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Green Logistics Determinants Of Foreign Direct Investment Attraction: Empirical Evidence From Thanh Hoa Province, Vietnam

Thi Thanh Hai Nguyen

Hong Duc University, Vietnam

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ABSTRACT

This study investigates the influence of green logistics factors on Foreign Direct Investment (FDI) attraction in Thanh Hoa Province, an emerging industrial hub in Northern Vietnam, with a particular focus on the moderating role of global supply chain pressure. Grounded in the Eclectic Paradigm (OLI framework), the Resource-Based View, and Institutional Theory, the study conceptualizes green logistics as a multidimensional locational advantage encompassing green logistics infrastructure, green regulatory frameworks, logistics digitalization, and green human resources. Using survey data collected from 152 foreign-invested enterprises operating in Thanh Hoa, the study applies Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 to test the proposed hypotheses. The empirical results indicate that all four green logistics dimensions exert positive and statistically significant effects on FDI attraction, with green logistics infrastructure emerging as the most influential determinant. While global supply chain pressure does not directly affect FDI attraction, it significantly moderates the relationship between green human resources and FDI attraction in a negative direction, suggesting that under intense international environmental scrutiny, foreign investors tend to rely more on standardized logistics systems and infrastructure than on locally embedded human capital. These findings extend the OLI framework by incorporating green logistics as a sustainability-oriented locational advantage at the sub-national level and provide practical implications for provincial policymakers seeking to attract high-quality, environmentally responsible FDI.

Keywords: Green logistics; Foreign direct investment; Logistics digitalization; Institutional framework; Vietnam

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1. Introduction

In the contemporary era of global economic integration, Foreign Direct Investment (FDI) has emerged as a cornerstone of economic development, particularly for emerging economies like Vietnam. However, the traditional paradigm of attracting investment at any environmental cost is rapidly being replaced by a "Green Growth" strategy. As international investors increasingly align their operations with Environmental, Social, and Governance (ESG) criteria, the quality of a host country's logistics system - specifically its "greenness"—has become a decisive factor in location choice. Recent scholarship suggests that environmental performance is no longer a burden but a critical determinant of a country's competitiveness in attracting high-quality FDI (Zaman & Shamsuddin, 2017).

Green logistics - defined as the reduction of environmental impacts across logistics activities such as transportation, warehousing, and packaging - has increasingly evolved into a strategic source of competitive advantage. Empirical evidence provided by Hausman, Lee, and Subramanian (2013) demonstrates that improvements in national logistics performance are strongly associated with higher trade intensity and foreign direct investment (FDI) inflows, particularly in countries with efficient and sustainability-oriented logistics systems. In addition, studies published in the *Journal of Cleaner Production* highlight that institutional pressures, including environmental regulations and global sustainability standards, play a critical role in driving firms to adopt green logistics practices, which in turn help sustain the long-term competitiveness of manufacturing locations (Zhu & Sarkis, 2007; Zhu, Sarkis, & Lai, 2008). In the context of Vietnam, the greening of the logistics sector is therefore not only a competitiveness imperative but also a crucial pathway for realizing the country's commitment to achieving net-zero emissions by 2050, as announced at COP26.

Thanh Hoa Province, positioned as a new growth pole in Northern Vietnam, presents a compelling case for this investigation. With the strategic advantage of the Nghi Son Deep-water Seaport and a burgeoning industrial landscape, the province has witnessed a significant surge in FDI. However, Thanh Hoa faces a critical juncture: how to transition from traditional, carbon-intensive industrial activities to a sustainable investment model. While the provincial government has made strides in infrastructure, the systematic implementation of green logistics - ranging from renewable energy integration in warehousing to digitized transportation networks - remains uneven.

This study is driven by both theoretical and empirical necessities. Theoretically, while the Eclectic Paradigm (OLI) by Dunning (1988) explains FDI based on ownership, location, and internalization advantages, it requires an updated lens to incorporate "green" locational advantages (Reid & Toffel, 2009). Practically, there is a lack of empirical evidence quantifying

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how specific green logistics factors influence the decisions of foreign investors in specific localities like Thanh Hoa.

Therefore, this paper aims to analyze the impact of green logistics factors on FDI attraction in Thanh Hoa Province. By employing an empirical approach, the research seeks to provide a scientific roadmap for provincial policymakers to enhance the local investment climate, ensuring that Thanh Hoa not only attracts more capital but does so in a manner that is sustainable and resilient in the face of global climate challenges.

2. Literature Review

2.1. Theoretical Background

The Eclectic Paradigm (OLI Framework) The theoretical foundation for understanding FDI attraction is rooted in Dunning's (1988) OLI framework, which posits that a firm's decision to invest abroad depends on Ownership (O), Location (L), and Internalization (I) advantages. In the context of this study, "Green Logistics" represents a critical Location Advantage. According to Cuerva et al. (2014), as global environmental standards tighten, firms are increasingly attracted to locations that offer "green" infrastructure and eco-efficient services to mitigate operational risks and comply with international carbon regulations.

Resource-Based View (RBV) and Natural Resource-Based View (NRBV) The RBV suggests that firms achieve competitive advantage through unique resources (Barney, 1991). Hart (1995) extended this into the Natural Resource-Based View (NRBV), arguing that for firms to remain competitive in the future, their resources must support environmental sustainability. From the perspective of Thanh Hoa province, a green logistics system (including green warehouses and clean energy) acts as a specialized regional resource that attracts FDI by enabling foreign firms to implement sustainable supply chain strategies (Gold et al., 2010).

Institutional Theory Institutional theory suggests that organizations adapt to the norms and regulations of the environments in which they operate (DiMaggio & Powell, 1983). For FDI firms in Thanh Hoa, green logistics is not just an operational choice but a response to institutional pressures - both from the Vietnamese government's green growth strategy and from international trade agreements like the EVFTA, which mandate strict environmental standards (Zhu & Sarkis, 2007).

2.2. Hypothesis Development

Green Logistics Infrastructure (GINF) and FDI Modern infrastructure is a primary determinant of FDI. However, recent studies emphasize that "green" infrastructure—such as intermodal

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transport that reduces carbon emissions - is now more attractive to high-quality investors. Research by Bensassi et al. (2015) demonstrates that the quality of logistics infrastructure significantly boosts trade and investment flows.

***H1**: Green logistics infrastructure has a positive impact on FDI attraction in Thanh Hoa Province.*

Green Regulatory Framework (GREG) and FDI Environmental regulations can act as a "pull factor" for high-tech FDI. According to the "Porter Hypothesis," well-designed environmental regulations trigger innovation (Porter & van der Linde, 1995). In the logistics sector, provincial policies that offer incentives for green practices or mandate emissions standards signal a stable and forward-looking investment climate (Zaman & Shamsuddin, 2017).

***H2**: The regional green regulatory framework has a positive impact on FDI attraction in Thanh Hoa Province.*

Logistics Digitalization and Technology (TECH) and FDI Digitalization is a prerequisite for green logistics, enabling route optimization and energy efficiency. Evangelista et al. (2018) found that the integration of ICT in logistics operations significantly reduces environmental impact and operational costs, which are key concerns for foreign investors seeking efficiency.

***H3**: The level of logistics digitalization and technology has a positive impact on FDI attraction in Thanh Hoa Province.*

Green Human Resources (GHR) and FDI The ability to manage green supply chains requires specialized skills. Studies by Jabbour and de Sousa Jabbour (2016) highlight that "Green Human Resource Management" is essential for the successful implementation of environmental technologies. For Thanh Hoa, the availability of a workforce skilled in sustainable logistics operations is a major draw for multinational corporations.

***H4:** The quality of green human resources in the logistics sector has a positive impact on FDI attraction in Thanh Hoa Province.*

2.2.2. The Moderating Role of Global Supply Chain Pressure (GSCP)

Global Supply Chain Pressure refers to the demands from international customers and lead firms regarding environmental standards and carbon footprint reduction (Zhu & Sarkis, 2004). This pressure acts as a "magnifier" that dictates how much value an investor places on local green logistics capabilities.

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The interaction between GSCP and Green Infrastructure (GINF) For investors integrated into global chains (like those in Nghi Sơn exporting to the US/EU), the availability of green ports or low-carbon transport is not just a benefit but a survival factor to avoid "carbon border taxes." According to Wolf (2014), firms under high supply chain scrutiny will prioritize locations with green infrastructure more than those serving local markets.

***H5a**: Global Supply Chain Pressure positively moderates the relationship between Green Logistics Infrastructure and FDI attraction.*

The interaction between GSCP and Green Regulatory Framework (GREG)

As international partners increasingly impose stringent environmental standards, foreign investors tend to depend more strongly on host-country environmental regulations to ensure regulatory clarity and operational consistency. Prior studies grounded in institutional theory indicate that well-defined and credible environmental governance frameworks at the local level function as a stabilizing mechanism that mitigates uncertainty for firms operating under intense transnational environmental scrutiny (Delmas & Toffel, 2008; Marquis & Qian, 2014).

***H5b**: Global Supply Chain Pressure positively moderates the relationship between the Green Regulatory Framework and FDI attraction.*

The interaction between GSCP and Logistics Digitalization (TECH)

Digital logistics (tracking, IoT, big data) is essential for the "traceability" required by global supply chains. A firm under high pressure to report its carbon footprint will value Thanh Hoa's digital logistics capabilities much more than a firm with lower reporting requirements (Evangelista et al., 2018).

***H5c:** Global Supply Chain Pressure positively moderates the relationship between Logistics Digitalization and FDI attraction.*

The interaction between GSCP and Green Human Resources (GHR) MNCs facing global sustainability mandates require a local workforce that can immediately operate green technologies and manage eco-efficient warehouses. Jabbour and de Sousa Jabbour (2016) emphasize that the synergy between external pressure and internal human capital is vital for environmental performance. However, in emerging regions where green logistics skills are still unevenly developed, intense global supply chain pressure may also lead foreign investors to rely more on standardized systems, external service providers, or imported managerial practices, potentially weakening the role of locally embedded green human resources.

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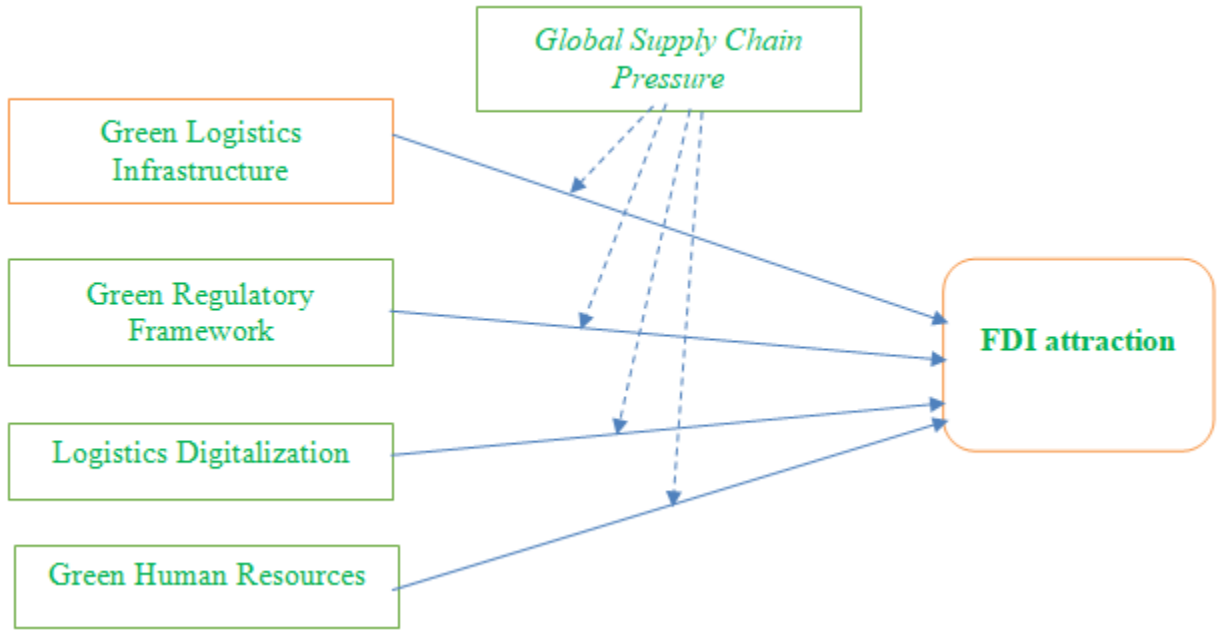
***H5d**: Global Supply Chain Pressure positively moderates the relationship between Green Human Resources and FDI attraction.*

Based on the theoretical foundations and the hypothesized relationships discussed above, this study proposes the conceptual framework illustrated in Figure 1.

Figure 1: Conceptual framework



3. Research Methodology

3.1. Research Design and Data Collection

This study employs a quantitative research design to test the hypothesized relationships between green logistics factors, global supply chain pressure, and FDI attraction in Thanh Hoa Province. Data were collected through a structured survey targeting senior managers, logistics directors, and operational heads of Foreign Direct Investment (FDI) enterprises currently operating in Thanh Hoa.

A purposive sampling technique was utilized to ensure that respondents possessed sufficient knowledge of their firm's strategic investment and supply chain requirements. Out of the distributed questionnaires, 152 valid responses were obtained from FDI firms located in the Nghi Son Economic Zone and various Industrial Parks (IPs) such as Le Mon, Bim Son, and Lam Son - Sao Vàng. This sample size fulfills the minimum requirements for Structural Equation Modeling

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(SEM) as suggested by Hair et al. (2017), particularly for the Partial Least Squares (PLS) approach.

3.2. Measurement Scales

All constructs were measured using a 5-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The scales were adapted from established international studies to ensure content validity:

Green Logistics Infrastructure (GINF): Measured by 5 items adapted from Bensassi et al. (2015) and Zaman & Shamsuddin (2017). These items focus on the availability of eco-friendly transport modes, green port facilities at Nghi Son, and energy-efficient warehousing.

Green Regulatory Framework (GREG): Measured by 4 items adapted from Zhu & Sarkis (2007). This scale assesses the transparency and effectiveness of local environmental policies and provincial incentives for green initiatives.

Logistics Digitalization & Technology (TECH): Measured by 6 items adapted from Evangelista et al. (2018). It evaluates the adoption of IoT, big data for route optimization, and digital tracking systems that minimize waste and emissions.

Green Human Resources (GHR): Measured by 5 items adapted from Jabbour & de Sousa Jabbour (2016), focusing on the environmental expertise and green management skills of the local workforce.

Global Supply Chain Pressure (GSCP): Measured by 4 items adapted from Wolf (2014) and Zhu & Sarkis (2004). This construct measures the demands from international partners regarding carbon footprint transparency and green compliance.

FDI Attraction (FDI): FDI attraction is operationalized as perceived attractiveness and reinvestment intention among incumbent foreign firms. Measured using four items adapted from prior studies on location attractiveness and expansion intention of foreign investors, capturing firms' satisfaction with the investment environment and their willingness to expand operations in Thanh Hoa (Wei et al., 1999; Belderbos et al., 2001; Dunning & Lundan, 2008).

3.3. Data Analysis Method

This study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) as the primary analytical technique, implemented using SmartPLS 4 software. PLS-SEM is particularly well suited to the objectives of this research because the proposed model is relatively complex and incorporates moderating effects (interaction terms)**.** In addition, PLS-SEM does not require

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the data to follow a normal distribution, a condition that is often violated in survey-based empirical studies. Finally, this method performs effectively with relatively small sample sizes (N = 152), thereby ensuring robust and reliable parameter estimation for the analysis.

The analysis followed a two-step approach as recommended by Hair et al. (2021):

Measurement Model Evaluation: Assessing reliability (Cronbach's Alpha, Composite Reliability) and validity (Convergent Validity via AVE and Discriminant Validity via HTMT criteria).

Structural Model Evaluation: Testing the structural paths (R^2, f^2, and p-values) to confirm or reject the hypotheses. The moderating effect of GSCP was tested using the Product Indicator Approach within SmartPLS 4 to determine if the interaction terms (X times GSCP) were statistically significant.

4. Research Results

4.1. Profile of Survey Respondents

The final dataset comprises 152 valid questionnaires collected from managers and senior staff of FDI enterprises operating in Thanh Hoa Province. All respondents hold positions that are directly related to logistics management, supply chain coordination, or strategic investment decisions, ensuring that their responses accurately reflect firm-level perceptions of green logistics conditions. Table 1 presents the demographic and organizational characteristics of the surveyed foreign-invested enterprises operating in Thanh Hoa Province.

Table 1. Profile of survey respondents (N = 152)

Characteristics	Category	Frequency	Percentage (%)
Position	Senior managers	61	40.1
	Logistics / Operations managers	54	35.5
	Department heads	37	24.4
Working experience	< 5 years	29	19.1
	5–10 years	67	44.1
	> 10 years	56	36.8
Enterprise location	Nghi Son EZ	74	48.7
	Industrial Parks	78	51.3

The respondent profile indicates a high level of managerial seniority, with over 75% of participants occupying senior management or functional leadership roles. This strengthens the

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credibility of the findings, as these individuals are typically responsible for logistics strategy, supplier coordination, and investment-related decisions.

In terms of professional experience, more than 80% of respondents have at least five years of working experience, suggesting a deep understanding of both local logistics conditions and the evolving environmental requirements imposed by global supply chains. Such experience is particularly relevant in the context of Thanh Hoa Province, where FDI enterprises are increasingly exposed to international environmental standards.

The nearly equal distribution of firms between Nghi Son Economic Zone and other industrial parks reflects the diversified spatial structure of FDI in Thanh Hoa. This balanced representation enhances the generalizability of the results across different industrial clusters within the province.

4.2. Measurement Model Assessment

The measurement model was evaluated to ensure the reliability and validity of the constructs prior to hypothesis testing. Following the guidelines of Hair et al. (2021), indicator reliability, internal consistency reliability, convergent validity, discriminant validity, and collinearity were assessed. The reliability and validity of the measurement model were assessed using internal consistency, convergent validity, and discriminant validity criteria, as reported in Table 2.

Table 2. Measurement model evaluation results

Construct	Items	Loading range	Cronbach's α	CR (ρc)	AVE	VIF range
FDI	4	0.817–0.866	0.862	0.906	0.706	1.903–2.123
GHR	5	0.799–0.854	0.894	0.922	0.703	1.999–2.504
GINF	5	0.728–0.830	0.849	0.892	0.624	1.561–2.045
GREG	4	0.841–0.870	0.882	0.918	0.738	2.057–2.522
GSCP	4	0.828–0.882	0.877	0.914	0.728	2.001–2.441
TECH	6	0.796–0.868	0.916	0.934	0.704	2.181–2.821

All measurement items exhibit outer loadings above 0.70, confirming strong indicator reliability. The values of Cronbach's Alpha and Composite Reliability for all constructs exceed the recommended threshold of 0.70, indicating high internal consistency. Furthermore, AVE values range from 0.624 to 0.738, exceeding the minimum criterion of 0.50, thus confirming convergent validity.

Collinearity diagnostics reveal that all VIF values are below 3, suggesting that multicollinearity does not pose a threat to the estimation of the model.

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Discriminant validity was assessed using the HTMT criterion, with all HTMT values well below the conservative threshold of 0.85 (ranging from 0.190 to 0.687). This indicates that each construct captures a distinct conceptual domain.

4.3. Structural Model Assessment

After establishing the adequacy of the measurement model, the structural relationships were examined to test the proposed hypotheses. The results of the structural model estimation and hypothesis testing are summarized in Table 3.

Table 3. Structural model results and hypothesis testing

Hypothesis	Path	β	t-value	p-value	f^2	Result
H1	GINF → FDI	0.304	4.510	0.000	0.157	Supported
H2	GREG → FDI	0.169	3.025	0.003	0.053	Supported
H3	TECH → FDI	0.218	3.149	0.002	0.073	Supported
H4	GHR → FDI	0.222	3.437	0.001	0.083	Supported
H5a	GSCP × GINF → FDI	0.110	1.769	0.077	0.019	Not supported
H5b	GSCP × GREG → FDI	0.047	0.967	0.333	0.004	Not supported
H5c	GSCP × TECH → FDI	-0.014	0.238	0.812	0.000	Not supported
H5d	GSCP × GHR → FDI	-0.276	4.753	0.000	0.119	Significant but opposite to hypothesized direction

The results indicate that all four green logistics dimensions - green infrastructure, regulatory framework, digitalization, and green human resources - exert positive and statistically significant effects on FDI attraction. Among these, green logistics infrastructure exhibits the strongest impact, highlighting the critical role of physical and technological logistics foundations in shaping foreign investors' location decisions.

Interestingly, global supply chain pressure does not have a direct effect on FDI attraction. However, it plays a significant moderating role in the relationship between green human resources and FDI, with a negative interaction effect. Contrary to the hypothesized positive moderating effect (H5d), the interaction between global supply chain pressure and green human resources exhibits a statistically significant negative coefficient. This suggests that under high

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global supply chain pressure, FDI firms tend to rely more on standardized logistics systems and infrastructure rather than on local human resources alone.

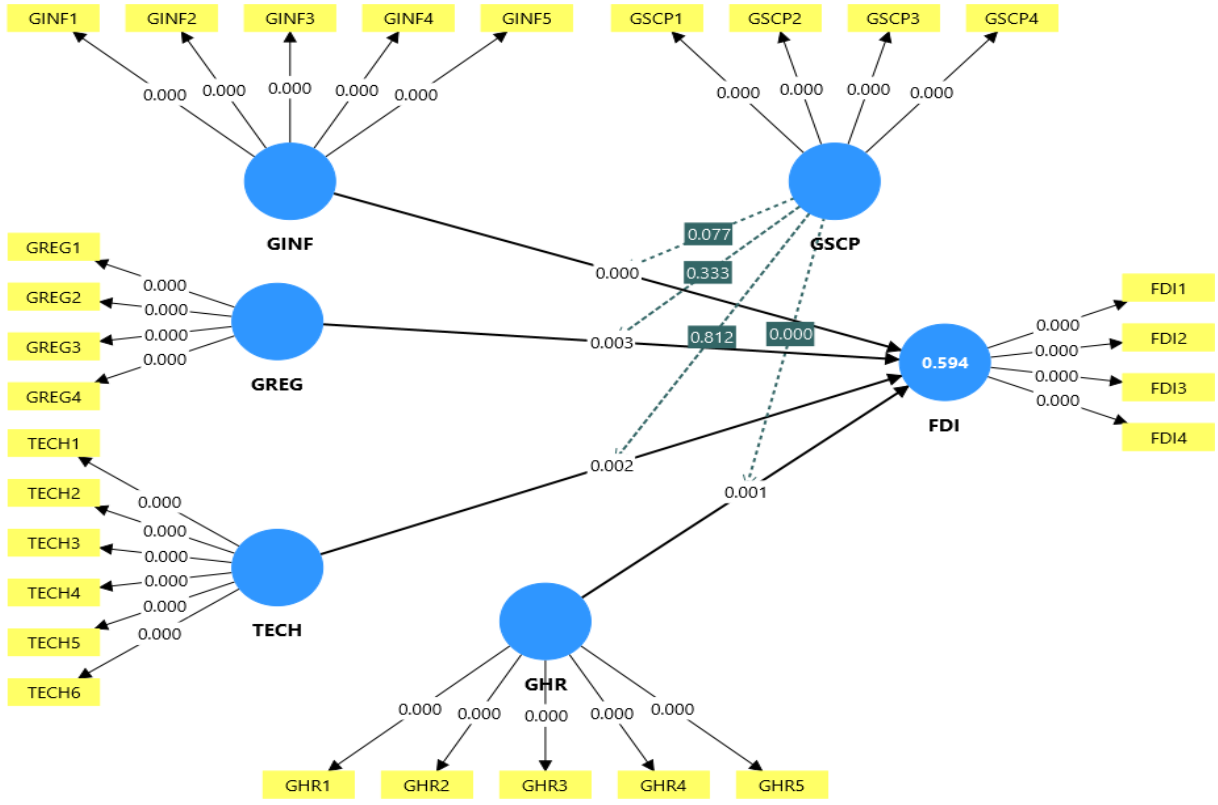
The model explains a substantial proportion of variance in FDI attraction (R^2 = 0.594; Adjusted R^2 = 0.568), indicating strong explanatory power. Moreover, the Q^2predict value of 0.545 confirms the model's robust predictive relevance.

Figure 2 illustrates the estimated structural model with standardized path coefficients and significance levels.

4.4. Summary of empirical findings

Overall, the findings provide strong empirical support for the argument that green logistics capabilities constitute a critical locational advantage in attracting FDI to Thanh Hoa Province. While institutional pressure from global supply chains does not directly drive investment decisions, it reshapes how investors value specific green logistics resources, particularly human capital.

Figure 2: Structural Model



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5. Discussion

This study investigates the influence of green logistics factors on FDI attraction in Thanh Hoa Province, with particular attention to the moderating role of global supply chain pressure. The empirical findings provide several important theoretical and practical insights.

5.1. The role of green logistics as a locational advantage for FDI

Consistent with Dunning's Eclectic Paradigm (OLI framework), the results confirm that green logistics dimensions function as a critical location-specific advantage shaping foreign investors' location choices. Specifically, green logistics infrastructure (GINF), regulatory framework (GREG), digitalization and technology (TECH), and green human resources (GHR) all exert significant positive effects on FDI attraction.

Among these factors, green logistics infrastructure emerges as the strongest determinant of FDI attraction. This finding aligns with prior empirical evidence suggesting that high-quality logistics infrastructure significantly reduces transaction costs and operational uncertainty for multinational enterprises (Bensassi et al., 2015; Dunning & Lundan, 2008). In the context of Thanh Hoa, the presence of Nghi Son Deep-water Seaport, combined with improvements in intermodal transport and energy-efficient logistics facilities, appears to play a decisive role in enhancing the province's investment appeal.

From a Natural Resource-Based View (NRBV) perspective (Hart, 1995), green logistics infrastructure represents a region-specific strategic resource that enables foreign firms to comply with international environmental standards while maintaining operational efficiency. This is particularly relevant for export-oriented FDI firms serving the EU and US markets, where carbon regulations and sustainability reporting requirements are becoming increasingly stringent.

Situating Thanh Hoa Province within the broader landscape of foreign direct investment in Vietnam underscores the contextual relevance of the present findings. Unlike established FDI hubs such as Bac Ninh and Hai Phong in the North, or Binh Duong in the Southern key economic region, which benefit from mature industrial ecosystems, deeply integrated global supply chains, and highly standardized logistics and institutional frameworks, Thanh Hoa represents an emerging investment frontier undergoing rapid industrial transformation. In these mature FDI regions, green logistics practices are increasingly institutionalized and often function as baseline requirements rather than differentiating locational advantages. By contrast, in provinces like Thanh Hoa - where industrialization is accelerating but green logistics infrastructure, regulatory support, and digital capabilities remain uneven - the development of green logistics plays a more decisive role in shaping foreign investors' perceptions of long-term location attractiveness. This contextual distinction suggests that the influence of green logistics

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on FDI attraction is inherently contingent upon the developmental stage of the host region, with sustainability-oriented logistics systems serving as a strategic signal of future-oriented policy commitment and investment readiness in emerging provincial economies.

5.2. The importance of institutional and regulatory support

The positive impact of the green regulatory framework (GREG) on FDI attraction supports the arguments of Institutional Theory, which emphasizes that firms adapt their strategies to regulatory pressures and institutional environments (DiMaggio & Powell, 1983). Well-designed environmental regulations and green incentives signal policy stability and reduce institutional uncertainty, thereby increasing investor confidence.

This result is consistent with the Porter Hypothesis, which suggests that appropriately designed environmental regulations can enhance competitiveness by stimulating innovation rather than imposing excessive compliance costs (Porter & van der Linde, 1995). Similar findings have been reported in studies examining the relationship between environmental regulation and investment attractiveness in emerging economies (Zaman & Shamsuddin, 2017; Li et al., 2020).

In Thanh Hoa Province, recent provincial initiatives promoting green industrial zones and logistics decarbonization appear to have strengthened the institutional foundation necessary to attract environmentally conscious FDI. These findings suggest that regulatory quality matters not merely as a compliance mechanism but as a strategic signal to global investors.

5.3. Digitalization and green human resources as complementary drivers

The significant positive effect of logistics digitalization and technology (TECH) underscores the growing importance of digital transformation in green logistics systems. Digital technologies such as IoT, big data analytics, and real-time tracking systems enhance route optimization, energy efficiency, and transparency - key concerns for multinational firms operating under ESG scrutiny (Evangelista et al., 2018).

This finding corroborates earlier research demonstrating that digital logistics capabilities are essential for reducing environmental impact while improving supply chain performance (Centobelli et al., 2020). In the context of Thanh Hoa, the uneven adoption of logistics digitalization across industrial parks suggests that further investment in digital infrastructure could significantly strengthen the province’s competitive position.

Similarly, the positive relationship between green human resources (GHR) and FDI attraction highlights the importance of environmentally skilled labor in supporting green logistics operations. This result is consistent with the green human resource management literature, which

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emphasizes the role of employee skills and environmental awareness in the successful implementation of green supply chain practices (Jabbour & de Sousa Jabbour, 2016).

5.4. The nuanced role of global supply chain pressure

One of the most intriguing and theoretically significant findings of this study is the unexpected negative moderating effect of global supply chain pressure on the relationship between green human resources and FDI attraction, which runs counter to the initial hypothesis (H5d).

This result suggests that under conditions of intense global supply chain pressure - such as stringent carbon reporting requirements or supplier audits imposed by lead firms - foreign investors may rely more heavily on standardized logistics systems, infrastructure, and technologies than on locally embedded human resources. This interpretation aligns with arguments by Zhu and Sarkis (2004), who note that external pressure often leads firms to prioritize system-level compliance mechanisms over localized capabilities.

The negative moderation effect contrasts with studies that report a strengthening role of supply chain pressure in enhancing green capabilities (Wolf, 2014), indicating that the effect of GSCP may be context-dependent. In emerging regions like Thanh Hoa, where green logistics skills are still developing, global pressure may inadvertently reduce the relative importance of local human resources, as firms import standardized practices or rely on global logistics partners.

6. Contributions

6.1. Theoretical Contributions

This study makes several important contributions to the literature on FDI attraction and green logistics.

First, this research extends Dunning's Eclectic Paradigm (OLI framework) by empirically demonstrating that green logistics capabilities constitute a multidimensional locational advantage in an emerging economy context. While prior studies have largely focused on traditional logistics infrastructure or institutional quality as drivers of FDI, this study decomposes green logistics into infrastructure, regulatory framework, digitalization, and human resources, thereby providing a more nuanced understanding of how sustainability-oriented location advantages operate.

Second, by integrating insights from the Resource-Based View (RBV) and the Natural Resource-Based View (NRBV), this study highlights how region-level green logistics resources can enhance a host location's attractiveness to foreign investors. The findings confirm that not only tangible resources such as green infrastructure but also intangible resources such as digital capabilities and green human capital contribute to competitive positioning. This contributes to

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the NRBV literature by shifting the unit of analysis from the firm level to the sub-national (provincial) level, an area that remains underexplored.

Third, the study contributes to Institutional Theory by empirically validating the role of green regulatory frameworks as a positive signal to foreign investors. The results suggest that environmental regulation should not be viewed merely as a compliance burden but as an institutional mechanism that reduces uncertainty and enhances location credibility. This finding provides empirical support for the Porter Hypothesis in the context of green logistics and FDI attraction in emerging regions.

Finally, the study offers a novel contribution by uncovering the negative moderating effect of global supply chain pressure on the relationship between green human resources and FDI attraction. Contrary to the dominant assumption that external environmental pressure uniformly strengthens green capabilities, the findings reveal a more complex dynamic. This insight challenges the linear interpretation of institutional pressure and suggests that global supply chain demands may reconfigure the relative importance of local resources, favoring standardized infrastructure and technologies over localized human capital. This nuanced result opens new avenues for future research on the contingent effects of global sustainability pressures.

6.2. Practical Contributions

From a practical perspective, the findings provide actionable implications for provincial policymakers, industrial park authorities, and FDI-oriented infrastructure planners.

First, the strong influence of green logistics infrastructure underscores the need for continued investment in low-carbon transport systems, green ports, and energy-efficient logistics facilities. For Thanh Hoa Province, upgrading intermodal connectivity around Nghi Son Economic Zone and promoting renewable energy use in logistics operations can significantly enhance investment attractiveness.

Second, the positive role of the green regulatory framework suggests that policymakers should prioritize regulatory clarity, consistency, and transparency. Rather than focusing solely on stricter enforcement, provincial authorities can design incentive-based policies that encourage green logistics adoption while signaling long-term policy stability to foreign investors.

Third, the importance of logistics digitalization indicates that digital infrastructure should be considered an integral component of green logistics strategies. Investments in smart logistics platforms, digital tracking systems, and data-sharing mechanisms can help FDI firms meet international ESG reporting requirements more efficiently.

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Fourth, although green human resources positively influence FDI attraction, the negative moderating role of global supply chain pressure highlights a potential risk: without adequate system-level support, local human capital alone may be insufficient under intense international scrutiny. This implies that workforce development initiatives should be closely aligned with infrastructure and technology upgrades, ensuring that human resources are embedded within standardized green logistics systems.

7. Conclusion, Limitations, and Future Research

7.1. Conclusion

This study examines the impact of green logistics factors on FDI attraction in Thanh Hoa Province, with particular emphasis on the moderating role of global supply chain pressure. Using PLS-SEM analysis on survey data from 152 FDI enterprises, the findings demonstrate that green logistics infrastructure, regulatory frameworks, digitalization, and green human resources all significantly enhance FDI attraction.

Among these factors, green logistics infrastructure plays a dominant role, reaffirming the importance of physical and technological foundations in attracting sustainability-oriented investment. While global supply chain pressure does not directly influence FDI attraction, it significantly reshapes how investors value specific green resources, particularly by weakening the effect of local green human resources.

Importantly, the discovery of a negative moderating effect of global supply chain pressure on the role of green human resources challenges the conventional assumption that external sustainability pressure uniformly strengthens local green capabilities, thereby offering a more nuanced understanding of contingent institutional effects in emerging economies.

Overall, the results suggest that green logistics should be viewed as a strategic locational asset, capable of supporting both economic competitiveness and environmental sustainability in emerging industrial regions.

7.2. Limitations

Despite its contributions, this study has several limitations that should be acknowledged.

First, the analysis is based on cross-sectional survey data, which limits the ability to infer causal relationships over time. Future studies could employ longitudinal designs to capture the dynamic evolution of green logistics capabilities and investment decisions.

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Second, the study focuses on a single province, which may limit the generalizability of the findings to other regions with different institutional or economic conditions. Comparative studies across multiple provinces or countries would help validate and extend the results.

Third, the measurement of global supply chain pressure relies on managerial perceptions, which may be subject to response bias. Future research could incorporate objective indicators, such as the presence of carbon reporting requirements or participation in international sustainability certification schemes.

7.3. Directions for Future Research

Building on these limitations, future research could explore several promising directions. Scholars may investigate how green logistics capabilities interact with firm-level strategies or ownership structures to influence investment outcomes. Additionally, further examination of the contingent and potentially non-linear effects of global supply chain pressure could provide deeper insights into the mechanisms through which sustainability pressures shape investment behavior.

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