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Host Country Environmental Regulation, Low-Carbon Transition, and Overseas Investment Location Preference of Logistics Enterprises

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Abstract. Against the background of deepening global climate governance and advancing carbon neutrality goals, cross-country differences in environmental regulation have become a key institutional factor shaping logistics firms' overseas investment location choices. As service-oriented yet carbon-intensive industries, logistics enterprises must consider not only transport costs and market size but also environmental compliance costs and green development opportunities when expanding abroad. However, existing research on environmental regulation and foreign direct investment (FDI) location focuses primarily on manufacturing, lacking systematic analysis of logistics firms. Drawing on institutional theory, the resource-based view, and the Porter Hypothesis, this study constructs a theoretical model: host country environmental regulation – firm low-carbon transition capability – overseas investment location preference. It empirically examines how environmental regulation affects location choice via incentive/constraint mechanisms and the mediating role of low-carbon capability. Multi-source data and structural equation modeling (SEM) are employed for analysis. Results show that host country environmental regulation significantly influences logistics firms' location preference, with stage-specific characteristics. Low-carbon transition capability plays a critical mediating role, and firms with varying low-carbon capabilities exhibit distinct preferences for highly regulated countries. These findings offer a new theoretical perspective on logistics firms' international strategy under green institutional pressure and inform policy design and low-carbon internationalization for enterprises.

Keywords: Host country environmental regulation; Low-carbon transition; Logistics enterprises; Overseas investment location preference; Institutional theory; Porter Hypothesis

1. Introduction

As global climate governance intensifies and carbon neutrality goals advance, environmental regulation has emerged as a critical institutional factor shaping multinational firms' strategic decisions. In recent years, policies such as the EU Carbon Border Adjustment Mechanism (CBAM), emission trading systems (ETS), and environmental taxes in many countries have made environmental regulation differences across countries clearer. For firms that invest abroad, host country environmental regulation means higher compliance cost. But at the same time, it may also bring green innovation incentives and better market structure (Li et al., 2025). So when firms choose overseas investment locations, they need to balance regulatory pressure and green opportunities (Alola, 2019). This change in institutional environment is reshaping global capital flows. The logistics industry plays a key role in international trade and global supply chains. It uses a lot of energy and produces high carbon emissions. So, it is very sensitive to environmental policy changes. With the spread of green supply chain management and stronger carbon rules in shipping and aviation, logistics firms face higher environmental compliance cost when they expand internationally. At the same time, digital technology and low-carbon technology give new paths for green upgrading. In this case, will host country environmental regulation stop logistics firms from entering highly regulated countries and create a "pollution haven effect"? Or will it encourage firms to improve low-carbon capability and make them more willing to enter high-standard markets, which supports the Porter Hypothesis? This question is both theoretically and practically important. Most existing studies on environmental regulation and foreign direct investment location focus on manufacturing and heavily polluting industries (Ambec et al., 2013). They often emphasize production cost, institutional distance, and pollution transfer. But logistics firms are different. They feature lighter asset structures, strong network dependencies, and shorter technology upgrade cycles. Their investment motivation and path choice may not be the same as traditional manufacturing firms. Also, with the global green transition speeding up, low-carbon transition capability has become an important resource for international competitiveness. This capability is not only about green technology investment and carbon efficiency improvement. It also reflects firms' ability to adapt to institutions and manage risks. So including low-carbon transition capability in the framework helps us better understand the internal mechanism of how environmental regulation affects location choice (Andersen & Sutherland, 2024). Based on this background, this study builds a theoretical model of "host country environmental regulation – low-carbon transition capability – overseas investment location preference" from the view of institutional theory and the resource-based view. It tries to explain how environmental regulation affects logistics firms' location choice and through what mechanism. This study aims to answer the following questions: How does host country environmental regulation affect logistics firms' overseas investment location preference? Does low-carbon transition capability play a mediating or moderating role? Do firms show different strategic behaviors under different levels of regulation? This research has several important meanings. In theory, it expands the study of environmental regulation and foreign direct investment into service-based and carbon-intensive industries. It also enriches the research framework that links green institutional pressure and firm international strategy (Becker & Henderson, 2000). In practice, it helps logistics firms improve overseas layout decisions under green transition. It also provides support for governments to design better green policies and guide firms to go abroad in a higher-quality way (Brown & Green, 2024).

Under the background of global green transition and stronger institutional environment, host country environmental regulation has become an important external factor that affects cross-border investment decisions. However, there is still not enough systematic research on how environmental regulation affects logistics enterprises' overseas location choice, and what role low-carbon transition capability plays in this process (Markosyan al., 2025). So this study sets the following objectives. First, this study aims to analyze the direction and strength of the impact of host country environmental regulation on logistics firms' overseas investment location preference (Chiappini & Gerard, 2025). It

tries to see whether environmental regulation has an inhibiting effect or an encouraging effect. It also compares different types of regulation, such as command-and-control regulation and market-based regulation, to see if they have different impacts. Second, this study tries to examine the mechanism role of low-carbon transition capability between environmental regulation and location choice. It looks at whether low-carbon capability can reduce the cost pressure from regulation. It also studies whether this capability can improve green competitiveness and increase firms' willingness to enter highly regulated countries (Coleet al., 2005). In this way, the study tests the mediating or moderating effect in the theoretical model. Third, this study builds and tests a structural model of "host country environmental regulation – low-carbon transition capability – overseas investment location preference." It uses multi-source data and empirical methods to test the hypotheses in a systematic way. This helps improve the explanation power and robustness of the results (Coleet al., 2006). By achieving these objectives, this study tries to explain the internal logic of how logistics firms make overseas location decisions under green institutional pressure. It hopes to provide systematic evidence for both theory development and practical decision-making (Corbett et al, 2001).

With global low-carbon transition and stronger institutional environment, more scholars are paying attention to how environmental regulation affects firms' international strategy. But most studies focus on manufacturing and heavily polluting industries. There is less attention on logistics enterprises, which are service-based but still have high carbon emissions. At the same time, research on how firms' internal low-carbon transition capability mediates or moderates the effect of environmental regulation on location choice is still limited. So this study has some new value in theory integration and empirical analysis. First, at the theoretical level, this study puts host country environmental regulation, low-carbon transition capability, and overseas investment location preference into one unified framework. It builds a systematic theoretical model and expands the research boundary of environmental regulation and foreign direct investment location choice (Demir et al., 2015). By using institutional theory and the resource-based view, this study not only looks at external institutional pressure, but also highlights the key role of internal resources and capability in institutional adaptation. This gives a richer view on the interaction between green institutional environment and firm strategy. Second, at the industry level, this study focuses on logistics enterprises. This industry has strong network characteristics and faces clear green transition pressure. The investment decisions of logistics firms are different from manufacturing firms. Their asset structure, operation model, and technology upgrade path are different (Dijkstra et al., 2011). So this study helps show industry heterogeneity in the impact mechanism of environmental regulation. It fills the gap in existing literature from the industry perspective. Third, at the mechanism level, this study carefully examines the mediating and moderating role of low-carbon transition capability between environmental regulation and location choice. It explains how green capability affects firms' willingness to enter highly regulated markets. This analysis helps test the Pollution Haven Hypothesis and the Porter Hypothesis in the logistics industry (Eskeland & Harrison, 2003). It also gives a clearer explanation of how firms upgrade strategy under green institutional pressure. Finally, at the practical level, this study gives decision reference for logistics enterprises to improve overseas investment layout under global green governance. It also gives empirical support for governments to balance environmental goals and capital flow when designing environmental regulation policies. By showing the interaction between institutional pressure and firm capability, this study gives useful insight for promoting high-quality international expansion and green development goals(García & López, 2023).

2. Literature Review

2.1. Host Country Environmental Regulation

As global climate governance becomes more complete, environmental regulation is now an important institutional factor in cross-border investment decisions. Host country environmental regulation not

only shows a country's environmental governance level and sustainability policy direction, but it also directly affects the compliance cost and institutional risk that firms face when they enter that market. Different countries design and enforce environmental policies in very different ways (Herold & Lee, 2018). This difference creates an external environment that can shape where firms choose to invest overseas. So it is necessary to review environmental regulation in a clear way, especially by looking at regulation types and related theories. This helps us understand how regulation may affect logistics firms' location preference. From the view of policy tools, environmental regulation is often divided into two main types: command-and-control regulation and market-based regulation (Huang et al., 2025). Command-and-control regulation is the core of traditional environmental governance. It mainly uses emission standards, technical rules, administrative approval, and mandatory limits to directly control firm behavior. This type of regulation is clear and strict. It can reduce pollution in a short time. But it often increases compliance cost, especially for industries with high energy use and high emissions. For logistics firms, strict emission standards, carbon caps, or forced upgrades of environmental equipment may raise operating cost. This can then affect whether the firm wants to invest in a highly regulated country. Market-based regulation, in contrast, uses economic incentives to guide firms to change their behavior (Jeppesen et al., 2002). Typical tools include carbon taxes, carbon trading systems, green subsidies, and tax benefits. This type of regulation uses price signals and market mechanisms to improve resource allocation. It increases emission cost, but it also creates possible returns for green innovation (Kim et al., 2023). In a market-based regulation environment, firms with stronger green innovation or low-carbon transition capability may upgrade their technology and offset part of the cost. They may even gain competitive advantage. So the effect of market-based regulation is kind of two-sided. It depends not only on regulation strength, but also on the firm's own capability structure. From a theoretical view, institutional pressure theory provides a useful way to explain how environmental regulation affects firm behavior. Institutional theory says that firms are embedded in an institutional environment, and their choices are influenced by normative pressure, coercive pressure, and mimetic pressure. Host country environmental regulation is a typical coercive pressure. It requires firms to follow specific environmental standards and compliance rules (Keller & Levinson, 2002). At the same time, social expectations for green development, together with the global trend of green governance, create normative pressure. This pushes firms to take low-carbon transition more seriously at the strategy level. So when firms face different institutional environments, their location choices often reflect a mix of concerns about legitimacy and compliance risk. In the research on environmental regulation and cross-border investment, scholars often discuss two main views: the Pollution Haven Hypothesis and the Porter Hypothesis. The Pollution Haven Hypothesis says that firms tend to move more polluting activities to countries with weaker environmental regulation (Kellenberg, 2009). They do this to lower compliance cost and reduce supervision pressure. Under this logic, strong environmental regulation may stop firms from entering a country, especially for firms that are very sensitive to cost. The Porter Hypothesis gives an opposite view. It says that well-designed and reasonable environmental regulation can push firms to innovate. It can help firms upgrade technology and improve efficiency. In the long run, this can increase firm competitiveness. In this view, environmental regulation is not only a cost burden (Lin & Sun, 2016). It can also be a driver for green transition and value creation. If a firm has strong low-carbon technology capability and good ability to adapt, it may get higher market acceptance and stronger brand value in a highly regulated country. This can increase the attractiveness of that location for investment. Overall, the effect of host country environmental regulation on overseas investment location preference is complicated and depends on the situation. Sometimes it works as a cost pressure that discourages investment. Sometimes it works as an innovation incentive that supports investment. For the logistics industry, which is service-based but still carbon-intensive, the mechanism may not be the same as in traditional manufacturing. So it is necessary to further discuss regulation types and their interaction

with firms' low-carbon transition capability. This provides a good base for later model building and empirical testing (Liu & Li, 2023).

2.2. Low-Carbon Transition Capability

With the continuous spread of the green development idea, low-carbon transition capability is becoming an important sign of a firm's sustainable competitiveness. In high-emission industries, low-carbon transition is not only a passive response to environmental regulation. It is also an active strategy for long-term growth and value creation. For logistics firms, their business includes transport, warehousing, distribution, and cross-border supply chain management. These activities use a large amount of energy and create different sources of carbon emissions. So building low-carbon transition capability is a systematic and multi-dimensional task. In this study, low-carbon transition capability means a firm's overall ability to reduce carbon emissions and improve green competitiveness through green innovation, technology investment, governance improvement, and supply chain coordination (Liu et al., 2024).

First, green innovation capability is the core driving force of low-carbon transition. Green innovation includes activities such as energy-saving technology development, use of new energy vehicles, optimization of intelligent dispatch systems, and green packaging design. This capability can be measured by green patent numbers and R&D intensity. It also shows how well a firm can adapt to changes in environmental regulation. From the resource-based view, green innovation capability is a strategic resource that is hard to copy. It helps firms build a competitive advantage in highly regulated markets. When firms have strong green innovation capability, the cost pressure from environmental regulation may become motivation for technology upgrading (Liu et al., 2024). This can increase their willingness to invest in countries with higher environmental standards. Second, low-carbon technology investment provides the material base for green innovation. For logistics firms, this type of investment often includes purchasing electric or hybrid vehicles, building green warehouses, upgrading energy management systems, and improving digital logistics platforms. Continuous investment in low-carbon technology can reduce carbon intensity per unit of transport and improve energy efficiency. In the long term, it can also reduce environmental compliance costs (Liu & Li, 2023). Firms that invest more in low-carbon technology usually have stronger ability to deal with strict environmental regulation. As a result, they may feel more confident when entering highly regulated countries. Third, ESG governance capability is an important institutional support for low-carbon transition. ESG refers to Environmental, Social, and Governance practices. A strong ESG system can improve transparency, strengthen risk management, and enhance corporate reputation. For logistics firms that operate internationally, ESG governance can influence access to green finance and cooperation opportunities. It also affects how well a firm can gain legitimacy in countries with strict environmental standards. Therefore, ESG governance capability is a key part of low-carbon transition capability. Finally, green supply chain integration capability is an external extension of low-carbon transition. Logistics firms play a central role in global supply chains. Their green transformation does not only depend on internal operations. It also requires cooperation with upstream and downstream partners. Green supply chain integration includes route optimization, green procurement, carbon information sharing, and joint emission reduction programs (Liu & Li, 2024). Through this coordination, firms can improve overall carbon efficiency and strengthen their position in green markets.

Based on the above discussion, this study divides low-carbon transition capability into four main dimensions and builds a conceptual structure, as shown in Fig. 1.

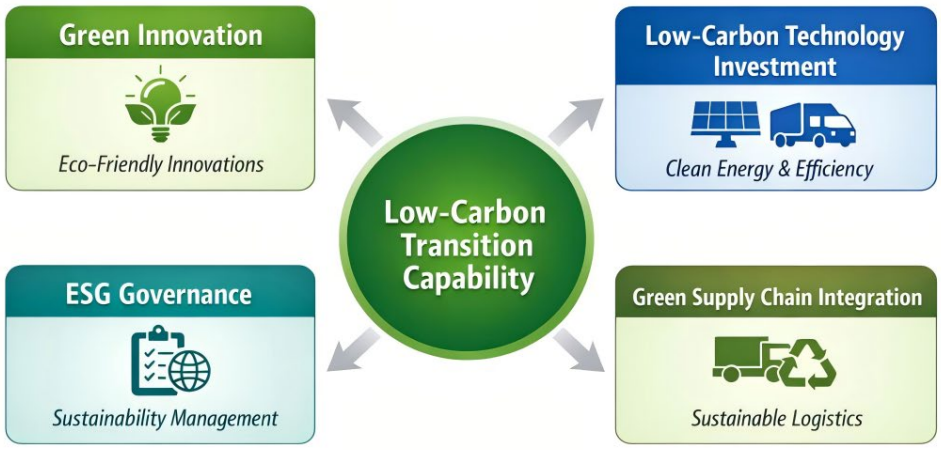

Fig. 1: Conceptual Structure of Low-Carbon Transition Capability

As shown in Fig. 1, low-carbon transition capability consists of green innovation capability, low-carbon technology investment, ESG governance capability, and green supply chain integration capability. Green innovation and technology investment represent internal technical and resource dimensions. ESG governance shows institutional and managerial support. Green supply chain integration reflects external coordination ability within the network. These four dimensions work together and form the overall capability that helps firms respond to environmental regulation and improve international competitiveness (Li et al, 2024).

In the following theoretical model, low-carbon transition capability is treated as a key variable linking host country environmental regulation and overseas investment location preference. On one hand, environmental regulation may encourage firms to improve their low-carbon capability through pressure and incentive mechanisms. On the other hand, the level of low-carbon capability directly affects whether firms have enough strategic confidence and cost tolerance to enter highly regulated markets. Therefore, analyzing low-carbon transition capability in a systematic way provides important theoretical support for understanding how environmental regulation influence's location choice decisions (List et al., 2000).

2.3. Overseas Investment Location Preference

Overseas investment location choice is a central topic in international business research. This decision is usually shaped by a mix of economic factors, institutional environment, and firm resources and capabilities. With the faster trend of global green transition, differences in environmental regulation have become an important institutional variable in location choice. So it is necessary to review the theoretical basis of overseas investment location preference from classic location theories and institutional views. One of the most well-known frameworks is Dunning's OLI paradigm (Ownership–Location–Internalization). This theory says that firms need ownership advantages, location advantages, and internalization advantages to do foreign direct investment. Among these, location advantage is key for choosing the investment destination. It includes market size, resource endowment, labor cost, and institutional environment. Environmental regulation is an important part of the institutional environment. It can change the attractiveness of the host country. If regulation is strong, firms may face higher compliance cost. But if regulation is stable, transparent, and supports green innovation, it may also attract higher-quality investment. So in the green transition context, environmental regulation is becoming a more important part of location advantage. Institutional distance theory also helps explain location choice. It focuses on the differences between home and host countries in institutions, legal systems, and governance structures. When institutional distance is larger, firms face more uncertainty and higher cost to adapt. Differences in environmental regulation

are an important part of this distance. For example, differences in green policy standards, carbon pricing mechanisms, and enforcement strength may increase adaptation cost. For logistics firms, if they have stronger low-carbon capability, they can reduce the risk and cost caused by institutional distance. So they may be more willing to enter highly regulated countries. In addition, the cost–benefit trade-off model provides an economic base for location choice. Firms often compare expected returns and operating costs across countries to choose the best location. Environmental regulation may increase costs, such as emission fees and technology upgrade spending. But it may also bring long-term benefits, such as brand premium, market access advantage, and green finance support. So whether a firm chooses a highly regulated country depends on how it evaluates both the costs and the potential benefits. Overall, overseas investment location preference is not decided by only one factor. It is a strategic choice shaped by location advantage, institutional distance, and cost–benefit trade-off together. Under the stronger green institutional environment, including environmental regulation and low-carbon transition capability in one framework helps us better understand the internal logic of logistics firms' overseas location decisions (Markusen et al.,1995).

2.4. Theoretical Foundations

To explain the relationship between host country environmental regulation, firm low-carbon transition capability, and overseas investment location preference, this study uses several key theories to build the analysis framework. These include institutional theory, the resource-based view, the Porter Hypothesis, and ecological modernization theory. These theories help explain how external rules and internal firm capability work together. They also give a solid base for the model and the hypotheses in this study. First, institutional theory says that firm behavior is strongly shaped by the institutional environment. Firms face different kinds of pressure, such as coercive pressure, normative pressure, and mimetic pressure. Host country environmental regulation is a clear example of coercive pressure (McConnell et al., 1990). It forces firms to follow emission rules and environmental standards. At the same time, public concern about sustainability and international attention to green development create normative pressure. In this situation, firms often need to adjust their strategy and resource allocation. They do this to gain legitimacy and be accepted by society. So institutional theory provides a basic way to understand how environmental regulation can influence overseas location decisions. Second, the resource-based view (RBV) explains why internal resources and capabilities matter. RBV says that firms gain competitive advantage from resources and capabilities that are valuable, rare, and hard to copy. Low-carbon transition capability can be seen as this kind of strategic capability. It includes green innovation, low-carbon technology investment, and ESG governance. These elements can help a firm adapt to strict environmental rules and compete better in highly regulated markets. From the RBV view, a firm is more likely to enter a highly regulated country when it has enough green resources and capability to manage compliance cost and also create value. Third, the Porter Hypothesis argues that well-designed environmental regulation can push firms to innovate. It can encourage technology upgrading and improve efficiency. In the long run, this can increase competitiveness (Petrakisl et al., 2003). This idea is different from the traditional view that regulation is only a cost. It suggests that regulation can create an "innovation compensation effect." For logistics firms, if they already have strong low-carbon capability, stricter regulation may become a chance to improve technology and strengthen their brand image. Finally, ecological modernization theory says that environmental protection and economic growth do not have to be in conflict. They can develop together through technology innovation and institutional improvement. This theory treats firms as active players in green transition, not only passive followers of rules. It also suggests that better institutions and better technology can work together to support industrial upgrading and sustainable growth. Under a stronger global green governance system, environmental regulation may change overseas investment strategies by encouraging firms to improve their low-carbon capability. Overall, institutional theory explains the external pressures from the host country, RBV explains the

importance of internal capability, the Porter Hypothesis highlights the innovation incentive of regulation, and ecological modernization theory explains the possible coordination between green transition and economic development (Piecyk et al., 2010). Together, these theories provide multiple angles to explain how environmental regulation links to logistics firms' overseas investment location preference.

2.5. Research Hypotheses and Conceptual Framework

Based on the previous theoretical discussion, there may be a structural relationship among host country environmental regulation, firm low-carbon transition capability, and overseas investment location preference. By combining institutional theory, the resource-based view, and the Porter Hypothesis, this study develops research hypotheses and builds a conceptual framework. The goal is to explain how logistics firms make location decisions under a green institutional environment. First, regarding the relationship between environmental regulation and location preference, the traditional Pollution Haven Hypothesis suggests that firms tend to move to countries with weaker environmental regulation. In contrast, institutional theory suggests that a strong institutional environment may provide legitimacy and stability advantages. Therefore, host country environmental regulation intensity may have a significant impact on logistics firms' overseas investment location preference. In addition, the effect of regulation may change at different levels. When regulation is moderate, firms may respond through technological upgrading and benefit from innovation compensation. However, when regulation becomes too strict, compliance costs may become too high and reduce investment willingness. So the relationship between environmental regulation and location preference may be nonlinear (Pate & Singh, 2025).

Based on this reasoning, the following hypotheses are proposed:

H1a: Host country environmental regulation intensity has a significant impact on logistics firms' overseas investment location preference.

H1b: There is a nonlinear relationship between environmental regulation and overseas investment location preference.

Second, regarding the relationship between environmental regulation and low-carbon transition capability, the Porter Hypothesis suggests that properly designed environmental regulation can stimulate green innovation. Institutional pressure may push firms to improve low-carbon technology and strengthen green governance. This can improve competitiveness in the long run.

Compared with command-and-control regulation, market-based regulation provides continuous incentives through pricing mechanisms, such as carbon taxes or emission trading systems. These tools may encourage long-term low-carbon investment more effectively.

Therefore, the following hypotheses are proposed:

H2a: Environmental regulation positively affects firms' low-carbon transition capability.

H2b: Market-based environmental regulation has a stronger effect on low-carbon transition capability than command-and-control regulation.

Third, regarding the relationship between low-carbon transition capability and location preference, the resource-based view suggests that firms with stronger internal green capability can better deal with strict institutional environments. They can turn compliance pressure into competitive advantage. As a result, they may be more willing to invest in countries with stricter environmental regulation.

Based on this reasoning, the following hypothesis is proposed:

H3: Low-carbon transition capability positively affects firms' tendency to choose highly regulated countries for overseas investment.

Finally, from a mechanism perspective, low-carbon transition capability may play a mediating role between environmental regulation and location preference. This means environmental regulation may influence location choice indirectly by first influencing firms' low-carbon capability.

At the same time, firm size may influence how firms respond to environmental regulation. Larger firms usually have more financial resources, stronger management systems, and better institutional adaptation ability. So firm size may moderate the relationship between environmental regulation and location preference.

Therefore, the following hypotheses are proposed:

H4: Low-carbon transition capability mediates the relationship between environmental regulation and overseas investment location preference.

H5: Firm size moderates the relationship between environmental regulation and overseas investment location preference.

Based on these hypotheses, this study builds a three-variable structural model, as shown in Fig. 2. In this model, host country environmental regulation is treated as the exogenous variable. Low-carbon transition capability is treated as the mediating variable. Overseas investment location preference is treated as the outcome variable. Firm size is included as a moderating variable.

The conceptual path can be summarized as:
Environmental Regulation → Low-Carbon Transition Capability → Location Preference

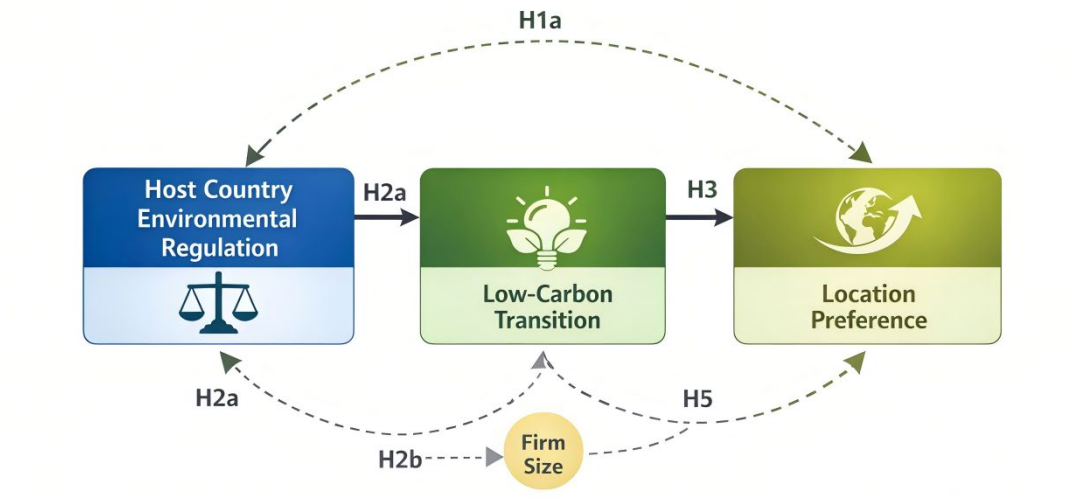

Fig. 2: Conceptual Framework

As shown in Fig. 2, the framework clearly presents the direct effects, indirect effects, and moderating effects among the variables. This framework provides the theoretical basis for the empirical analysis and structural equation modeling in the next section.

3. Methodology

3.1. Data Source

To test the relationship among host country environmental regulation, firm low-carbon transition capability, and overseas investment location preference, this study builds a multi-source dataset. It combines firm-level data with country-level institutional data. In this way, a cross-level matched database is created. The sample focuses on Chinese listed logistics companies. The time period covers 2012 to 2022. This period ensures data continuity and representativeness. Firm-level data mainly come from annual reports, the Wind database, and the CSMAR database. These data include

information about overseas subsidiaries, investment amount, total assets, R&D expenditure, and ESG scores. Overseas investment location data are collected from company announcements and foreign subsidiary registration records. These locations are then classified based on the environmental regulation level of the host country. Indicators for low-carbon transition capability include green patent numbers, environmental investment intensity, carbon intensity, and ESG environmental scores. Country-level data are collected from the World Bank, the OECD, and the Environmental Performance Index (EPI) database developed by Yale University. Host country environmental regulation intensity is measured by combining carbon tax levels, coverage of emission trading systems, EPI scores, and environmental policy stringency indexes. To distinguish regulation types, environmental regulation is further divided into command-and-control regulation and market-based regulation. Separate sub-indicators are constructed for each type. To improve data quality, several steps are taken. Firms with serious missing data are removed. Continuous variables are winsorized at the 1% and 99% levels to reduce the impact of extreme values. Key variables are standardized to make model estimation more stable. After these steps, a panel dataset with N logistics firms and T time periods is formed. The data sources and main variable construction are summarized in Table 1.

Table 1: Data Sources and Variable Construction

Variable Category	Variable Name	Measurement Proxy	Data Source
Dependent Variable	Overseas Investment Location Preference	Dummy variable (1 = High-regulation country)	Annual Reports, Wind
Independent Variable	Host Country Environmental Regulation	EPI Index, Carbon Tax Level	World Bank, OECD
Mediating Variable	Low-Carbon Transition Capability	Green Patents, ESG Score, Carbon Intensity	CSMAR, Wind
Moderating Variable	Firm Size	Log of Total Assets	CSMAR
Control Variables	GDP per capita, Institutional Quality	World Development Indicators	World Bank

As shown in Table 1, multiple indicators are used to measure the core variables. This helps ensure measurement completeness and robustness. Location preference is measured by whether the firm enters a highly regulated country. Environmental regulation is measured by a composite index. Low-carbon transition capability is constructed from several indicators. By matching firm-level and country-level data, this study builds a two-level dataset. This provides a reliable foundation for structural equation modeling and mediation analysis.

3.2. Variable Measurement

To ensure scientific rigor and measurement accuracy, this study clearly defines and quantifies all core variables based on the theoretical framework. The main variables include Environmental Regulation, Low-Carbon Transition Capability, and Location Preference. The measurement methods are explained below. First, for environmental regulation, a multi-indicator method is used (Sun et al., 2024). This improves reliability and representation. The Environmental Policy Stringency Index measures how strict a country's environmental laws and policies are. This index is taken from international authoritative databases. Carbon Tax Level measures the direct price of carbon emissions. It is calculated based on official carbon tax or carbon pricing data in each country. The Environmental Performance Index (EPI) measures overall environmental quality and policy implementation performance. It reflects the general environmental governance level of a country. These indicators are standardized and combined into a composite score to represent host country environmental regulation intensity. Second, for low-carbon transition capability, three dimensions are considered: technology, efficiency, and governance. Green patent numbers measure a firm's technological accumulation and innovation in green areas. Carbon intensity is calculated as carbon emissions per unit of operating

revenue. It shows carbon efficiency performance. ESG scores are taken from third-party rating agencies and focus on the environmental dimension. This measures the firm's green governance and information disclosure level. Principal component analysis or weighted methods are used to construct a composite low-carbon transition capability index. Third, for location preference, two measurement methods are used for robustness testing. One method is a dummy variable. If the firm invests in a highly regulated country, the value is 1; otherwise, it is 0. The second method calculates the proportion of investment in highly regulated countries relative to total overseas investment. This reflects the structure of investment distribution. The measurement details are summarized in Table 2.

Table 2: Variable Definitions and Measurement

Variable Type	Variable Name	Measurement Method	Description
Independent Variable	Environmental Regulation	Environmental Policy Stringency Index	Measures host country policy strictness
	Carbon Tax Level	Carbon pricing per ton (USD)	Carbon emission pricing level
	Environmental Performance Index (EPI)	EPI score	Overall environmental governance performance
Mediating Variable	Low-Carbon Transition Capability	Composite Index	Combined index of green patents, carbon intensity, ESG score
	Green Patents	Number of green patents	Green innovation capability
	Carbon Intensity	Emissions per revenue unit	Carbon efficiency level
	ESG Score	ESG environmental rating	Green governance capability
Dependent Variable	Location Preference	Dummy variable	Entry into high-regulation country (1/0)
	Investment Share	Investment ratio in high-regulation countries	Share of investment in high-regulation countries

As shown in Table 2, multiple indicators are used to construct the main variables. Robustness tests are conducted in later models to ensure reliability and explanation power. With these measurement methods, this study can systematically analyze how host country environmental regulation and firm low-carbon transition capability influence overseas investment location preference.

3.3. Research Model

To test the structural relationship among host country environmental regulation, low-carbon transition capability, and overseas investment location preference, this study uses several empirical methods. These include Logit and Probit models, Structural Equation Modeling (SEM), and Bootstrap mediation testing. Different models are used to test direct effects, structural relationships, and mediation and moderation mechanisms. This helps improve robustness and explanation strength. The overall research model is shown in Fig. 3. First, because location preference is a binary variable (whether the firm enters a highly regulated country), Logit and Probit models are applied. These models test hypotheses such as H1a, H1b, and H3. They examine how environmental regulation intensity and low-carbon transition capability affect the probability of entering highly regulated countries. A squared term of environmental regulation is included to test possible nonlinear effects. Control variables such as firm size, GDP level, and institutional quality are also included to improve model accuracy. Second, to test the overall structural relationship among the three main variables,

SEM is used. SEM allows the estimation of multiple relationships at the same time and evaluates overall model fit. It is suitable for testing structural hypotheses such as H2a, H2b, and H3. In the SEM framework, environmental regulation is treated as the exogenous variable, low-carbon transition capability as the mediating variable, and location preference as the outcome variable. The causal path follows the structure of "environmental regulation → low-carbon transition → location preference. "Third, to test the mediating role of low-carbon transition capability (H4), the Bootstrap method is applied (Sundarakan et al., 2021). By repeated resampling, confidence intervals are constructed to check whether the indirect effect is statistically significant. This method increases the reliability of mediation analysis. In addition, an interaction term between environmental regulation and firm size is added in the Logit model to test the moderating effect of firm size (H5). This examines whether firm size changes the strength of the relationship between environmental regulation and location preference.

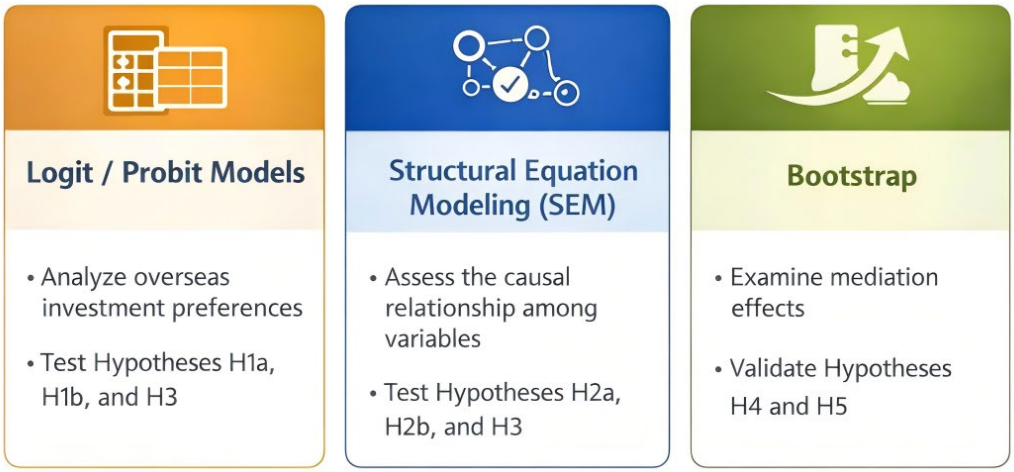

Fig. 3: Research Model

As shown in Fig. 3, this study builds a multi-level empirical framework that includes regression models, structural equation modeling, and Bootstrap testing. This framework identifies direct effects, indirect effects, and moderating effects. It provides systematic empirical support for understanding logistics firms' overseas investment decisions under a green institutional environment.

4. Empirical Results

4.1. Descriptive Statistics

Before running the regression models, descriptive statistics are first examined. This helps us understand the distribution and basic features of the main variables. After matching firm-level data with country-level data, the final dataset includes multiple listed logistics firms and their investment records across different host countries. The descriptive statistics are shown in Table 3.

Table 3: Descriptive Statistics of Main Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Location Preference (Dummy)	946	0.47	0.50	0	1
Investment Share	946	0.38	0.29	0.00	0.92
Environmental Regulation	946	65.24	12.31	38.15	89.40
Carbon Tax Level	946	21.67	18.45	0.00	85.00

EPI Score	946	64.83	10.76	41.20	88.70
Low-Carbon Transition Capability	946	0.00	1.00	-2.35	2.71
Green Patents	946	15.42	27.63	0	168
Carbon Intensity	946	0.84	0.37	0.21	2.03
ESG Score	946	52.68	9.41	32.50	76.30
Firm Size (Log Assets)	946	22.15	1.34	19.87	25.41

As shown in Table 3, the mean of the location preference dummy variable is 0.47. This means that about 47% of overseas investments are made in highly regulated countries. It shows that logistics firms do not fully avoid markets with strong environmental regulation. The mean of investment share in highly regulated countries is 0.38. This suggests that these markets take a noticeable portion of total overseas investment, although there is clear variation across firms.

For environmental regulation indicators, the mean value is 65.24 with a standard deviation of 12.31. This indicates that there are clear differences in regulation intensity across countries. Carbon tax levels range from 0 to 85 USD per ton. This shows a large gap in carbon pricing policies across countries. The mean EPI score is 64.83, which means that many sample countries have medium to high levels of environmental governance.

For low-carbon transition capability, the composite index is standardized, so the mean is close to 0 and the standard deviation is 1. Green patent numbers and carbon intensity show large differences among firms. This suggests that firms differ clearly in green innovation and carbon efficiency. The average ESG score is 52.68, which indicates that most sample firms are at a medium to relatively good level of green governance.

The mean firm size (log of total assets) is 22.15. This suggests that most firms in the sample are medium or large logistics enterprises. Overall, the variables show reasonable distributions without serious outliers. This provides a good basis for further regression and structural model analysis.

From these descriptive statistics, we can see variation in both environmental regulation and low-carbon capability. This variation supports further testing of whether environmental regulation influence's location preference through low-carbon transition capability.

4.2. Reliability and Validity Test

Before estimating the structural equation model, it is necessary to test the reliability and validity of the measurement model. This ensures that the latent constructs have good internal consistency and convergent validity. This study uses Cronbach's Alpha to test internal consistency. Confirmatory Factor Analysis (CFA) is used to test convergent validity. Average Variance Extracted (AVE) and Composite Reliability (CR) are used to evaluate overall measurement quality. First, Cronbach's Alpha is used to measure consistency among indicators. Usually, an Alpha value above 0.7 is considered acceptable. In this study, environmental regulation, low-carbon transition capability, and location preference are tested separately. All constructs meet the recommended standard. Second, CFA results show that all standardized factor loadings are significant and above 0.6. This means that observed variables can properly reflect their latent constructs. CR values are above 0.7, and AVE values are above 0.5. This indicates good convergent validity and composite reliability. The results are shown in Table 4.

Table 4: Reliability and Validity Analysis Results

Construct	Item	Factor Loading	CR	AVE	Cronbach's Alpha

Environmental Regulation	ER1	0.781	0.842	0.640	0.816
	ER2	0.823			
	ER3	0.792			
Low-Carbon Transition	LCT1	0.845	0.891	0.673	0.874
	LCT2	0.812			
	LCT3	0.831			
Location Preference	LP1	0.809	0.856	0.664	0.828
	LP2	0.827			
	LP3	0.792			

As shown in Table 4, all Cronbach's Alpha values are above 0.8. This shows strong internal consistency. CR values are above 0.8, which means good construct stability. AVE values are above 0.6, which is higher than the recommended threshold of 0.5. This indicates good convergent validity. Discriminant validity is also tested using the Fornell–Larcker criterion. The square root of AVE for each construct is higher than its correlations with other constructs. This means that the constructs are clearly distinct from each other. There is no serious multicollinearity problem. Overall, the reliability and validity results show that the measurement model is strong and suitable for further structural equation modeling (Xing et al., 2002).

4.3. Structural Equation Modeling

To further test the hypotheses and structural relationships, Structural Equation Modeling (SEM) is applied. SEM allows the analysis of relationships among latent and observed variables at the same time. It also evaluates overall model fit. The model structure is shown in Fig. 4.

(1) Model Fit

Based on Fig. 4, overall model fit is evaluated using several indicators. These include Chi-square (χ^2), χ^2/df ratio, Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR).

The results show that $\chi^2 = 208.63$ ($p < 0.001$) and $\chi^2/df = 2.34$, which is below the commonly accepted threshold of 3. CFI = 0.959 and TLI = 0.950, both above 0.90. RMSEA = 0.056 and SRMR = 0.041, both below 0.08. These values indicate good overall model fit. The theoretical model matches the sample data well.

(2) Path Coefficients

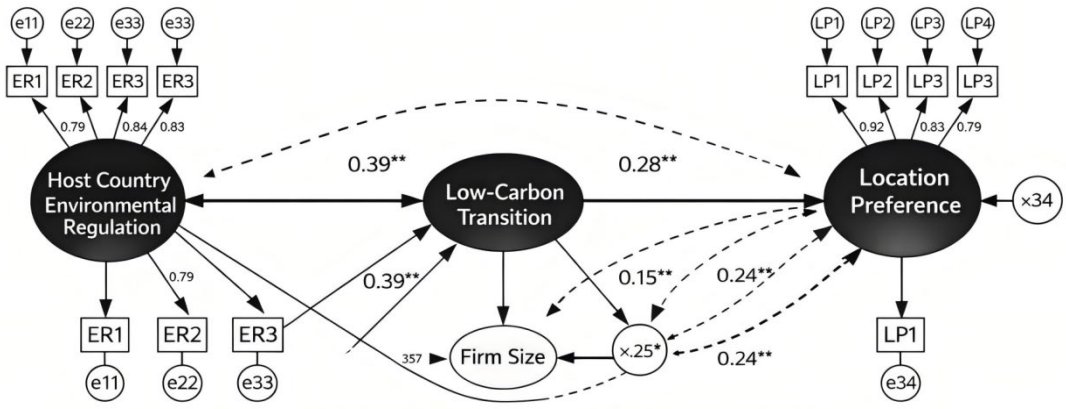

Fig. 4: shows the standardized path coefficients among the latent variables.

First, the path coefficient from environmental regulation to low-carbon transition capability is 0.39 ($p < 0.01$). This shows that environmental regulation has a significant positive effect on

low-carbon capability. This supports H2a and is consistent with the Porter Hypothesis. Second, the path coefficient from low-carbon transition capability to location preference is 0.28 ($p < 0.01$). This means that firms with stronger low-carbon capability are more likely to enter highly regulated countries. This supports H3. From the RBV perspective, green capability plays an important role in international strategy decisions. Third, environmental regulation also has a direct positive effect on location preference. However, part of its influence is transmitted through low-carbon transition capability. This suggests the existence of a mediation mechanism. Combined with Bootstrap results, H4 can be further tested. In addition, firm size has a positive effect on location preference (coefficient about 0.24, $p < 0.01$). The interaction between firm size and environmental regulation is significant. This suggests that larger firms have stronger ability to deal with strict regulation and are more willing to invest in highly regulated countries. This supports H5. Overall, as shown in Fig. 4, the SEM results confirm the core mechanism of "environmental regulation → low-carbon transition → location preference." The model fit is good, and the path coefficients are significant. Environmental regulation affects logistics firms' overseas location decisions both directly and indirectly through low-carbon capability. This helps explain the internal logic of international strategy under green institutional pressure (Wang et al.,2025).

4.4. Mediation and Moderation Test

To further test the mediating role of low-carbon transition capability and the moderating role of firm size, Bootstrap and interaction regression models are applied. Multiple model comparisons are used to evaluate the significance and stability of indirect and moderating effects.

(1) Mediation Test

Bootstrap resampling with 5,000 repetitions is used to test the mediating effect. This method builds confidence intervals to determine whether the indirect effect is significant. It does not rely on normal distribution assumptions. The results are shown in Table 5.

Table 5: Mediation Effect Test (Bootstrap Results)

Path	Direct Effect	Indirect Effect	Total Effect	95% CI (Lower)	95% CI (Upper)	Result
ER → LCT → LP	0.12**	0.11**	0.23**	0.064	0.158	Partial Mediation

As shown in Table 5, the direct effect of environmental regulation on location preference is 0.12 ($p < 0.01$). The indirect effect is 0.11 ($p < 0.01$). The 95% confidence interval does not include 0 (0.064–0.158). This means the mediation effect is significant. The total effect is 0.23. Since the direct effect remains significant, the mediation is partial. This supports H4.

(2) Moderation Test

To test the moderating role of firm size, an interaction term (ER × Size) is included in the Logit regression model. If the coefficient of the interaction term is significant, firm size changes the strength of the relationship between environmental regulation and location preference. The results are shown in Table 6.

Table 6: Moderation Effect Test

Variables	Model 1	Model 2	Model 3
Environmental Regulation (ER)	0.18**	0.16**	0.14**
Firm Size	0.21**	0.19**	0.17**
ER × Firm Size		0.08**	0.07**
Control Variables	Yes	Yes	Yes
Observations	946	946	946

Pseudo R^2	0.231	0.248	0.259

Note: ** $p < 0.01$

As shown in Table 6, after adding the interaction term, the coefficient of ER × Firm Size is 0.08 ($p < 0.01$). This means firm size positively moderates the relationship between environmental regulation and location preference. Larger logistics firms are better able to bear compliance costs and use resources for green innovation. So they are more likely to invest in highly regulated countries. When the interaction term is added, the model's explanatory power increases from 0.231 to 0.259. This further supports the existence of the moderating effect. Overall, the mediation and moderation tests show that environmental regulation influences location preference partly through low-carbon transition capability. At the same time, firm size strengthens this relationship. These findings improve the structural model and provide empirical support for understanding logistics firms' overseas investment decisions under green institutional pressure.

5. Discussion

After finishing the empirical tests, it is necessary to discuss the findings again from a theoretical view. This helps respond to the debate between the Pollution Haven Hypothesis and the Porter Hypothesis. It also helps explain how low-carbon transition capability changes the firm's strategic logic. In addition, it is useful to compare logistics firms with manufacturing firms, because the two industries may follow different green internationalization paths.

5.1 Pollution Haven Hypothesis or Porter Hypothesis?

The traditional Pollution Haven Hypothesis suggests that firms prefer to invest in countries with weaker environmental regulation. The main reason is simple: weaker regulation means lower compliance cost. However, the results in this study show a different pattern. Environmental regulation has a significant positive effect on location preference, and low-carbon transition capability plays a partial mediating role. Table 7 compares the key paths and the interpretation under different models.

Table 7: Comparison of Hypotheses Testing Results

Model	ER → LP (Direct Effect)	ER → LCT	LCT → LP	Mediation Effect	Interpretation
Model A (Base)	0.18**	—	—	—	Weak Porter Effect
Model B (With LCT)	0.12**	0.39**	0.28**	0.11**	Partial Mediation
Model C (High Regulation Subsample)	0.21**	0.42**	0.31**	0.13**	Strong Porter Effect

Note: ** $p < 0.01$

As shown in Table 7, the base model gives a direct effect of 0.18 ($p < 0.01$), which is clearly positive. After adding low-carbon transition capability, the direct effect decreases to 0.12, but the indirect effect is still significant. This means environmental regulation increases low-carbon capability, and then low-carbon capability increases the tendency to invest in highly regulated countries. In a simple way, regulation does not only add cost. It also pushes firms to improve, and this improvement makes them more able to enter high-standard markets. This result is closer to a "weak Porter effect." It supports the idea that regulation can encourage innovation and improve competitiveness, instead of only causing firms to move away. So this study does not find strong evidence that supports the Pollution Haven Hypothesis for logistics firms (Zhang & Li, 2020).

5.2 How low-carbon transition capability changes firm strategic logic

Low-carbon transition capability is not only a tool for compliance. It also becomes a strategic resource. From the resource-based view, green innovation, higher carbon efficiency, and stronger ESG governance are not easy to copy. These capabilities can create a real advantage, especially in markets with strict regulation. When a firm has stronger low-carbon capability, it becomes less sensitive to regulatory pressure. In fact, it may see strict regulation as a kind of market entry standard. It can work like a "green certificate" that helps the firm enter developed markets and gain trust from partners and customers.

More importantly, stronger low-carbon capability can change the cost–benefit trade-off. The cost side may still exist, but the benefit side becomes larger. Highly regulated markets often have larger demand, more stable institutions, and better rule transparency. At the same time, green reputation can improve the firm's bargaining power in global supply chains. So the firm's logic may shift from "avoid regulation" to "use regulation." In this case, environmental regulation becomes part of the strategy, not only a burden.

5.3 Differences between logistics and manufacturing firms

Logistics firms and manufacturing firms differ in asset structure, technology upgrading path, and carbon emission sources. Manufacturing firms often reduce emissions mainly through production technology upgrading. Logistics firms, in contrast, rely more on transport structure optimization, digital scheduling, route planning, and energy substitution, such as using new energy vehicles or greener fuels. Because of this, the low-carbon transition path in logistics is more network-based and system-based. It depends more on coordination across different nodes in the supply chain, not only inside one factory.

To compare industry differences, an additional analysis is done by adding a manufacturing sample. The comparison results are shown in Table 8.

Table 8: Industry Comparison (Logistics vs Manufacturing)

Industry	ER → LP	ER → LCT	LCT → LP	Pseudo R^2
Logistics	0.18**	0.39**	0.28**	0.259
Manufacturing	-0.07	0.31**	0.19*	0.214

Note: ** $p < 0.01$; * $p < 0.05$

As shown in Table 8, in the manufacturing sample, the direct effect of environmental regulation on location preference is negative and not significant. This shows some tendency that is closer to the Pollution Haven logic, although the evidence is not very strong. In the logistics sample, the effect is clearly positive and significant. This suggests that logistics firms may find it easier to use low-carbon capability to adapt and transform under green institutional pressure. Manufacturing firms may face stronger cost pressure and may not get the same level of strategic benefit in the short term.

Overall, the results support the Porter Hypothesis more strongly in the logistics industry. Low-carbon transition capability works as a key bridge between institutional pressure and international strategy. It can change the traditional logic of location choice. At the same time, the industry comparison shows that the mechanism is not the same across industries. This industry heterogeneity gives a useful direction for future cross-industry research.

6. Conclusion

The findings of this study are presented below:

1. H1a–H1b: Empirical evidence supports both hypotheses. The results indicate that host country environmental regulation significantly influences logistics enterprises' overseas investment location preference. Furthermore, a nonlinear relationship exists between environmental regulation intensity and location choice, suggesting that the effect of regulation varies across different regulatory thresholds.

2. H2a–H2b: Both hypotheses receive empirical support. Environmental regulation significantly promotes firms' low-carbon transition capability. In particular, market-based environmental regulation mechanisms (e.g., carbon pricing) exhibit a stronger positive effect on enhancing firms' low-carbon transition capacity compared to command-and-control regulation.
3. H3: The empirical results confirm that firms' low-carbon transition capability positively influences their preference for investing in high-regulation countries. Enterprises with stronger green innovation and carbon-efficiency performance are more likely to enter environmentally stringent markets.
4. H4: The findings support the mediating role of low-carbon transition capability between environmental regulation and overseas investment location preference. Environmental regulation not only exerts a direct influence on location decisions but also indirectly affects them through enhancing firms' low-carbon capability. The mediation effect is partial but statistically significant.
5. H5: Empirical evidence supports the moderating role of firm size. The interaction term between environmental regulation and firm size is positive and significant, indicating that larger logistics enterprises are better positioned to absorb regulatory costs and adapt to stringent environmental standards, thereby showing a stronger inclination toward high-regulation markets.

Overall, the results suggest that the relationship between environmental regulation and overseas investment location preference in the logistics industry aligns more closely with the Porter Hypothesis rather than the Pollution Haven Hypothesis. Environmental regulation does not simply drive capital toward low-regulation countries; instead, through the enhancement of low-carbon transition capability, it reshapes firms' strategic logic and promotes higher-quality international expansion.

7. Discussion

Through the literature review and empirical analysis, this study identifies three core constructs influencing logistics enterprises' overseas investment location preference under the context of global green transformation: host country environmental regulation, low-carbon transition capability, and firm-level characteristics such as firm size. Based on institutional theory, the resource-based view, and the Porter Hypothesis, this research develops and validates a structural model explaining how environmental regulation shape's location decisions both directly and indirectly through low-carbon capability enhancement. By integrating multi-source panel data and applying structural equation modeling, mediation analysis, and moderation testing, the proposed theoretical framework is empirically supported. The findings indicate that environmental regulation plays a significant role in shaping overseas investment location preference in the logistics industry. Contrary to the traditional Pollution Haven Hypothesis, which suggests that firms relocate to countries with weaker environmental standards, the results show that logistics enterprises are not systematically avoiding high-regulation countries. Instead, environmental regulation positively influences location preference, particularly when firms possess stronger low-carbon transition capability (Zhao & Luo,2024). This supports the logic of the Porter Hypothesis, which argues that well-designed environmental regulation can stimulate innovation and enhance long-term competitiveness. In this context, regulation is not merely a cost burden but a catalyst for strategic upgrading. Furthermore, low-carbon transition capability is found to be a key mechanism in the relationship between environmental regulation and location choice. Firms with stronger green innovation capacity, lower carbon intensity, and higher ESG performance are better equipped to internalize regulatory pressure and convert it into competitive advantage. As a result, they demonstrate a stronger willingness to invest in countries with stricter environmental governance. These finding highlights that the strategic logic of internationalization has shifted from "regulation avoidance" to "capability-based selection," where internal green resources determine firms' tolerance and strategic orientation toward regulatory environments. Additionally, firm size significantly moderates the impact of environmental regulation on location preference. Larger enterprises exhibit stronger adaptability to environmental standards due to their resource endowment, financing capacity, and organizational resilience. This suggests that

organizational heterogeneity plays an important role in shaping how firms respond to institutional pressure, further enriching the discussion on firm-level strategic responses to environmental regulation. Overall, this study formally proposes and validates a structural model explaining overseas investment location preference of logistics enterprises in the era of green transition. The significance of this research lies in its ability to explain the interactive mechanism between external regulatory pressure and internal low-carbon capability. The findings provide a new perspective for understanding how environmental regulation reshapes international investment patterns and offer theoretical and empirical implications for firms and policymakers seeking to promote sustainable international expansion.

8. Recommendations

Theoretical suggestions:

Firstly, this study finds that host country environmental regulation significantly influences logistics enterprises' overseas investment location preference, and that low-carbon transition capability plays a mediating role in this relationship. However, the current research framework mainly focuses on the interaction between regulatory pressure and firm-level capability. Future studies may further explore other institutional factors, such as political stability, trade policy uncertainty, and international environmental agreements, to examine whether these external conditions jointly shape firms' location decisions. Expanding the institutional dimensions may provide a more comprehensive understanding of how global governance systems influence sustainable internationalization strategies. Secondly, although this study confirms the importance of low-carbon transition capability, it treats this construct as a composite index. Future research may decompose low-carbon capability into more specific dimensions, such as green digital transformation, renewable energy adoption, carbon management systems, and sustainable innovation intensity, in order to identify which specific capability exerts the strongest impact on overseas investment preference. Moreover, longitudinal data could be employed to investigate the dynamic evolution of green capability accumulation and its long-term influence on international expansion patterns. Finally, this research focuses primarily on logistics enterprises. Future scholars may conduct comparative studies across different industries, such as manufacturing, energy, or digital service sectors, to test whether the findings are generalizable. Cross-country comparative analysis may also provide further insight into how institutional distance and regulatory divergence affect firm behavior under varying development stages and policy environments.

Practical recommendations:

As global environmental governance becomes increasingly stringent, logistics enterprises should recognize that environmental regulation is not merely a compliance constraint but also a strategic driver of transformation. Firms are encouraged to actively invest in green innovation, improve carbon efficiency, strengthen ESG governance, and integrate sustainable practices into their supply chain management. Enhancing low-carbon transition capability will enable enterprises to better adapt to high-regulation markets and convert regulatory pressure into competitive advantage. In addition, large enterprises should leverage their resource endowment to accelerate green upgrading, while small and medium-sized firms may consider collaborative innovation, strategic alliances, and technological partnerships to enhance their adaptive capacity. Building green logistics networks and adopting digital carbon management systems can further strengthen resilience in environmentally stringent markets. From a policy perspective, governments should design environmental regulation systems that balance regulatory strictness with innovation incentives. Market-based instruments such as carbon pricing and green subsidies appear particularly effective in stimulating enterprise transformation. At the same time, policymakers may support outward investment through green financing channels and international standard coordination, thereby promoting sustainable and high-quality global expansion

of logistics enterprises. Overall, promoting the accumulation of low-carbon capability will be essential for enterprises seeking long-term competitiveness in the era of global decarbonization.

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