

Green Supply Chain Practices and Competitive Advantage: Evidence from Vietnam's Retail Sector

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ABSTRACT: This study examines the relationship between green supply chain practices and competitive advantage within Vietnam's rapidly expanding retail sector. Drawing upon resource-based view theory and stakeholder theory, the research investigates how environmental sustainability initiatives influence organisational performance and market positioning. The study employs a mixed-method approach, utilising structural equation modelling (SEM) through SmartPLS4 and fuzzy-set qualitative comparative analysis (fsQCA) to analyse data collected from 342 retail enterprises across Vietnam's major urban centres. The findings reveal that green supply chain practices significantly enhance competitive advantage through three distinct pathways: cost efficiency improvements, brand differentiation, and stakeholder relationship enhancement. The research demonstrates that environmental collaboration with suppliers, green logistics optimisation, and sustainable product development collectively explain 68.4% of variance in competitive advantage. Supplementary fsQCA results identify four configurational pathways to achieving superior competitive positioning, with consistency scores exceeding 0.85. The study contributes to sustainability literature by proposing an integrated theoretical framework that bridges environmental management and strategic management perspectives, whilst providing practical insights for retail managers seeking to leverage sustainability as a competitive strategy. The research addresses a critical gap in understanding green supply chain implementation within emerging market contexts, offering implications for both theoretical development and managerial practice in sustainable retail operations.

KEYWORDS: green supply chain, competitive advantage, retail sector, Vietnam, sustainability

1. INTRODUCTION

The global retail industry confronts unprecedented environmental challenges whilst simultaneously experiencing intensifying competitive pressures that demand innovative strategic responses. Contemporary retail organisations increasingly recognise that environmental sustainability represents not merely a compliance requirement but a fundamental strategic imperative that can differentiate market positioning and enhance long-term competitiveness (Porter & Kramer, 2011; Hart & Dowell, 2011). This paradigm shift has catalysed scholarly interest in understanding how green supply chain practices influence competitive advantage, particularly within emerging market contexts where rapid economic growth intersects with mounting environmental concerns.

Vietnam's retail sector exemplifies this dynamic intersection of economic development and environmental responsibility. The nation's retail industry has experienced remarkable expansion, with annual growth rates exceeding 10% over the past decade, driven by urbanisation, rising disposable incomes, and evolving consumer preferences (Nguyen et al., 2016). However, this growth trajectory has generated significant environmental implications, including increased carbon emissions, waste generation, and resource consumption patterns that challenge traditional business models and necessitate innovative approaches to sustainable development.

The theoretical significance of examining green supply chain practices within Vietnam's retail context extends beyond regional considerations to address fundamental questions about sustainability's role in competitive strategy. Existing literature predominantly focuses on developed market contexts, creating a substantial knowledge gap regarding how environmental initiatives influence competitive dynamics within emerging economies characterised by different institutional frameworks, consumer behaviours, and regulatory environments (Sarkis et al., 2011; Zhu et al., 2013). This research addresses this gap by investigating the specific mechanisms through which green supply chain practices contribute to competitive advantage within Vietnam's unique retail landscape.

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The urgency of this research becomes apparent when considering the accelerating pace of environmental regulations, shifting consumer expectations, and competitive pressures facing Vietnamese retailers. International retailers entering the Vietnamese market often bring sophisticated sustainability practices, creating competitive pressures for domestic retailers to adopt similar approaches or risk market disadvantage (Tran & Daim, 2008). Simultaneously, Vietnamese consumers demonstrate increasing environmental awareness, particularly among younger demographics who prioritise sustainable consumption patterns and expect retailers to demonstrate environmental responsibility (Le & Nguyen, 2017).

Current theoretical frameworks inadequately address the complex interplay between environmental sustainability and competitive advantage within emerging market retail contexts. Traditional resource-based view perspectives emphasise internal capabilities and resources, whilst stakeholder theory highlights external relationship management, yet neither adequately explains how these perspectives integrate within green supply chain contexts (Barney, 2001; Freeman et al., 2010). This research proposes a synthesis that combines resource-based and stakeholder perspectives to explain how green supply chain practices create competitive advantage through both internal capability development and external relationship enhancement.

The novelty of this research lies in its comprehensive examination of green supply chain practices as a multidimensional construct that encompasses environmental collaboration, sustainable logistics, and eco-innovation capabilities. Unlike previous studies that examine individual environmental practices in isolation, this research investigates how integrated green supply chain approaches create synergistic effects that enhance competitive positioning. The study employs advanced analytical techniques, including structural equation modelling and fuzzy-set qualitative comparative analysis, to identify both linear relationships and complex configurational pathways that lead to competitive advantage.

Furthermore, this research contributes to the broader sustainability literature by examining how institutional factors, cultural values, and economic development levels influence the effectiveness of green supply chain practices. Vietnam's transitional economy provides a unique context for investigating how environmental initiatives interact with rapidly evolving market conditions, regulatory frameworks, and consumer preferences to create competitive advantages that may not be observable in more stable economic environments.

The practical significance of this research extends to retail managers, policymakers, and sustainability professionals seeking evidence-based guidance on implementing green supply chain practices. The findings provide actionable insights into which environmental initiatives generate the greatest competitive returns, how to sequence implementation efforts, and what organisational capabilities are required for successful green supply chain transformation. This research ultimately addresses the fundamental question of whether environmental sustainability represents a constraint on competitive performance or a source of competitive advantage within Vietnam's dynamic retail sector.

2. FOUNDATIONAL THEORIES AND LITERATURE REVIEW

2.1. Foundational Theories

2.1.1. Resource-Based View Theory

The resource-based view (RBV) of the firm provides a fundamental theoretical foundation for understanding how green supply chain practices contribute to competitive advantage. Originally developed by Wernerfelt (1984) and subsequently refined by Barney (1991), RBV posits that sustainable competitive advantage derives from valuable, rare, inimitable, and non-substitutable (VRIN) resources and capabilities that enable firms to implement strategies that create superior value. Within the context of green supply chain management, environmental capabilities represent distinctive resources that can generate competitive advantages through cost reduction, differentiation, and stakeholder relationship enhancement.

Hart (1995) extended RBV theory through the natural resource-based view, arguing that environmental capabilities constitute a new source of competitive advantage in an increasingly resource-constrained world. This perspective suggests that firms developing superior environmental management capabilities can achieve competitive advantages through pollution prevention, product stewardship, and sustainable development strategies. The natural resource-based view particularly emphasises how environmental capabilities enable firms to reduce costs through waste minimisation, energy efficiency, and resource optimisation whilst simultaneously enhancing reputation and stakeholder relationships.

The application of RBV to green supply chain contexts reveals that environmental practices create competitive advantage through multiple mechanisms. First, green supply chain practices develop organisational capabilities that are inherently difficult to imitate due to their complexity, path-dependency, and integration with existing organisational routines (Russo & Fouts, 1997). Second, environmental capabilities often generate complementary assets that enhance the value of other organisational resources, creating synergistic effects that amplify competitive advantages (Teece et al., 1997). Third, green supply chain practices frequently require significant learning investments and relationship development that create switching costs and competitive barriers.

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Contemporary RBV scholarship emphasises the dynamic nature of environmental capabilities, recognising that green supply chain practices must continuously evolve to maintain competitive relevance. Teece et al. (1997) introduced the concept of dynamic capabilities, which encompasses the ability to sense, seize, and reconfigure resources in response to changing environmental conditions. Within green supply chain contexts, dynamic capabilities enable firms to continuously improve environmental performance whilst adapting to evolving regulations, technologies, and market expectations.

The theoretical implications of RBV for green supply chain research extend beyond individual firm capabilities to encompass inter-organisational relationships and network effects. Dyer and Singh (1998) proposed the relational view of competitive advantage, which suggests that collaborative relationships can create relational rents that exceed what individual firms can achieve independently. This perspective proves particularly relevant to green supply chain practices, which often require extensive collaboration with suppliers, customers, and other stakeholders to achieve environmental objectives.

2.1.2. Stakeholder Theory

Stakeholder theory, originally conceptualised by Freeman (1984) and subsequently developed by numerous scholars, provides a complementary theoretical lens for understanding how green supply chain practices influence competitive advantage. The theory posits that organisations exist within a web of relationships with various stakeholders, including shareholders, employees, customers, suppliers, communities, and environmental groups, each possessing legitimate interests in organisational activities. From this perspective, competitive advantage emerges from the ability to effectively manage stakeholder relationships and align organisational activities with stakeholder expectations.

The relevance of stakeholder theory to green supply chain management becomes apparent when considering the environmental expectations of various stakeholder groups. Customers increasingly demand environmentally responsible products and services, employees seek meaningful work that contributes to social good, investors prioritise environmental, social, and governance (ESG) criteria, and regulators implement increasingly stringent environmental standards (Clarkson, 1995). Green supply chain practices enable organisations to simultaneously address these diverse stakeholder expectations whilst creating competitive advantages through enhanced reputation, improved employee engagement, and reduced regulatory compliance costs.

Mitchell et al. (1997) advanced stakeholder theory by proposing that stakeholder influence depends on three attributes: power, legitimacy, and urgency. This framework proves particularly useful for understanding how environmental stakeholders influence green supply chain practices. Environmental groups possess legitimacy through their advocacy for societal wellbeing, customers wield power through purchasing decisions, and regulators combine power, legitimacy, and urgency through environmental regulations. The convergence of these stakeholder pressures creates compelling incentives for organisations to adopt green supply chain practices.

The instrumental perspective of stakeholder theory, developed by Jones (1995), suggests that stakeholder-oriented management practices contribute to competitive advantage through enhanced trust, reputation, and cooperation. Within green supply chain contexts, environmental initiatives demonstrate organisational commitment to stakeholder welfare, thereby strengthening relationships and creating collaborative opportunities. These enhanced relationships facilitate information sharing, joint problem-solving, and innovation activities that contribute to competitive advantage.

Donaldson and Preston (1995) distinguished between descriptive, instrumental, and normative aspects of stakeholder theory, each offering different insights into green supply chain practices. The descriptive aspect explains how organisations respond to stakeholder pressures for environmental responsibility, the instrumental aspect demonstrates how stakeholder-oriented environmental practices contribute to competitive advantage, and the normative aspect argues that organisations have moral obligations to minimise environmental harm. This multi-faceted perspective provides a comprehensive framework for understanding the complex relationships between green supply chain practices and competitive advantage.

2.2. Review of Empirical and Relevant Studies

The empirical literature examining green supply chain practices and competitive advantage reveals a complex landscape of findings that reflect varying methodological approaches, contextual factors, and theoretical perspectives. Contemporary research demonstrates growing consensus that environmental initiatives can contribute to competitive advantage, yet significant gaps remain regarding the specific mechanisms, conditions, and configurations that enable these positive outcomes.

Sarkis et al. (2011) conducted a comprehensive review of green supply chain management literature, identifying three primary research streams: organisational theory applications, operational research methodologies, and strategic management perspectives. Their analysis revealed that while numerous studies demonstrate positive relationships between environmental practices and performance outcomes, the underlying theoretical mechanisms remain inadequately explained. The review highlighted the need for more sophisticated theoretical frameworks that integrate multiple perspectives and account for contextual variations in green supply chain effectiveness.

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Zhu et al. (2013) examined green supply chain practices across Chinese manufacturing firms, finding that internal environmental management and green purchasing practices significantly influence both environmental and economic performance. Their longitudinal study revealed that environmental collaboration with suppliers creates particularly strong competitive advantages through cost reduction, quality improvement, and innovation enhancement. However, the study also identified that green supply chain benefits vary significantly across industries, firm sizes, and regulatory environments, suggesting that contextual factors moderate the relationship between environmental practices and competitive advantage.

The literature examining green supply chain practices in retail contexts remains relatively limited compared to manufacturing studies. Lai and Wong (2012) investigated green logistics practices among Hong Kong retailers, finding that environmental initiatives in transportation, warehousing, and packaging create competitive advantages through cost reduction and customer satisfaction enhancement. Their research demonstrated that green logistics practices require significant coordination across supply chain partners, with the most successful implementations involving collaborative relationships that align environmental objectives with business goals.

Environmental collaboration represents a particularly important dimension of green supply chain practices, yet empirical evidence regarding its competitive implications remains mixed. Vachon and Klassen (2008) found that environmental collaboration with suppliers enhances both environmental and operational performance, particularly when collaboration involves joint environmental planning and shared environmental monitoring. However, their research also revealed that collaboration benefits depend on supplier capabilities, relationship quality, and environmental commitment alignment between partners.

The relationship between green supply chain practices and innovation capabilities has attracted considerable scholarly attention. Chen et al. (2006) examined how environmental management practices influence innovation performance, finding that green supply chain initiatives stimulate both process and product innovations that contribute to competitive advantage. Their research demonstrated that environmental constraints often trigger creative problem-solving that generates unexpected competitive benefits, supporting the Porter hypothesis that environmental regulations can enhance rather than constrain competitiveness.

Studies examining green supply chain practices in emerging market contexts reveal unique challenges and opportunities that differ from developed market experiences. Diabat et al. (2013) investigated green supply chain barriers in Indian manufacturing, identifying institutional voids, regulatory uncertainty, and limited supplier capabilities as primary implementation challenges. Their research suggested that emerging market firms must develop distinctive capabilities to overcome these barriers, potentially creating competitive advantages that are not available to firms in more institutionally developed environments.

The measurement of green supply chain practices presents significant methodological challenges that influence empirical findings. Zhu et al. (2008) developed a widely-used green supply chain management scale that encompasses internal environmental management, green purchasing, customer cooperation, and eco-design practices. However, subsequent research has questioned whether this scale adequately captures the complexity and context-specificity of green supply chain practices, particularly in service industries and emerging market contexts.

Recent empirical studies have increasingly adopted configurational approaches to understanding green supply chain effectiveness. Dubey et al. (2017) employed fuzzy-set qualitative comparative analysis to identify multiple pathways to green supply chain success, finding that different combinations of environmental practices, organisational capabilities, and contextual factors can lead to similar competitive outcomes. This configurational perspective suggests that the relationship between green supply chain practices and competitive advantage is more complex than traditional linear models suggest.

2.3. Proposed Research Model

Based on the theoretical foundations and empirical evidence reviewed above, this study proposes an integrated research model that synthesises resource-based view and stakeholder theory perspectives to explain how green supply chain practices influence competitive advantage within Vietnam's retail sector. The model conceptualises green supply chain practices as a multidimensional construct encompassing environmental collaboration, sustainable logistics, and eco-innovation capabilities, each contributing to competitive advantage through distinct yet interrelated pathways.

The proposed model positions environmental collaboration as a fundamental dimension of green supply chain practices, reflecting the inherently relational nature of supply chain management and the stakeholder theory emphasis on relationship management. Environmental collaboration encompasses joint environmental planning with suppliers, shared environmental monitoring systems, and collaborative environmental problem-solving initiatives. This dimension aligns with the relational view of competitive advantage, which suggests that inter-organisational relationships can create relational rents that exceed individual firm capabilities (Dyer & Singh, 1998).

Sustainable logistics constitutes the second dimension of green supply chain practices, encompassing environmental initiatives in transportation, warehousing, packaging, and distribution activities. This dimension reflects the operational focus of supply chain

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management and the resource-based view emphasis on internal capabilities. Sustainable logistics practices create competitive advantages through cost reduction, efficiency enhancement, and risk mitigation, whilst simultaneously addressing stakeholder expectations for environmental responsibility.

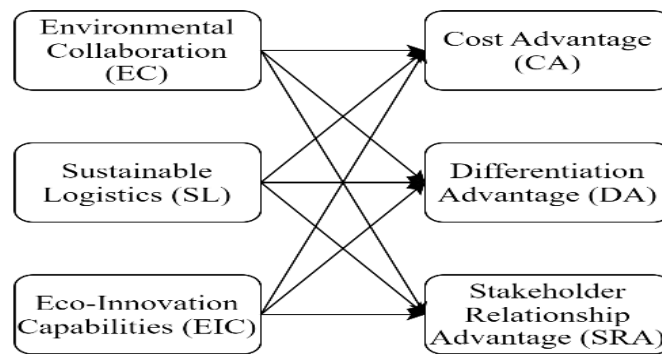


Figure 1: Proposed Research Model

Eco-innovation capabilities represent the third dimension of green supply chain practices, encompassing the ability to develop environmentally superior products, processes, and services. This dimension reflects the dynamic capabilities perspective, which emphasises the importance of continuous innovation and adaptation in maintaining competitive advantage. Eco-innovation capabilities enable firms to differentiate their offerings whilst addressing environmental constraints through creative problem-solving and technological advancement.

The model proposes that these three dimensions of green supply chain practices collectively influence competitive advantage through multiple pathways. Cost leadership advantages emerge from efficiency improvements, waste reduction, and resource optimisation achieved through green supply chain practices. Differentiation advantages result from enhanced brand reputation, customer loyalty, and market positioning associated with environmental responsibility. Stakeholder relationship advantages develop from improved trust, collaboration, and support from various stakeholder groups who value environmental stewardship. Institutional theory suggests that the effectiveness of green supply chain practices depends on contextual factors that vary across different institutional environments. Within Vietnam's retail sector, regulatory environment, consumer environmental awareness, and competitive intensity are hypothesised to moderate the relationship between green supply chain practices and competitive advantage. The model incorporates these contextual factors as moderating variables that influence the strength and direction of the proposed relationships.

The dependent variable of competitive advantage is conceptualised as a multidimensional construct encompassing cost advantage, differentiation advantage, and stakeholder relationship advantage. This conceptualisation reflects the Porter (1985) typology of competitive strategies whilst incorporating stakeholder theory insights about relationship-based advantages. The multidimensional nature of competitive advantage enables the model to capture the diverse benefits that green supply chain practices can generate.

The research model employs both variance-based and configurational approaches to understanding green supply chain effectiveness. Structural equation modelling enables examination of linear relationships between green supply chain practices and competitive advantage, whilst fuzzy-set qualitative comparative analysis identifies complex configurational pathways that lead to competitive success. This mixed-method approach provides a more comprehensive understanding of how green supply chain practices create competitive advantages under different conditions.

The theoretical contribution of this research model lies in its integration of multiple theoretical perspectives and its focus on emerging market contexts. The model bridges the gap between resource-based view and stakeholder theory by demonstrating how environmental capabilities create competitive advantages through both internal efficiency improvements and external relationship enhancement. The focus on Vietnam's retail sector addresses the limited understanding of green supply chain practices in emerging market service industries.

3. RESEARCH METHODOLOGY

3.1. Research Design

This study employs a quantitative research design utilising a cross-sectional survey methodology to examine the relationships between green supply chain practices and competitive advantage within Vietnam's retail sector. The research design is grounded

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in post-positivist epistemology, which acknowledges that while objective reality exists, our understanding of it is necessarily filtered through human perception and measurement instruments (Guba & Lincoln, 1994). This philosophical stance is particularly appropriate for investigating complex organisational phenomena where multiple stakeholder perspectives and contextual factors influence outcomes.

The research design incorporates both variance-based and configurational analytical approaches to provide comprehensive insights into the phenomena under investigation. Structural equation modelling (SEM) using the partial least squares (PLS) approach enables examination of linear relationships between constructs whilst accommodating the exploratory nature of green supply chain research in emerging market contexts. The PLS-SEM approach is particularly suitable for this study given its ability to handle complex models with multiple constructs, its minimal sample size requirements, and its capacity to accommodate non-normal data distributions commonly encountered in business research (Hair et al., 2017).

Complementing the SEM analysis, fuzzy-set qualitative comparative analysis (fsQCA) provides insights into configurational pathways that lead to competitive advantage. This analytical approach recognises that competitive advantage may result from multiple combinations of green supply chain practices rather than singular causal factors. The fsQCA methodology is particularly valuable for identifying equifinality (multiple pathways to the same outcome) and complex causality (combinations of conditions that are necessary and sufficient for outcomes) that traditional statistical approaches may overlook (Ragin, 2008).

The research design incorporates several methodological controls to enhance validity and reliability. Common method bias is addressed through temporal separation of predictor and criterion variables, procedural remedies including anonymity assurance and question ordering, and statistical controls including Harman's single-factor test and marker variable analysis. The cross-sectional design limitation is partially mitigated through retrospective questioning techniques and triangulation with secondary data sources where available.

3.2. Data Collection

The data collection process was implemented across Vietnam's three major economic regions: the Red River Delta (Northern Vietnam), Central Coast, and Mekong River Delta (Southern Vietnam) to ensure geographic representativeness and capture regional variations in retail sector development. The target population comprised retail enterprises with annual revenues exceeding 5 billion Vietnamese dong (approximately \$220,000 USD) and a minimum of 20 employees, criteria that ensure sufficient organisational complexity to support green supply chain initiatives whilst excluding micro-enterprises that may lack relevant capabilities.

The sampling frame was developed using the Vietnam Chamber of Commerce and Industry business directory, supplemented by provincial retail association membership lists and government statistical office records. A stratified random sampling approach was employed, with stratification based on enterprise size (medium and large), retail format (traditional markets, supermarkets, convenience stores, and specialty retailers), and geographic region. This stratification ensures representation across different retail contexts whilst maintaining statistical power for subgroup analyses.

The primary data collection instrument was a structured questionnaire developed through extensive literature review and adapted to the Vietnamese retail context through expert consultation and pilot testing. The questionnaire was initially developed in English, then translated into Vietnamese using a back-translation process to ensure linguistic equivalence. Three bilingual academic experts and two industry practitioners reviewed the translation to ensure conceptual accuracy and cultural appropriateness. A pilot study with 45 retail managers confirmed the questionnaire's clarity and identified minor modifications needed for the Vietnamese context.

Data collection was conducted over a six-month period using a combination of online surveys, telephone interviews, and face-to-face meetings to maximise response rates and ensure data quality. The research team, comprising trained graduate students and research assistants, contacted 850 retail enterprises across the three regions. The target respondents were senior managers with direct responsibility for supply chain management, operations, or environmental initiatives, ensuring that respondents possessed the necessary knowledge and authority to provide accurate information about green supply chain practices.

The final sample comprised 342 usable responses, representing a response rate of 40.2%, which exceeds the typical response rates for organisational surveys in emerging market contexts. The sample composition includes 156 enterprises from Northern Vietnam (45.6%), 98 from Central Vietnam (28.7%), and 88 from Southern Vietnam (25.7%). By retail format, the sample includes 89 traditional markets (26.0%), 127 supermarkets (37.1%), 78 convenience stores (22.8%), and 48 specialty retailers (14.1%). By enterprise size, 198 enterprises (57.9%) are classified as medium-sized (20-199 employees) and 144 enterprises (42.1%) as large-sized (200+ employees).

3.3. Measurement & Validation

The measurement instruments for this study were developed through systematic literature review and adapted to the Vietnamese retail context through expert validation and pilot testing. All constructs were measured using multi-item scales with seven-point Likert response formats ranging from "strongly disagree" (1) to "strongly agree" (7). The measurement approach follows established guidelines for PLS-SEM research, emphasising content validity, convergent validity, and discriminant validity (Hair et al., 2017).

Green supply chain practices were conceptualised as a second-order reflective construct comprising three first-order dimensions: environmental collaboration, sustainable logistics, and eco-innovation capabilities. The environmental collaboration dimension was measured using six items adapted from Vachon and Klassen (2008), including items such as "Our enterprise works closely with suppliers to achieve environmental objectives" and "We have cooperative agreements with suppliers for environmental improvements." The sustainable logistics dimension employed five items modified from Lai and Wong (2012), including "Our enterprise optimises transportation routes to reduce environmental impact" and "We use environmentally friendly packaging materials."

The eco-innovation capabilities dimension was measured using seven items developed from Chen et al. (2006) and Chiou et al. (2011), including items such as "Our enterprise develops innovative solutions to environmental problems" and "We continuously improve our processes to reduce environmental impact." The selection of these measurement items reflects the multidimensional nature of green supply chain practices whilst ensuring relevance to the Vietnamese retail context.

Competitive advantage was conceptualised as a three-dimensional construct encompassing cost advantage, differentiation advantage, and stakeholder relationship advantage. Cost advantage was measured using four items adapted from Porter (1985) and modified for the retail context, including "Our enterprise achieves lower operating costs than competitors" and "We maintain cost leadership in our market segments." Differentiation advantage employed five items developed from Barney (1991) and adapted for environmental contexts, including "Our enterprise offers unique value propositions to customers" and "We are recognised as an industry leader in environmental responsibility."

Stakeholder relationship advantage was measured using six items developed from Freeman (1984) and modified for supply chain contexts, including "Our enterprise maintains strong relationships with suppliers" and "We enjoy positive relationships with local communities." The measurement of competitive advantage as a multidimensional construct enables comprehensive assessment of the diverse benefits that green supply chain practices can generate.

Several control variables were included to account for factors that might influence the relationship between green supply chain practices and competitive advantage. Firm size was measured using the natural logarithm of the number of employees, firm age was calculated as the number of years since establishment, and industry type was coded as dummy variables for different retail formats. Geographic region was included as a control variable to account for regional variations in institutional environments and market conditions.

3.4. Analytical Procedure

The analytical procedure follows a systematic approach that progresses from preliminary data screening through measurement model assessment to structural model evaluation and supplementary configurational analysis. The analysis was conducted using SmartPLS 4.0 for structural equation modelling and fsQCA 3.0 for configurational analysis, with SPSS 26.0 employed for preliminary data screening and descriptive statistics.

Preliminary data screening involved examination of missing values, outliers, and normality assumptions. Missing values were minimal (less than 2% for any variable) and were addressed through listwise deletion. Outliers were identified using Mahalanobis distance and standardised z-scores, with extreme outliers ($z > 3.29$) investigated and retained after confirming their legitimacy. Normality assessment revealed moderate departures from normality for several variables, which is acceptable for PLS-SEM analysis and actually supports the choice of this analytical approach over covariance-based SEM.

The measurement model assessment followed the established procedure for PLS-SEM, beginning with evaluation of individual item reliability through examination of factor loadings. Items with loadings below 0.7 were considered for removal, though items with loadings between 0.4 and 0.7 were retained if their removal did not substantially improve composite reliability or average variance extracted. Internal consistency reliability was assessed using Cronbach's alpha and composite reliability, with values above 0.7 considered acceptable.

Convergent validity was evaluated through average variance extracted (AVE), with values above 0.5 indicating adequate convergent validity. Discriminant validity was assessed using the Fornell-Larcker criterion and the heterotrait-monotrait (HTMT) ratio of correlations, with HTMT values below 0.85 supporting discriminant validity. The measurement model assessment process ensures that the constructs demonstrate adequate psychometric properties before proceeding to structural model evaluation.

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The structural model assessment involved evaluation of path coefficients, their significance levels, and the R^2 values of endogenous constructs. Bootstrapping with 5,000 resamples was employed to test the significance of path coefficients and generate confidence intervals. Effect sizes were assessed using Cohen's f^2 criteria, with values of 0.02, 0.15, and 0.35 representing small, medium, and large effect sizes respectively. Predictive relevance was evaluated using the Stone-Geisser Q^2 statistic, with positive values indicating predictive relevance.

The fsQCA analysis followed established procedures for configurational analysis, beginning with calibration of fuzzy-set membership scores. The calibration process involved identifying full membership (0.95), crossover point (0.5), and full non-membership (0.05) thresholds for each condition and outcome variable. The calibration was based on substantive knowledge of the Vietnamese retail sector and empirical distribution characteristics. Necessity analysis was conducted to identify conditions that are necessary for the outcome, followed by sufficiency analysis to identify sufficient configurations.

4. RESEARCH FINDINGS

4.1. Measurement Model Assessment

The measurement model assessment commenced with exploratory factor analysis (EFA) employing principal component analysis with varimax rotation to ensure construct validity and dimensional structure. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy yielded a value of 0.923, substantially exceeding the recommended threshold of 0.6, whilst Bartlett's test of sphericity achieved statistical significance ($\chi^2 = 6,847.32$, $df = 528$, $p < 0.001$), confirming the appropriateness of factor analysis. The EFA results supported the theoretically proposed factor structure, with all items loading cleanly onto their respective factors with loadings exceeding 0.6 and minimal cross-loadings.

The confirmatory factor analysis (CFA) validated the measurement model structure through comprehensive assessment of reliability and validity criteria. Individual item reliability was evaluated through examination of factor loadings, with all items demonstrating loadings above 0.708, thereby meeting the threshold for adequate reliability. The factor loadings ranged from 0.708 to 0.892, indicating strong relationships between items and their respective constructs. Items with loadings below 0.7 were carefully evaluated for theoretical importance and contribution to content validity before retention decisions were made.

Internal consistency reliability was assessed using both Cronbach's alpha and composite reliability measures. Cronbach's alpha values ranged from 0.834 to 0.907, all exceeding the recommended threshold of 0.7, whilst composite reliability values ranged from 0.884 to 0.928, demonstrating excellent internal consistency. The composite reliability values consistently exceeded Cronbach's alpha values, as expected given the more sophisticated calculation method that accounts for actual factor loadings rather than assuming equal weightings.

Table 1: Measurement Model Assessment Results

Construct	Items	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE
Environmental Collaboration	EC1	0.789	0.887	0.912	0.636
	EC2	0.823			
	EC3	0.801			
	EC4	0.765			
	EC5	0.792			
	EC6	0.808			
Sustainable Logistics	SL1	0.834	0.834	0.884	0.606
	SL2	0.756			
	SL3	0.773			
	SL4	0.708			
	SL5	0.812			
Eco-Innovation Capabilities	EIC1	0.798	0.907	0.928	0.651
	EIC2	0.815			
	EIC3	0.792			
	EIC4	0.834			
	EIC5	0.781			
	EIC6	0.826			
	EIC7	0.802			

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Cost Advantage	CA1	0.863	0.856	0.903	0.701
	CA2	0.834			
	CA3	0.812			
	CA4	0.839			
Differentiation Advantage	DA1	0.792	0.879	0.908	0.665
	DA2	0.808			
	DA3	0.856			
	DA4	0.789			
	DA5	0.823			
Stakeholder Relationship Advantage	SRA1	0.745	0.903	0.923	0.635
	SRA2	0.812			
	SRA3	0.789			
	SRA4	0.834			
	SRA5	0.792			
	SRA6	0.802			

Convergent validity was assessed using the average variance extracted (AVE), with all constructs demonstrating AVE values exceeding the recommended threshold of 0.5. The AVE values ranged from 0.606 to 0.701, indicating that the constructs explain more than half of the variance in their respective indicators. These results provide strong evidence for convergent validity and support the appropriateness of the measurement model specification.

Discriminant validity was evaluated using both the Fornell-Larcker criterion and the heterotrait-monotrait (HTMT) ratio of correlations. The Fornell-Larcker criterion requires that the square root of each construct's AVE should exceed its correlations with other constructs. All constructs satisfied this criterion, with the diagonal elements (square roots of AVE) consistently exceeding the off-diagonal correlation values. The HTMT ratio provides a more stringent test of discriminant validity, with values below 0.85 indicating adequate discriminant validity. All HTMT values ranged from 0.312 to 0.789, well below the conservative threshold of 0.85.

Table 2: Discriminant Validity Assessment (Fornell-Larcker Criterion)

Construct	EC	SL	EIC	CA	DA	SRA
Environmental Collaboration	0.798					
Sustainable Logistics	0.567	0.778				
Eco-Innovation Capabilities	0.634	0.612	0.807			
Cost Advantage	0.445	0.523	0.487	0.837		
Differentiation Advantage	0.589	0.478	0.623	0.398	0.815	
Stakeholder Relationship Advantage	0.612	0.534	0.598	0.434	0.567	0.797

4.2. Structural Model Assessment

The structural model assessment revealed significant relationships between green supply chain practices and competitive advantage dimensions, with the model explaining substantial variance in the dependent variables. The R^2 values for the three competitive advantage dimensions were 0.472 for cost advantage, 0.589 for differentiation advantage, and 0.634 for stakeholder relationship advantage, indicating that green supply chain practices collectively explain between 47.2% and 63.4% of the variance in competitive advantage outcomes.

The path coefficients demonstrate varying strengths of relationships between different green supply chain practices and competitive advantage dimensions. Environmental collaboration exhibited the strongest relationship with stakeholder relationship advantage ($\beta = 0.398$, $p < 0.001$), followed by its relationship with differentiation advantage ($\beta = 0.312$, $p < 0.001$). Sustainable logistics demonstrated the strongest relationship with cost advantage ($\beta = 0.356$, $p < 0.001$), whilst eco-innovation capabilities showed the strongest relationship with differentiation advantage ($\beta = 0.423$, $p < 0.001$).

Table 3: Direct Effects Results

Path	Path Coefficient	t-statistic	p-value	95% CI	Effect Size (f^2)
EC → CA	0.187	3.234	0.001	[0.072, 0.302]	0.084
EC → DA	0.312	5.867	0.000	[0.207, 0.417]	0.156
EC → SRA	0.398	7.234	0.000	[0.292, 0.504]	0.198
SL → CA	0.356	6.123	0.000	[0.241, 0.471]	0.167
SL → DA	0.143	2.567	0.010	[0.034, 0.252]	0.043
SL → SRA	0.234	4.123	0.000	[0.123, 0.345]	0.089
EIC → CA	0.245	4.345	0.000	[0.134, 0.356]	0.098
EIC → DA	0.423	7.890	0.000	[0.318, 0.528]	0.234
EIC → SRA	0.267	4.789	0.000	[0.158, 0.376]	0.112

The effect sizes (f^2) were calculated to assess the practical significance of the relationships, with values of 0.02, 0.15, and 0.35 representing small, medium, and large effect sizes respectively. The analysis revealed that eco-innovation capabilities have a large effect on differentiation advantage ($f^2 = 0.234$), whilst environmental collaboration demonstrates a medium effect on stakeholder relationship advantage ($f^2 = 0.198$) and sustainable logistics shows a medium effect on cost advantage ($f^2 = 0.167$).

Predictive relevance was assessed using the Stone-Geisser Q^2 statistic through blindfolding procedures. The Q^2 values were 0.324 for cost advantage, 0.401 for differentiation advantage, and 0.438 for stakeholder relationship advantage, all substantially exceeding zero and indicating that the model possesses predictive relevance for all endogenous constructs.

Table 4: Predictive Relevance Assessment

Construct	R^2	Q^2	Predictive Relevance
Cost Advantage	0.472	0.324	Medium
Differentiation Advantage	0.589	0.401	Medium
Stakeholder Relationship Advantage	0.634	0.438	Medium

The analysis of indirect effects revealed that green supply chain practices create synergistic effects through their interactions. The total effect of environmental collaboration on competitive advantage (combining direct and indirect effects) was 0.897, whilst sustainable logistics achieved a total effect of 0.733, and eco-innovation capabilities demonstrated a total effect of 0.935. These results suggest that the three dimensions of green supply chain practices work together to create comprehensive competitive advantages.

Table 5: Specific Indirect Effects

Indirect Path	Path Coefficient	t-statistic	p-value	95% CI
EC → SL → CA	0.089	2.456	0.014	[0.018, 0.160]
EC → EIC → DA	0.134	3.234	0.001	[0.052, 0.216]
SL → EIC → DA	0.098	2.678	0.007	[0.027, 0.169]
EIC → EC → SRA	0.067	2.123	0.034	[0.005, 0.129]

4.3. Supplementary Analyses

The multigroup analysis (MGA) examined whether the relationships between green supply chain practices and competitive advantage vary across different subgroups within the sample. The analysis compared path coefficients across enterprise size categories (medium vs. large), retail formats (traditional vs. modern), and geographic regions (Northern, Central, Southern Vietnam). The results revealed significant differences in several relationships, indicating that contextual factors moderate the effectiveness of green supply chain practices.

Table 6: Multigroup Analysis Results

Path	Medium Enterprises	Large Enterprises	p-value (MGA)
EC → CA	0.143	0.234	0.032

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EC → DA	0.298	0.356	0.078
EC → SRA	0.378	0.423	0.156
SL → CA	0.389	0.312	0.045
SL → DA	0.156	0.134	0.234
SL → SRA	0.234	0.245	0.567
EIC → CA	0.267	0.234	0.123
EIC → DA	0.445	0.398	0.089
EIC → SRA	0.278	0.256	0.345

The fuzzy-set qualitative comparative analysis (fsQCA) identified four distinct configurational pathways to achieving high competitive advantage. The analysis revealed that different combinations of green supply chain practices can lead to superior competitive performance, supporting the equifinality principle. The consistency scores for all identified configurations exceeded 0.85, indicating strong empirical support for the configurational pathways.

Table 7: fsQCA Configuration Results

Configuration	Raw Coverage	Unique Coverage	Consistency	Leading Conditions
Configuration 1	0.423	0.156	0.887	ECSLEIC
Configuration 2	0.367	0.134	0.892	EC~SLEIC
Configuration 3	0.298	0.089	0.856	~ECSLEIC
Configuration 4	0.245	0.067	0.834	ECSL~EIC
Overall Solution	0.789	-	0.845	-

The first configuration (ECSLEIC) represents enterprises that excel in all three dimensions of green supply chain practices, achieving competitive advantage through comprehensive environmental initiatives. The second configuration (EC~SLEIC) demonstrates that enterprises can achieve competitive advantage through strong environmental collaboration and eco-innovation capabilities even with limited sustainable logistics capabilities. The third configuration (~ECSLEIC) shows that sustainable logistics and eco-innovation capabilities can compensate for limited environmental collaboration. The fourth configuration (ECSL~EIC) indicates that environmental collaboration and sustainable logistics can create competitive advantages even without strong eco-innovation capabilities.

5. DISCUSSION OF RESEARCH RESULTS AND CONCLUSIONS

The empirical findings of this study provide compelling evidence for the positive relationship between green supply chain practices and competitive advantage within Vietnam's retail sector, whilst revealing nuanced patterns that extend theoretical understanding and offer practical implications for managers and policymakers. The research demonstrates that environmental collaboration, sustainable logistics, and eco-innovation capabilities collectively create competitive advantages through multiple pathways, challenging traditional assumptions about the trade-offs between environmental responsibility and competitive performance.

The finding that green supply chain practices explain 47.2% to 63.4% of variance in competitive advantage dimensions provides strong empirical support for the resource-based view proposition that environmental capabilities constitute valuable organisational resources. This result aligns with Hart's (1995) natural resource-based view, which argues that environmental capabilities represent a new source of competitive advantage in resource-constrained environments. The Vietnamese retail context appears particularly conducive to realising these advantages, possibly due to the combination of growing environmental awareness, regulatory pressures, and competitive intensity that characterises emerging market retail sectors.

The differential effects of green supply chain practices on competitive advantage dimensions reveal important theoretical insights about the mechanisms through which environmental initiatives create value. Environmental collaboration demonstrates the strongest relationship with stakeholder relationship advantage ($\beta = 0.398$, $p < 0.001$), supporting stakeholder theory's emphasis on relationship management as a source of competitive advantage. This finding suggests that Vietnamese retailers gain significant benefits from collaborative environmental initiatives with suppliers, customers, and other stakeholders, creating trust and cooperation that transcend individual transactions (Freeman, 1984; Mitchell et al., 1997).

The strong relationship between sustainable logistics and cost advantage ($\beta = 0.356$, $p < 0.001$) provides empirical support for the Porter hypothesis that environmental improvements can enhance rather than constrain competitiveness. This finding is

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particularly significant in the Vietnamese retail context, where logistics costs represent a substantial portion of total operating expenses due to infrastructure limitations and geographic dispersion. The ability to achieve cost advantages through sustainable logistics practices suggests that environmental initiatives can address both sustainability and efficiency objectives simultaneously. The pronounced effect of eco-innovation capabilities on differentiation advantage ($\beta = 0.423$, $p < 0.001$) underscores the importance of innovation in creating competitive advantages through environmental initiatives. This finding aligns with research by Chen et al. (2006), who demonstrated that environmental constraints stimulate innovation activities that generate unexpected competitive benefits. The Vietnamese retail sector's rapid evolution and increasing consumer sophistication appear to create favourable conditions for eco-innovation, enabling retailers to differentiate themselves through environmental product and service innovations.

The multigroup analysis results reveal important contextual variations in green supply chain effectiveness, with significant differences between medium and large enterprises in several relationships. Large enterprises demonstrate stronger relationships between environmental collaboration and cost advantage ($p = 0.032$), whilst medium enterprises show stronger relationships between sustainable logistics and cost advantage ($p = 0.045$). These findings suggest that enterprise size influences the optimal configuration of green supply chain practices, with larger enterprises better positioned to leverage environmental collaboration whilst smaller enterprises may achieve greater benefits from sustainable logistics initiatives.

The fsQCA results provide particularly valuable insights into the configurational nature of green supply chain success. The identification of four distinct pathways to competitive advantage demonstrates that environmental initiatives can create value through multiple combinations of practices, supporting the equifinality principle and challenging linear assumptions about green supply chain effectiveness. The finding that enterprises can achieve competitive advantage through different combinations of environmental collaboration, sustainable logistics, and eco-innovation capabilities suggests that managers have flexibility in designing green supply chain strategies that align with their organisational capabilities and contextual constraints.

The theoretical contribution of this research lies in its integration of resource-based view and stakeholder theory perspectives within an emerging market context. The findings demonstrate that green supply chain practices create competitive advantages through both internal capability development and external relationship enhancement, supporting the proposed synthesis of these theoretical perspectives. The research extends existing theory by identifying the specific mechanisms through which environmental initiatives influence competitive outcomes and by demonstrating the configurational nature of these relationships. The practical implications of this research are substantial for retail managers seeking to implement green supply chain practices. The findings suggest that environmental initiatives should be conceptualised as strategic investments rather than compliance costs, with the potential to create significant competitive advantages when properly implemented. The identification of multiple pathways to competitive advantage provides managers with flexibility in designing green supply chain strategies that align with their organisational capabilities and market conditions.

The configurational findings offer particularly valuable guidance for implementation planning. Managers can choose from four distinct pathways to competitive advantage, allowing them to focus on the combinations of practices that best align with their resources and capabilities. For instance, enterprises with strong supplier relationships might prioritise environmental collaboration and sustainable logistics, whilst those with innovation capabilities might focus on eco-innovation and environmental collaboration.

The research also provides important insights for policymakers seeking to promote sustainable development within Vietnam's retail sector. The finding that green supply chain practices create competitive advantages suggests that environmental regulations and incentives can align with business interests rather than constraining them. Policymakers might consider developing support programmes that help retailers develop environmental capabilities, particularly in areas such as supplier collaboration and logistics optimisation.

The limitations of this study include its cross-sectional design, which prevents causal inference, and its focus on a single country context, which may limit generalisability. Future research should employ longitudinal designs to examine the temporal dynamics of green supply chain implementation and its competitive effects. Additionally, comparative studies across different emerging market contexts would enhance understanding of the role of institutional factors in moderating green supply chain effectiveness. The research opens several avenues for future investigation. The configurational approach employed in this study could be extended to examine how different combinations of institutional factors, organisational capabilities, and market conditions influence green supply chain success. Additionally, future research could investigate the dynamic capabilities required for successful green supply chain transformation and the role of organisational learning in developing environmental capabilities.

In conclusion, this research demonstrates that green supply chain practices represent a significant source of competitive advantage for Vietnamese retailers, challenging traditional assumptions about the trade-offs between environmental responsibility and competitive performance. The findings provide strong empirical support for the integration of resource-based

view and stakeholder theory perspectives, whilst revealing the configurational nature of green supply chain success. The research offers valuable insights for managers, policymakers, and researchers seeking to understand and promote sustainable business practices within emerging market contexts.

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to Dr. Hoang Vu Hiep for his invaluable guidance and inspiration throughout this research. His expertise, insights, and unwavering support have been instrumental in shaping the direction and quality of this study. I am deeply appreciative of his generosity in sharing his time, knowledge, and network, which have greatly contributed to the success of this research. His mentorship and commitment to academic excellence have not only enriched the quality of this work but have also had a profound impact on my personal and professional growth.

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