such as financial assets, human capital, and technological capabilities—in shaping company performance.

From a theoretical perspective, Jay Barney argues that businesses can achieve superior performance by possessing and effectively utilizing strategic resources capable of enhancing organizational efficiency and effectiveness. In this context, DT should not be viewed simply as the application of technology, but rather as a firm-specific digital capability, encompassing data integration, process optimization, and strategic decision-making support. Therefore, from RBV's perspective, DT is not simply an investment in technology but a process of forming strategic digital capabilities helping businesses create superior value and improve operational efficiency.

Therefore, the study proposes the following hypothesis:

H1: DT has a positive impact on the firm performance of businesses in the import-export sector.

2.2. Foreign ownership and firm performance

Besides proactively improving operational efficiency through technological initiatives and optimizing internal processes through DT (H1), the operational capacity of a business is also strongly influenced by its specific governance structure and capital sources. In this context, the participation of foreign investors plays a crucial exogenous driving role. If DT provides a "tool" for businesses to streamline operations, then foreign ownership brings international standards of governance thinking and a rigorous monitoring system.

In fact, previous studies have yielded controversial conclusions regarding the relationship between foreign investment and business performance. Bena et al. (2017) confirm that foreign ownership promotes long-term investment in tangible, intangible, and human capital, leading to a significant increase in innovation output.

Ferreira and Matos (2008) document that enterprises with a higher proportion of independent foreign institutional ownership have higher enterprise value, better operational performance, and lower investment costs. Similarly, Lin and Fu (2017) demonstrate that large, foreign institutional shareholders have a more positive impact on business performance than small, domestic, and pressure-sensitive institutional shareholders. However, some studies show no or negative relationship between foreign ownership and business performance. Conversely, Amin and Hamdan (2018) point out a negative impact of FDI on business performance due to foreign investors being far from the actual workplace and lacking control over it. The participation of foreign shareholders provides businesses with access to valuable resources, including financial capital, advanced technology, modern management expertise, and knowledge of international markets. These resources support businesses in improving operational efficiency, optimizing decision-making processes, and enhancing competitiveness in the global business environment. In this context, foreign ownership reflects not only the participation of international capital flows but also the ability to access global management knowledge, technology, and business networks, which can then influence the operational efficiency of the enterprise.

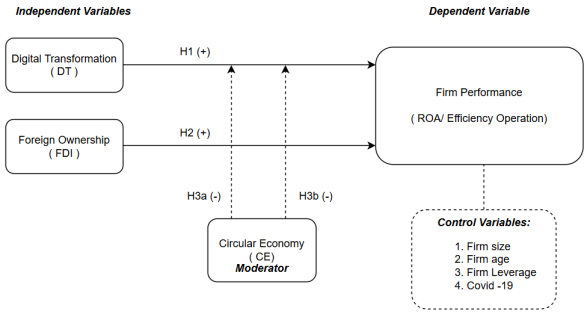
H2: Foreign ownership has a positive impact on firm's performance.

2.3. The moderating role of CE adoption on the effectiveness of DT and foreign ownership

Although DT and foreign ownership are expected to improve business performance by providing strategic resources and enhancing competitiveness, these benefits do not always translate into the same performance results in every context. According to RBV theory, businesses can create a competitive advantage by possessing valuable, scarce, difficult-to-replicate, and difficult-to-replace resources. DT helps businesses improve their operational capabilities, while foreign ownership provides access to international capital, technology, and management knowledge. However, the ability to effectively utilize these resources depends heavily on the institutional environment. According to Institutional Theory, a company's resource efficiency depends significantly on institutional pressures from the external environment, including the legal framework, industry standards, and expectations from the international market (Meyer and Rowan, 1977).

In particular, for import and export businesses in Vietnam, the pressure from the CE is becoming more pronounced as businesses must simultaneously comply with increasingly stringent sustainability standards from major export markets such as the EU and the US. In the context of deep integration, Vietnamese import and export businesses are facing increasing competitive pressure from key international markets such as the EU, the US, and Japan. These markets are increasingly applying strict standards related to the environment, traceability, emission reduction, and sustainable development in the global supply chain. This forces export businesses to continuously adjust their production, management, and compliance models to maintain market access. In this context, implementing a CE is no longer simply a strategic choice, but is gradually becoming an institutional condition for businesses to maintain their ability to participate in global value chains.

Figure 3: Research hypothesis model



Source: Authors' own work

During the initial adaptation phase, CE adoption can significantly change how businesses allocate and utilize strategic resources. For DT, instead of focusing entirely on improving operational efficiency, optimizing costs, or decision-making speed, a portion of technological resources may be redirected to activities serving emission monitoring, environmental data management, traceability, and meeting ESG standards. This reallocation may diminish the short-term financial benefits of DT. Similarly, although foreign investors may bring international capital, technology, and management expertise, they often apply higher standards of sustainable development, supply chain transparency, and environmental responsibility to meet the requirements of the global market. This can increase compliance costs, internal coordination costs, and complexity in governance, especially in initial stages of CE implementation. Therefore, in the context of Vietnam, the CE is expected to weaken the positive impact of DT and foreign ownership on business performance in the short term.

H3a: The CE negatively regulates the relationship between DT and firm performance in the short term.

H3b: The CE negatively regulates the relationship between foreign ownership and firm performance in the short term.

3. Data and methodology

3.1. Data source

Data were gathered from the annual reports of 66 companies from 2018 to 2024, Hanoi Stock Exchange (HNX), Ho Chi Minh City Stock Exchange (HOSE), UPCOM, Vietstock website, and Fiinpro.

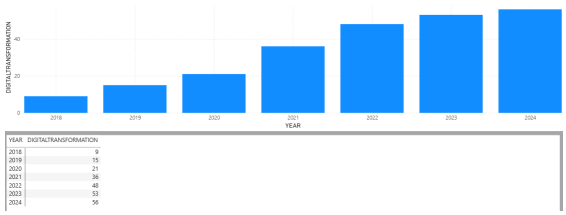
3.2. Data description

Table 1: Explain the research variables

Variable	Description
Dependent variable	
ROA (Return on Assets)	ROA= Net income/ Total assets, measures how effectively a business uses its total assets to generate profit.
Efficiency Operation	Operational Efficiency = Revenue/ Total Assets
Independent variable	
FDI (Foreign ownership ratio)	Total equity owned by foreign investors in a firm
DT	The DT variable equals to1 corresponding to companies that have implemented DT, including keywords such as: digitalization, DT, automation, cloud computing, ERP, SAP, artificial intelligence, IoT, etc., and conversely, 0 represents businesses that have not implemented DT.
Control Variable	
Firm leverage	Total debt to total assets
Firm size	Natural logarithm of total assets.
Firm age	Number of years since establishment.
COVID-19	Controls for the exogenous shock of the pandemic that disrupted trade and supply chains
Moderation Variable	
Circular economy	Dummy variable (0,1) 0: Business has not implementated, 1: Business has implemented

Source: Authors' own work

Figure 4: Number of businesses implementing DT into their business models from 2018-2024



YEAR	DIGITALTRANSFORMATION
2018	9
2019	15
2020	21
2021	36
2022	48
2023	53
2024	56

Source: Authors' own work

3.3. Method

$ROA = \beta_0 + \beta_1 *DT + controls + \varepsilon_{it}$ (1)

$ROA = \beta_0 + \beta_1 *FDI + controls + \varepsilon_{it}$ (2)

$ROA = \beta_0 + \beta_1 *DT + \beta_2 *FDI + \beta_3 *CE + \beta_4 *(DT*CE) + \beta_5 *(FDI*CE) + controls + \varepsilon_{it}$ (3)

Regarding the regression analysis model, we use panel data regression with pooled OLS, fixed-effects models (FEM), or random-effects models (REM), depending on the model's fit.

4. Results and discussion

4.1. Descriptive Statistics

The research dataset comprises 462 observations from listed import-export companies in Vietnam. Descriptive statistics show that the financial performance of businesses, measured by ROA, has an average value of 7.99%, with a standard deviation of 0.0812, reflecting a relatively large difference in profitability. The DT (DT) variable has an average value of 0.5152, indicating that approximately 51.5% of businesses in the sample have implemented DT. Meanwhile, FDI has an average value of 0.1285, implying that the average foreign ownership ratio is approximately 12.85% of total equity. For the control variables, Firm size has an average value of 28.90, indicating that the businesses in the sample are mainly medium and large-sized enterprises. Firm age averages 32.71 years, reflecting that most businesses have been operating in the market for a relatively long time. Firm leverage has an average value of 0.4471, indicating that debt accounts for approximately 44.7% of total assets, representing a relatively high level of financial leverage.

Table 2: Data discription

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	462	0.0798578	0.0812081	-0.3642	0.5076
Efficiency Operation	462	0.9877143	0.5268658	0.0056604	3.212444
DT	462	0.5151515	0.5003121	0	1
FDI	462	0.1285204	0.1402701	0	0.5721
Firm size	462	28.90005	1.240656	26.04142	33.04485
Firm age	462	32.71212	17.60329	7	123
Firm leverage	462	0.4471255	0.2176854	0.03	1.65
Covid	462	0.4285714	0.4954081	0	1
DT*CE	462	0.1277056	0.3341235	0	1
FDI*CE	462	0.0216298	0.075763	0	0.498

Source: Authors' own work

4.2. Pairwise correlations

Table 3: Correlation Matrix of Variables

Variables	ROA	Efficiency Operation	FDI	DT	Firm size	Firm age	Firm leverage	Covid
ROA	1.00							
Efficiency Operation	0.83	1.00						
FDI	-0.014	0.020	1.00					
DT	0.014	0.035	0.222	1.00				
Firm size	0.092	-0.171	0.066	0.299	1.00			
Firm age	0.102	0.101	0.003	0.113	-0.083	1.00		
Firm leverage	-0.503	0.190	-0.113	-0.038	-0.003	-0.128	1.00	
Covid	0.007	0.026	0.001	-0.263	-0.053	-0.049	0.049	1.00

Source: Authors' own work

Based on the correlation matrix, the correlation coefficients between the independent variables were all less than 0.8, indicating that the model showed no signs of serious multicollinearity, making it suitable for further regression analysis

4.3. VIF testing

Table 4: Vif testing between variables

Variable	VIF	1/VIF
DT	1.35	0.739258
FDI	1.24	0.806627
Firm size	1.24	0.808354
Firm age	1.06	0.943131
Firm leverage	1.08	0.925434
DT*CE	2.77	0.361539
FDI*CE	2.34	0.378318

Source: Authors' own work

The results of the variance amplification factor test show that all VIF values are much lower than the commonly used threshold of 10, indicating that multicollinearity is not a significant concern in this study.

4.4. Model Selection and Construction test

** Model Selection Test*

The study estimate model using three models: pooled OLS, FEM, REM. Then test are conducted choose the appropriate model.

$ROA = \beta_0 + \beta_1 *DT + controls + \varepsilon_{it}$ (1)

$ROA = \beta_0 + \beta_1 *FDI + controls + \varepsilon_{it}$ (2)

$ROA = \beta_0 + \beta_1 *DT + \beta_2 *FDI + \beta_3 *CE + \beta_4 *(DT*CE) + \beta_5 *(FDI*CE) + controls + \varepsilon_{it}$ (3)

Table 5 : Model selection results

	Test	F- test	Hausman test
Results	DT	Prob > F = 0.0000 < 0.05	Prob > chi2 = 0.0000
	FDI	Prob > F = 0.0000 < 0.05	Prob > chi2 = 0.0000
	DT*CE	Prob > F = 0.0000 < 0.05	Prob > chi2 = 0.0000
	FDI*CE	Prob > F = 0.0000 < 0.05	Prob > chi2 = 0.0000
Conclusion	DT	FEM is more suitable than OLS	FEM is more suitable than REM
	FDI	FEM is more suitable than OLS	FEM is more suitable than REM
	DT*CE	FEM is more suitable than OLS	FEM is more suitable than REM
	FDI*CE	FEM is more suitable than OLS	FEM is more suitable than REM

Source: Authors' own work

There for the Fixxed Effect model FEM is the most suitable model to explain the correlation between variables and independent variables DT and FDI.

** Model defects test*

Table 6: Model defects testreults

		Heteroscedasticity test	Autocorrelation test
Results	DT	chi2 (66) = 52588.73 Prob > chi2 = 0.0000 <0.05	F(1, 65) = 35.464 Prob > F = 0.0000 <0.05
	FDI	chi2 (66) = 91176.86 Prob > chi2 = 0.0000 <0.05	F(1, 65) = 37.008 Prob > F = 0.0000 <0.05
	DT*CE	chi2 (66) = 70845.56 Prob > chi2 = 0.0000	F(1, 65) = 35.502 Prob > F = 0.0000<0.05
	FDI*CE	chi2 (66) = 90885.78 Prob > chi2 = 0.0000<0.05	F(1, 65) = 37.164 Prob > F = 0.0000<0.05
Conclusion	DT	The FEM model has Heteroscedasticity	The FEM model exhibits the presence of first-order autocorrelation
	FDI	The FEM model has Heteroscedasticity	The FEM model exhibits the presence of first-order autocorrelation
	DT*CE	The FEM model has Heteroscedasticity	The FEM model exhibits the presence of first-order autocorrelation
	FDI*CE	The FEM model has Heteroscedasticity	The FEM model exhibits the presence of first-order autocorrelation

Source: Authors' own work

** Fixed Effects model with firm-clustered standard errors*

Table 7: Fixed Effects model with firm-clustered standard errors

ROA	Coefficient	Robust std. err	t	P>|t|	[95% conf. interval]	
DT	.0179171	.0106836	1.68	0.098	-.0034196	.0392538
FDI	.010087	.036383	0.28	0.782	-.0625749	.0827489
DT*CE	.011003	.0166493	0.66	0.511	-.022248	.044254
FDI*CE	-.0326037	.0675453	-0.48	0.631	-.1675009	.1022935

Source: Authors' own work

Table 7 presents the results of a baseline regression examining the relationship between DT, FDI, and ROA, including the moderating role of CE. Strong standard errors were applied to address potential heterogeneity issues. The results show that DT has a positive but insignificant impact on business performance. Specifically, the coefficient of DT is 0.0179 and is statistically significant at the 10% level (p = 0.098). This suggests that businesses with higher levels of DT tend to achieve better financial performance; however, the impact remains relatively weak and not statistically strong, implying that the impact of DT on ROA is still limited in scale. Conversely, FDI showed a positive coefficient but was not statistically significant even at the 10% level. This indicates that the presence of foreign investors has not yet created a strong enough impact to improve the financial performance of businesses in the sampled context.

Regarding the moderating effect, the interaction coefficient between DT and CE (DT × CE) was positive but not statistically significant at the 10% level. This suggests that CE has not yet played a significant role in strengthening the relationship between DT and business performance. Similarly, the interaction between FDI and CE (FDI × CE) is negative and not statistically significant, indicating that CE does not significantly moderate the relationship between foreign ownership and ROA.

4.5. Robustness test of alternative performance indicators

Table 8: Robust test of alternative Efficiency Operation

Efficiency Operation	Coefficient	Robust std. err	t	P>|t|	[95% conf. interval]
DT	.1351286	.0576419	2.34	0.022	.0200098 .2502473
FDI	-.2387234	.2114446	-1.13	0.263	-.6610074 .1835605
DT*CE	.0807251	.0562436	1.44	0.156	-.0316011 .1930512
FDI*CE	-.542933	.290156	-1.87	0.066	-1.122415 .0365485

Source: Authors' own work

To ensure result robustness, dependent variable was replaced with Operational Efficiency. Results show that DT has a positive and statistically significant impact at 5% level, indicating that DT not only improves financial efficiency but also has a stronger impact on operational efficiency.

Conversely, FDI is not statistically significant, suggesting a weak and unclear impact. Regarding the moderating variable, DT × CE is not statistically significant, while FDI × CE is negative and weakly significant at the 10% level, implying that CE may weaken the relationship between FDI and operational efficiency. This result suggests that CE may weaken the relationship between foreign ownership and operational efficiency, implying that inefficiencies or synergistic conflicts may exist when these two factors act simultaneously in practice. Overall, the robustness results confirm that DT has a more stable and stronger impact when measured by operational efficiency, while FDI and CE have yet to demonstrate a strong and consistent impact.

5. Conclusion

5.1. Discussion

This study examines the impact of DT and FDI on business performance, focusing on ROA and operational performance as well as the role of CE practices.Empirical results show that DT has a positive and statistically significant impact on business performance, with this impact being stronger and more stable on operational performance compared to ROA. This indicates that DT primarily improves internal processes, resource allocation, and operational capacity, thereby indirectly enhancing financial performance. Conversely, FDI does not consistently demonstrate a statistically significant impact in both models. This suggests that the impact of foreign ownership on business performance is not automatic but depends on the internal conditions of the business and its specific context. Regarding the

moderating variable CE, the results show that CE does not have a statistically significant moderating role in the relationship between revenue and business performance in both models.

These findings confirm the beneficial effects of DT as well as CE practices on driving firm's performance. Meanwhile, the insignificant impact of foreign onwersip probably reflect the fact that it may take time for foreign investors to get accustomed to local business environmet and generate benefits to the local community.

5.2. Implications and recommendations

This study contributes to the academic literature on DT and business performance in the context of emerging economies, particularly in the import-export sector. The research affirms that DT is not merely a technological investment, but a crucial strategic capability. In import-export businesses, where operational efficiency heavily depends on the speed and accuracy of information processing, logistics coordination, and cross-border supply chain integration, DT becomes a key factor driving both operational and financial performance. Furthermore, the role of CE adds an important contextual dimension to these relationships. CE not only acts as a facilitator but also shapes how foreign ownership impacts business performance, particularly in terms of operational efficiency. This shows that the relationship between ownership structure, DT, and business performance is dependent on the internal conditions of the enterprise as well as the external environment, especially in industries with a high degree of international integration such as import-export. The research findings offer several important implications for businesses and policymakers in the import-export industry. For import-export businesses, investing in DT is considered a key factor in enhancing competitiveness, particularly through improved operational efficiency such as order management, logistics optimization, reduced document processing time, and enhanced coordination with international partners. Simultaneously, the role of CE shows that the effectiveness of DT depends not only on technology adoption but also on the level of organization, governance mechanisms, and internal coordination capabilities. This implies that import-export businesses need to simultaneously improve their governance capabilities and operational structures to maximize the benefits of DT in a volatile international trade environment. The benefits of CE have been well-recognized in the literature (Le and Nghiem, 2023; Mai, 2023). Therefore, facilitationg CE practices especially among export-import firms not only help these entities boost their reputation but also minimize costs and improve profits.

Furthermore, for policymakers, developing a DT ecosystem in the import-export sector, such as e-customs, digital logistics, and cross-border trade platforms, will help maximize the impact of both DT and FDI. Simultaneously, policies supporting improved corporate governance capacity are also important in ensuring that the benefits from technology and international integration are effectively disseminated, thereby enhancing national competitiveness in international trade.

5.3. Limitations and future research directions

Although this study makes certain contributions, some limitations should be acknowledged. Firstly, the study primarily focuses on two business performance indicators: ROA and operational efficiency. While these are common measures in empirical research, they do not fully reflect other important aspects of import-export businesses such as innovation capacity, supply chain resilience, or export competitiveness. Further, although the study includes the moderating variable CE in the model, this variable does not fully reflect the complexity of institutional, legal, and organizational factors affecting the effectiveness of DT and FDI. Other contextual factors such as market volatility, trade policy instability, or global supply chain disruptions may also play a significant role but have not been considered in the model.

Future studies could overcome these limitations by using more detailed measures for DT, adding more business performance indicators, and expanding the moderating or mediating variables. Furthermore, applying dynamic panel data models such as the GMM system, or analyzing by industry and business type in the import/export sector, would help clarify the differences in the impact of DT and foreign ownership. Finally, future studies could also incorporate qualitative methods to gain a deeper understanding of the mechanisms by which DT and FDI impact business performance in practice.

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