

Sustainable Supply Chain Practices and Competitive Advantage of Listed Consumer Goods Companies in Nigeria

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Abstract

The growing pressure on firms to achieve environmental sustainability while maintaining superior market positioning has heightened the strategic importance of sustainable supply chain management (SSCM). This study examined the effect of green procurement, green manufacturing, green packaging and reverse logistics on the competitive advantage of listed consumer goods companies in Nigeria. A quantitative survey research design was adopted, and data were obtained from 84 management staff responsible for supply chain operations using census sampling and a structured questionnaire. Data were analysed using descriptive statistics and multiple regression with SPSS Version 25. The findings revealed that green procurement had a positive and significant effect on competitive advantage ($\beta = 0.332$, $t = 4.283$), while green manufacturing also exerted a positive and significant effect ($\beta = 0.279$, $t = 2.774$). Green packaging showed a positive effect ($\beta = 0.251$, $t = 1.991$), subject to verification of its exact significance level, whereas reverse logistics had a positive but statistically insignificant effect ($\beta = 0.192$, $t = 1.788$). The study concludes that environmentally responsible sourcing and production are important strategic capabilities for enhancing competitive advantage, while the benefits of reverse logistics may be limited by infrastructural and coordination challenges. The study recommends stronger integration of sustainability into procurement and

manufacturing decisions, increased investment in green technologies and packaging, and improved reverse logistics infrastructure. The study contributes context-specific evidence on the differential effects of SSCM practices on competitive advantage in Nigeria's consumer goods sector.

Keywords

Competitive Advantage, Green Manufacturing, Green Packaging, Green Procurement, Reverse Logistics

1. Introduction

Sustainable supply chain practices (SSCP) have increasingly become a strategic priority for organizations seeking to achieve long-term competitiveness and sustainability in the contemporary global business environment. The growing concerns over environmental degradation, climate change, resource depletion, pollution, and unsustainable industrial activities have intensified pressure on firms to integrate sustainability principles into their operational and supply chain systems. In response to these challenges, governments, investors, customers, environmental advocacy groups, and regulatory agencies now demand greater corporate accountability regarding environmental and social responsibility. Consequently, organizations across both developed and emerging economies are transitioning from traditional supply chain systems that primarily focus on cost minimization and operational efficiency toward sustainable supply chain models that incorporate environmental stewardship, social responsibility, and economic sustainability into procurement, production, packaging, logistics, and post-consumption activities (Mustafi et al., 2024). Existing studies have shown that firms implementing sustainable supply chain practices experience improved operational efficiency, reduced waste generation, enhanced customer satisfaction, stronger corporate reputation, improved stakeholder trust, and superior competitive advantage (Agyabeng-Mensah et al., 2020).

The importance of sustainable supply chain practices is particularly evident within the consumer goods sector due to the sector's direct interaction with consumers, suppliers, distributors, and environmental stakeholders. Consumer goods firms are increasingly expected to adopt environmentally responsible production and distribution systems because of growing public awareness of sustainability issues and changing consumer preferences toward eco-friendly products. In Nigeria, listed consumer goods firms represent a significant component of the manufacturing sector owing to their contributions to industrial development, employment generation, export promotion, income creation, and national economic growth. However, the operating environment of these firms remains highly challenging due to rising production costs, unstable exchange rates, inadequate infrastructure, energy constraints, supply chain disruptions, and intense market competition (Adebanjo et al., 2016). In addition, increasing regulatory pressure for

sustainability disclosure and environmental compliance has compelled firms to redesign their supply chain systems to align with global sustainability standards (Ashagrie Adela et al., 2024). Firms that fail to adopt sustainable operational practices risk reputational damage, declining customer loyalty, regulatory sanctions, and reduced market competitiveness.

Recent empirical studies indicate that firms adopting sustainable supply chain initiatives such as green procurement, green manufacturing, eco-friendly packaging, and reverse logistics tend to achieve better organizational and market outcomes, including increased market share, improved product differentiation, enhanced customer retention, and stronger brand equity (Yadua et al., 2025). Sustainable supply chain practices comprise several interconnected dimensions designed to minimize environmental impact while simultaneously improving operational and market performance. Green procurement involves the acquisition of environmentally friendly raw materials and collaboration with suppliers that comply with sustainability standards in order to reduce environmental risks across the supply chain. Green manufacturing emphasizes efficient resource utilization, cleaner production processes, waste minimization, energy conservation, and pollution prevention during manufacturing operations (Soyege et al., 2023). Green packaging focuses on the use of recyclable, biodegradable, reusable, and environmentally friendly packaging materials aimed at reducing environmental pollution and enhancing product sustainability. Reverse logistics refers to the systematic process of recovering, recycling, reusing, remanufacturing, or safely disposing products and packaging materials after consumption in order to recover economic value and minimize environmental degradation (Agyabeng-Mensah & Tang et al., 2021). Collectively, these practices contribute to cost reduction, environmental compliance, operational efficiency, innovation, and long-term market competitiveness.

The relationship between sustainable supply chain practices and market performance can be theoretically anchored on the Resource-Based View (RBV) and Circular Economy Theory. The Resource-Based View posits that firms achieve sustainable competitive advantage through the possession and effective utilization of valuable, rare, inimitable, and non-substitutable resources and capabilities that competitors cannot easily replicate (Barney & Hesterly, 2019). Sustainable supply chain capabilities such as green production technologies, environmentally responsible procurement systems, eco-friendly packaging innovations, and reverse logistics infrastructure constitute strategic resources capable of improving organizational efficiency and market performance. Complementing this perspective, Circular Economy Theory advocates a shift from the conventional linear economic model of “take-make-dispose” toward a regenerative production system that promotes resource efficiency, waste reduction, recycling, reuse, and value recovery throughout the supply chain (Geissdoerfer et al., 2017). This theory emphasizes the importance of maintaining materials and resources within the production cycle for as long as possible in order to maximize economic value while

minimizing environmental impact. In this regard, sustainable supply chain practices enable firms to optimize resource utilization, reduce production costs, improve environmental performance, strengthen brand image, and enhance customer satisfaction, which ultimately translates into improved market performance and sustainable competitive advantage (Rildwan Olaleye et al., 2025).

Despite the increasing awareness and global acceptance of sustainable business practices, many consumer goods firms in Nigeria still demonstrate limited integration of sustainability principles into their supply chain operations. The inadequate adoption of sustainable supply chain practices has contributed to operational inefficiencies, excessive waste generation, environmental pollution, rising production costs, weak brand reputation, and declining market competitiveness among firms within the sector (Yadua et al., 2025). Although prior studies have examined sustainable supply chain management in Nigeria, most existing studies have concentrated on isolated dimensions such as green procurement or green manufacturing while paying limited attention to the combined influence of multiple sustainable supply chain practices on market-based performance indicators (Anisulowo et al., 2024; Adelekan et al., 2025). Furthermore, many previous studies have focused primarily on financial or operational performance outcomes without adequately examining market performance indicators such as customer retention, market share, product differentiation, customer satisfaction, and competitive positioning.

Additionally, there remains limited empirical evidence on how green procurement, green manufacturing, green packaging, and reverse logistics jointly influence the market performance of listed consumer goods firms in Nigeria within a unified analytical framework (Abdulwahab & Attah, 2025; Yadua et al., 2025). This constitutes a significant empirical and contextual gap in the literature. Addressing this gap is essential because a comprehensive understanding of sustainable supply chain practices can provide managers, policymakers, investors, and industry stakeholders with practical insights for improving operational efficiency, environmental sustainability, customer satisfaction, corporate image, and long-term market competitiveness. Therefore, this study investigates the effect of sustainable supply chain practices on the market performance of listed consumer goods firms in Nigeria.

Specifically, the study seeks to:

- 1) assess the effect of green procurement on the competitive advantage of listed consumer goods firms in Nigeria;
- 2) examine the effect of green manufacturing on the competitive advantage of listed consumer goods firms in Nigeria;
- 3) evaluate the effect of green packaging on the competitive advantage of listed consumer goods firms in Nigeria; and
- 4) determine the effect of reverse logistics on the competitive advantage of listed consumer goods firms in Nigeria.

The following null hypotheses were formulated to guide the study:

H₀₁: Green procurement has no significant effect on the competitive advantage of listed consumer goods firms in Nigeria.

H₀₂: Green manufacturing has no significant effect on the competitive advantage of listed consumer goods firms in Nigeria.

H₀₃: Green packaging has no significant effect on the competitive advantage of listed consumer goods firms in Nigeria.

H₀₄: Reverse logistics has no significant effect on the competitive advantage of listed consumer goods firms in Nigeria.

This study focuses on the effect of sustainable supply chain practices on the market performance of listed consumer goods firms in Nigeria. Specifically, the study examines four major dimensions of sustainable supply chain practices, namely green procurement, green manufacturing, green packaging, and reverse logistics, as the independent variables, while market performance serves as the dependent variable. The study is limited to consumer goods firms quoted on the Nigerian Exchange Group (NGX) due to their strategic importance to Nigeria's manufacturing sector and their exposure to sustainability regulations and competitive market dynamics. Geographically, the study covers selected listed consumer goods firms operating within Nigeria. The study also focuses on managerial employees and supply chain-related personnel who possess adequate knowledge of sustainability practices and organizational performance. The scope is further delimited to the contemporary business environment in which sustainability concerns, environmental regulations, and competitive pressures significantly influence organizational operations and market outcomes.

2. Literature Review

2.1. Conceptual Review

2.1.1. Sustainable Supply Chain Practices (SSCP)

Sustainable supply chain practices (SSCP) has been described as the integration of environmental, social, and economic considerations into supply chain operations in order to improve reduce the negative impact on environment, enhance efficiency and realize long-run competitiveness (Yadua et al., 2025). SSCP involves designing, sourcing, producing, distributing and disposing of products in ways that help to reduce waste and resource utilization while ensuring that maximum value is created. Key dimensions of SSCP consists green procurement, green manufacturing, green packaging and reverse logistics. In the listed consumer goods sector in Nigeria, the implementation of SSCP facilitates efficient use of resources, adherence with environmental standards and enhanced stakeholder view, which in combination improve competitive advantage and market performance (Abdulwahab & Attah, 2025).

2.1.2. Green Procurement

Green procurement involves acquiring goods and services that have minimal negative impact on the environment through their lifecycle. It also includes the use of efficient energy (less energy consumption), recyclability, and sustainability (Ab-

dulwahab & Attah, 2025). It also involves using environmental standards or criteria to select suppliers from which to obtain the materials needed for supporting the achievement of organizational sustainability goals. Major elements of green procurement comprise evaluating suppliers using environmental criteria, utilization of eco-friendly materials, selecting suppliers that have environment certification and using cost-effective resources. In the listed CGS in Nigeria, green procurement helps to minimize waste, enhance efficiency and contribute to corporate social responsibility performance, thus improving market performance and competitive advantage.

2.1.3. Green Manufacturing

Green manufacturing refers to designing and carrying out production processes to minimize the negative impact of production on the environment while ensuring high efficiency and quality (Onyeka-Iheme et al., 2024). It stresses energy conservation, emphasizes energy preservation, pollution avoidance, waste reduction, and the utilization of sustainable raw materials. In the listed CGFs in Nigeria, green manufacturing improves customer satisfaction, reduces production costs, and enhances brand image, thus increasing competitive advantage and market performance.

2.1.4. Green Packaging

Green packaging has been described as the design and utilization of packaging materials that minimize the negative effect of packaging on the environment while ensuring that the product is protected and customers' needs are met (Nangpiire et al., 2024). It supports the use of eco-friendly, recyclable, and reusable materials and decreases extreme packaging. In the listed consumer goods firms in Nigeria, green packaging enhances customer perception, minimizes the cost of managing waste, and improve environmental compliance, which together affect market performance and competitive advantage (Abdulwahab & Attah, 2025). Improves customer perception, reduces waste management costs, and enhances environmental compliance, which collectively influence market performance and competitive advantage.

2.1.5. Reverse Logistics (RL)

Reverse logistics has been defined as the process through which products are moved from the end consumer back to the producer in order to enhance reuse, recycling, refurbishment, or proper disposal (Barasin & Ihunwo, 2022). It is an important aspect of circular supply chains and supports sustainability while ensuring that value is recovered from returned products. Reverse logistics enables listed consumer goods firms in Nigeria to reduce environmental impact, improve resource efficiency, and enhance marketing effectiveness, thereby supporting competitive advantage.

2.1.6. Competitive Advantage

Competitive advantage means the capacity of firms to outperform competitors by

offering higher value to customers or operating in a more efficient way (Barney, 1991, cited in Newbert, 2007). It can be achieved from unique resources, competencies, or strategic practices that rivals find difficult to replicate. Indices of competitive advantage comprise product differentiation, cost leadership, brand reputation, market share growth and customer loyalty. For listed consumer goods operating in Nigeria, sustainable supply chain practices represent strategic resources that improve competitive advantage by enhancing operational efficiency, environmental performance, and customer satisfaction (Anisulowo et al., 2024).

2.2. Empirical Review

Abdulwahab and Attah (2025) investigate the effect of green procurement practices on the performance of firms listed in Nigeria. The study employed descriptive survey design targeting employees of the firms across manufacturing, construction, oil and gas and service industries. Primary data were collected through a structure questionnaire and analyzed using Pearson correlation coefficient and multiple regressions. Results show that green procurement had significant positive effect on operational efficiency. The study offers practical evidence of the importance of green procurement in the consumer goods sector. However, other SSCM practices especially green manufacturing, green packaging and reverse logistics were ignored. The current study extends this by assessing the effects of multiple SSCM practices on market-based competitive advantage of listed CGF in Nigeria.

Yadua et al. (2025) studied SSCP and organizational performance (OP) of fast moving consumer goods companies (FMCGC) in Nigeria. The specific objectives of the study were to assess the effect of sustainable manufacturing, reverse logistics, green packaging, and supplier relationship management on organizational performance. The researchers utilized a cross-sectional survey targeting all the supply chain employees in FMCGCs in Nigeria. Data were collected through questionnaire from 357 respondent selected from seven firms. The companies were selected using purposive sampling technique while stratified sampling was used to select respondents. Data gathered were analyzed using descriptive statistics and Ordinary Least Squares (OLS) regression. Results showed that all the SSCP variables had significant positive influence on OP. The study highlights the value of SSCP. However, the study sample of the study was restricted to seven firms, limiting generalizability of findings. The current study addresses this gap by increasing the number of firms in the sample.

Onyeka-Iheme et al (2024) studied the extent to which green manufacturing practices (GMP) impact customer efficiency (CEF) in the listed CGFs in Nigeria. The specific objectives of the study were to assess the impact of green product design (GPD), green supply chain management (GSM), green efficient processes (GEP), green renewable energy (GRE) and end-of-life product management (EPM) on CEF. Survey research design was utilized and all the 526 managers constituted the population of the study. Data were collected through a structured question-

naire from 228 respondents. The sample size (228) was determined through Taro Yamane formula. Both descriptive and inferential (multiple regression) analyses were used to analyze data. Results showed that all the five GMP influenced CEF positively and significantly. The study offer practical evidence of the important role green manufacturing plays in the consumer goods sector. Nevertheless, the study failed to capture other SSCM practices and wider dimensions of competitive advantage like market performance. The current study address these gaps by integrating multiple SSCM practices and assessing their influence on market-based competitive advantage of listed CGFs in Nigeria.

Ashagrie Adela et al. (2024) conducted a study in which they assessed the effect of green product and green packaging on business performance, the mediating role of competitive advantage in Sidima region, Ethiopia. Cross-sectional survey design was employed while all the managers of medium and large manufacturing firms constituted the population of the study. Data were gathered through questionnaire from 301 respondents. Structural Equation Modelling (SEM) aided with AMOS version 23 was used to analyze data. Results revealed that green products and packaging had significant positive effects on business performance. Also, competitive advantage mediated the effects of the variables on business performance. The study is significant as it demonstrates the value of green products and packaging in the manufacturing sector. However, the study was carried out in Ethiopia and concentrated majorly on green products and packaging, ignoring other SSCM practices and how they influence market performance. The current study builds on it by assessing SSCM practices and their direct influence on competitive advantage of listed CGFs in Nigeria.

Anisulowo et al (2024) investigated the extent to which SSCM practices affect the financial sustainability of consumer goods firms listed in Nigeria. The specific objectives of the study were to assess the effects of supply relationship management (SRM) and lean supply chain practices (LSCP) on financial sustainability. Descriptive survey design was utilized and the population comprised 21 firms listed under the consumer goods sector on the Nigerian Exchange Group (NXG). Data were collected through structured questionnaire from 120 respondents selected from three firms. The questionnaire was administered through Google forms while descriptive analysis and Analysis of Variance were used to analyze data. Results showed that both SRM and LSCP had significant positive effect on financial sustainability. Based on these, the researchers concluded that SCM practices enhance financial sustainability of listed consumer goods firms in Nigeria. The study offered empirical evidence on the link between SSCM practices and financial sustainability in Nigeria. However, the sample size (three firms) of the study is small, limiting the extent to which findings can be generalized to the entire population. The currents study fills this gap by using a larger sample.

Adelekan et al. (2025) conducted a study to determine the how sustainable business practices enhance competitive advantage of fast moving consumer goods

(FMCG) firms in Lagos, Nigeria. Specifically, the study determines the effect of sustainable product, operational sustainability, social sustainability and environmental sustainability on competitive advantage. In order to achieve these objectives, survey research design was utilized and all the 5,107 employees of FMCG firms in Lagos constituted the population of the study. Data were gathered through structured questionnaire administered to 475 respondents' online and analyzed using descriptive analysis and structural equation modeling (SEM). Analysis was facilitated with Smart-PLS software. Results revealed that the four sustainable practices had significant positive effects on competitive advantage. The study highlights the important role of general sustainability practices. However, it concentrated on Lagos only and measured competitive advantage generally without isolating particular proxies such as market performance or cost reduction. Due to these identified gaps, the current study covers listed consumer goods firms across Nigeria and focuses on how green supply chain practices influence competitive advantage using market performance as a proxy of competitive advantage.

Barasin and Ihunwo (2022) investigated the effect of reverse logistics on marketing effectiveness of food and beverages companies in Rivers State, Nigeria. Cross-sectional survey design was utilized. The target population comprised all the managers of 14 listed food and beverage firms in Nigeria. Data were gathered through a structured questionnaire from 84 respondents and analyzed using Pearson Product Moment Correlation, aided with Statistical Package for Social Sciences (SPSS), Version 20. Results showed that reverse logistics had significant and positive effect on marketing effectiveness. The study provides an empirical evidence of the role reverse logistic plays in the manufacturing of food and beverages. However, the study focused on reverse logistics and marketing effectiveness of food and beverages firms in Rivers State, ignoring other dimensions of SSC practices and competitive advantage. The current study fills this gap by assessing SSC practices and their influence on market-based competitive advantage of listed CGFs in Nigeria.

2.3. Theoretical Review

Two theories used to explain the link between sustainable supply chain practices and competitive advantage of listed CGFs in Nigeria includes Resource Based Theory and Circular Economy Theory.

2.3.1. Resource-Based Theory

The Resource-Based Theory (RBT) was propounded by Barney (1991) cited in Newbert (2007). The theory explains that sustainable competitive advantage is achieved by firms through acquisition and effective deployment of valuable, rare, inimitable and non-substitutable (VRIN) resources. These resources can be tangible or intangible, which comprise business competencies, managerial capabilities, technical know-how, strategic processes, enabling businesses to produce unique value and achieve higher performance than the competitors. Businesses

that effectively combine and take advantage of such internal resources can maintain higher performance over time because these resources are not easy to imitate by competitors (Newbert, 2007).

SSC practices such as green procurement, green manufacturing, green packaging and reverse logistics can be considered as strategic business competencies that can represent valuable and difficult to duplicate resources. When successfully incorporated into business operations, these practices reduce cost, improve efficiency, increase brand image, enhance market positioning and competitive advantage. This theoretical point is supported by the studies of Abdulwahab and Attah (2025), Onyeka-Iheme et al. (2024), and Yadua et al. (2025) which revealed that SSC practices enhance business firm performance in Nigeria's consumer goods sector.

2.3.2. Circular Economy Theory

The Circular Economy Theory was developed by Pearce and Turner (1990) cited in Geissdoerfer et al. (2017). The theory lay emphasis on the need for firms to integrate environmental considerations into production and consumption system, bearing in mind that natural resources are finite in nature. Geissdoerfer et al. (2017) later expanded the theory by viewing circular economy as a renewing system that replaces the linear "take-make-dispose" model with closed-loop processes based on resource efficiency, reuse, recycling, and product life extension. Kirchherr et al. (2017) opine that circular economy practices support economic growth by minimizing the negative effect of environmental degradation on the economy. This is because it allows the economy to design supply chains that minimize waste and maximize resource circulation.

The Circular Economy Theory is highly relevant in this study as it explains that SSC practices such as green procurement, green manufacturing, green packaging and reverse logistic assist listed consumer goods firms to minimize waste, maximize resource utilization and create value loops, which subsequently improve efficiency, customer satisfaction, brand image and market performance. The studies conducted by Ashagrie Adela et al. (2024) and Barasin and Ihunwo (2022) provide evidence that circular economy practices enhance business performance, thus offering support to the assumptions of the Circular Economy Theory.

2.4. Conceptual Framework

Figure 1 shows that SSCP such as green procurement, green manufacturing, green packaging, and reverse logistics represent strategic resources (based on Resource-based Theory and Circular Theory) that when used in combination have joint effect on market performance (a proxy of competitive advantage). Each arrow shows that every dimension of SSCP has direct influence on efficiency, customer satisfaction, and general market competitiveness.

The model specification is:

$$\text{COA} = f(\text{SSCPs})$$

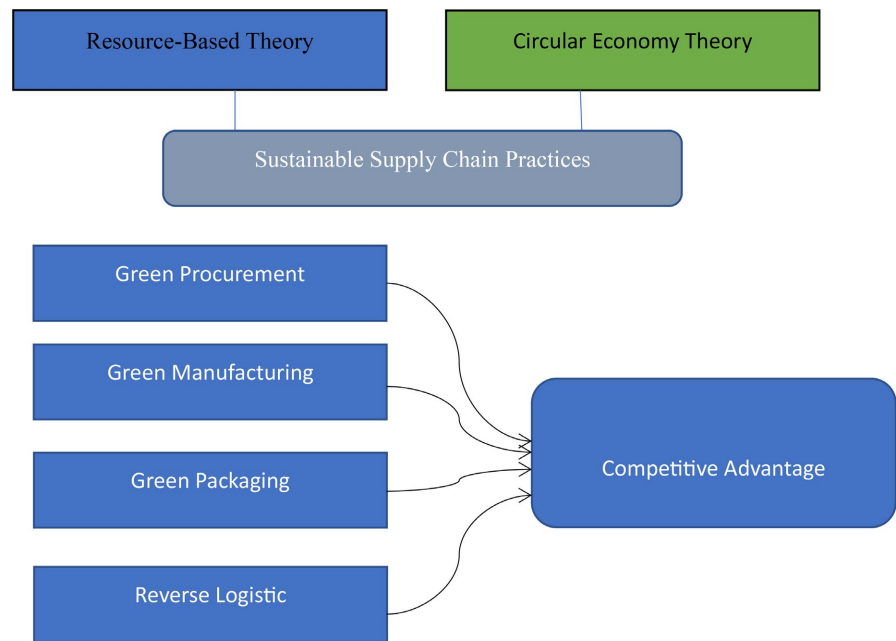


Figure 1. Conceptual framework.

3. Methodology

The study utilizes survey research design to assess the influence of sustainable supply chain practices (green procurement, green manufacturing, green packaging, and reverse logistics) on the competitive advantage of listed consumer goods companies in Nigeria. The design permits the collection of quantitative data from respondents (management staff) without manipulating variables. This facilitates generalization of findings across companies (Creswell & Creswell, 2018).

The population consists of all the 84 management staff in charge of supply chain operations in the 12 firms listed on the consumer goods sector in the Nigerian Exchange Group as at January 1, 2026. The population can be further broken into supply chain managers (1 Respondent), procurement managers (2 respondents), production managers (2 respondents) and logistics managers (2 respondents) in each of the firm. Since the sample size, census sampling was utilized. This also enhanced generalization of findings (Etikan et al., 2016).

Primary data were collected through a structured questionnaire administered through face-to-face and online (Google Forms). Both method of distribution of questionnaire were utilised to optimize response rate, with follow-ups to participation (Dillman et al., 2014). Expert review was used to ensure face and content validity of the questionnaire while pilot test was conducted by distributing the questionnaire to 10 managers of consumer goods firms not registered on the NGX. Cronbach's Alpha was used to assess the reliability of the questionnaire. All the constructs exceeded the 0.70 benchmark (Sekaran & Bougie, 2016). Common-method bias was addressed through procedural and statistical remedies, given that both the predictor and outcome variables were obtained from the same respondents using a structured questionnaire. Respondents were assured of anonymity

and confidentiality, while questionnaire items were clearly worded and presented to minimise response-pattern effects. In addition, Harman's single-factor test was conducted, and the result showed that no single factor accounted for the majority of the total variance. This suggests that common-method bias was not sufficiently substantial to compromise the validity of the study findings.

Descriptive analysis (mean and standard deviation) were used to summarize data while multiple regression was used to estimate relationships and test hypotheses. The beta coefficients of the regression result measure the effect of SSC practices on Competitive advantage. Specifically, t-statistic and p-value from the regression output was used to test hypotheses. The decision rule is that if t-statistic is greater than critical value at 5 percent level of significance, reject the null hypothesis, otherwise, fail to reject. Similarly, if p-value is less than 0.05, reject the null hypothesis, otherwise fail to reject. Multiple regression was employed because the study examined the simultaneous and unique effects of green procurement, green manufacturing, green packaging and reverse logistics on competitive advantage. Before interpreting the regression results, key assumptions were assessed, including multicollinearity, linearity, normality and homoscedasticity. Multicollinearity was examined using tolerance and VIF values, while linearity, normality and homoscedasticity were assessed using appropriate diagnostic plots and residual analysis. The results indicated that the assumptions were satisfactorily met, thereby supporting the use of multiple regression for estimating the coefficients and testing the hypotheses.

The R-squared was used to measure the overall goodness of fit of the model while F-statistic helped to assess whether or not the joint effects of SSC practices (green procurement, green manufacturing, green packaging, and reverse logistics) on market performance. Analysis was aided with Statistical Package for Social Sciences (SPSS) Version 25.

$$\text{COA} = f(\text{SSCPs}) \quad (1)$$

$$\text{COA} = f(\text{GP, GM, GP, RL}) \quad (2)$$

The linear form of the model is given as:

$$\text{COA} = \beta_0 + \beta_1 \text{GP} + \beta_2 \text{GM} + \beta_3 \text{GP} + \beta_4 \text{RL} + \mu \quad (3)$$

where:

COA = Competitive Advantage, SSCPs = Sustainable supply chain practices.

MKP = Market performance, GP = Green procurement, GM = Green manufacturing.

GP = Green packaging, RL = Reverse logistics.

β_0 = Constant, $\beta_1 - \beta_4$ = Parameters to be estimated, μ = Error term.

All parameters are expected to have positive signs, signifying the hypothesized positive influences of SSCP on market-based competitive advantage.

4. Data Analysis

This section presents the analysis, interpretation and discussion of data obtained

from the 84 management staff of listed consumer goods companies in Nigeria. The analysis begins with descriptive statistics, using the mean and standard deviation to determine the extent of adoption of sustainable supply chain practices and the level of competitive advantage among the sampled firms. Subsequently, multiple regression analysis is employed to examine the individual and combined effects of green procurement, green manufacturing, green packaging and reverse logistics on competitive advantage. The findings provide the empirical basis for testing the study's hypotheses and drawing conclusions in accordance with the research objectives.

Table 1. Descriptive analysis.

	N	Minimum	Maximum	Mean	Std. deviation	Interpretation
Green procurement	84	1.00	5.00	3.9524	0.91710	Agreed
Green manufacturing	84	1.00	5.00	3.9286	0.80339	Agreed
Green packaging	84	1.00	5.00	3.7857	0.94514	Agreed
Reverse logistics	84	1.00	5.00	3.7857	0.89269	Agreed
Competitive advantage	84	1.00	5.00	3.8690	0.81816	Agreed

Source: SPSS Version 25.

Table 1 presents the descriptive statistics of the sustainable supply chain practices and competitive advantage of listed consumer goods firms in Nigeria. The mean (3.9562) shows that the green procurement is practiced among the firms studied. The standard deviation (0.9170) shows that the dispersion of the data from their mean value is low, indicating that the variability of green procurement implementation across the firms is low. Similarly, the mean scores (3.9286) and (3.7857) are greater than criterion mean (3.00), showing that the respondents agreed that green principles are incorporated into manufacturing and packaging of goods. The standard deviations (0.80339) and (0.94514) are low, indicating that the dispersion of the data from the mean scores is low, such the mean computed are reliable descriptive measures. The mean (3.7857) shows that on the average respondents agreed that firms practice reverse logistic while standard deviation (0.89269) is low showing that the spread in the data is low. Generally, the respondents agreed that their firms are performing well in the market revealed by the mean (3.8690) and standard deviation (0.81816).

Table 2 shows the R-squared of the model. The R-squared (0.719) shows that 71.9 percent variation in competitive advantage is determined by green procurement, green manufacturing, green packaging and reverse logistic while the remaining 28.1 percent is attributed to other determinants of market performance. The R-square shows that the model has an overall goodness of fit and suitable for predicting market performance of consumer goods firms listed in Nigeria. The

Durbin Watson statistic (1.696) is close to the benchmark (2.00), indicating the absence of serial correlation in the model.

Table 2. Model summary.

Model	R	R square	Adjusted R square	Std. error of the estimate	Durbin-Watson
1	0.848 ^a	0.719	0.702	0.18999	1.696

Source: SPSS Version 25. a. Predictors: (Constant), Reverse logistics, Green procurement, Green manufacturing, Green packaging; b. Dependent Variable: Competitive Advantage.

Table 3. Analysis of variance (ANOVA).

Model	Sum of squares	Df	Mean square	F	Sig.
1 Regression	52.708	4	13.177	365.063	0.000 ^b
Residual	2.852	79	0.036		
Total	55.560	83			

Source: SPSS Version 25. a. Dependent Variable: Competitive Advantage; b. Predictors: (Constant), Reverse logistics, Green procurement, Green manufacturing, Green packaging

Table 3 shows the ANOVA of the model. The F-statistic (365.063) is high and significant at 5 percent level of significant indicated by p-value (0.000) which is less than 0.05. This shows that the joint effect of sustainable supply chain practices (green procurement, green manufacturing, green packaging and reverse logistic) is significant, which also means that the model has overall significance. The implication of this is that the SSC practices complement each other and their combine effect is significant.

Table 4. Regression coefficients.

Model	Unstandardized coefficients		Standardized coefficients beta	T	Sig.
	B	Std. error			
(Constant)	0.130	0.112		1.165	0.248
1 Green procurement	0.312	0.074	0.332	4.283	0.002
Green manufacturing	0.258	0.093	0.279	2.774	0.000
Green packaging	0.231	0.116	0.251	1.991	0.001
Reverse logistics	0.186	0.104	0.192	1.788	0.000

Source: SPSS Version 25. a. Dependent Variable: Competitive Advantage.

From **Table 4**, green procurement has a positive effect on competitive advantage ($B = 0.312$, $\beta = 0.332$, $t = 4.283$). Holding other sustainable supply chain practices constant, a one-unit increase in green procurement is associated with a

0.312-unit increase in competitive advantage. The standardised coefficient ($\beta = 0.332$) indicates a positive association of moderate magnitude relative to the other predictors. Since $t = 4.283 > 1.96$, the effect is statistically significant at the 5% level; hence, the null hypothesis should be rejected.

Green manufacturing also has a positive effect on competitive advantage ($B = 0.258$, $\beta = 0.279$, $t = 2.774$). Holding other variables constant, a one-unit increase in green manufacturing is associated with a 0.258-unit increase in competitive advantage. The positive Beta ($\beta = 0.279$) indicates that green manufacturing contributes positively to competitive advantage. Since $t = 2.774 > 1.96$, the effect is statistically significant at the 5% level; therefore, the null hypothesis should be rejected.

Green packaging has a positive effect on competitive advantage ($B = 0.231$, $\beta = 0.251$, $t = 1.991$). Holding other variables constant, a one-unit increase in green packaging is associated with a 0.231-unit increase in competitive advantage. However, because $t = 1.991$ is only marginally above the conventional critical value of 1.96, the significance should be confirmed from the actual SPSS p-value. If the actual p-value is ≤ 0.05 , the null hypothesis is rejected; if it is > 0.05 , the null hypothesis is not rejected.

Reverse logistics has a positive coefficient but does not appear to have a statistically significant effect on competitive advantage ($B = 0.186$, $\beta = 0.192$, $t = 1.788$). Although the positive coefficient suggests that improvements in reverse logistics are associated with higher competitive advantage, $t = 1.788 < 1.96$, indicating that the effect is not statistically significant at the 5% level. Therefore, the null hypothesis should not be rejected.

5. Discussion of Findings

The finding shows that green procurement has a positive and significant effect on competitive advantage ($B = 0.312$, $\beta = 0.332$, $t = 4.283$). This implies that environmentally responsible supplier selection and sustainable sourcing enhance resource efficiency, corporate reputation and product differentiation. The finding agrees with [Abdulwahab and Attah \(2025\)](#), who reported a positive relationship between green supply chain practices and organisational performance. It also supports the Resource-Based View (RBV), which posits that valuable organisational capabilities, such as sustainable procurement capabilities, can provide firms with competitive advantage.

The result indicates that green manufacturing positively and significantly affects competitive advantage ($B = 0.258$, $\beta = 0.279$, $t = 2.774$). Environmentally responsible production, waste reduction, energy conservation and efficient resource utilisation can reduce operational inefficiencies and improve corporate reputation. This finding is consistent with [Onyeka-Iheme et al. \(2024\)](#), [Yadua et al. \(2025\)](#) and [Ashagrie Adela et al. \(2024\)](#), who found positive relationships between sustainable practices and firm performance. The finding also supports Circular Economy Theory, as green manufacturing promotes resource efficiency, waste reduction and value creation.

Green packaging has a positive effect on competitive advantage ($B = 0.231$, $\beta = 0.251$, $t = 1.991$). The finding suggests that recyclable, reusable and biodegradable packaging can improve product differentiation, customer perception and corporate image. This agrees with [Onyeka-Iheme et al. \(2024\)](#), [Yadua et al. \(2025\)](#) and [Ashagrie Adela et al. \(2024\)](#), who established positive effects of sustainable practices on firm performance. The result is also consistent with Circular Economy Theory, which emphasises reduction, reuse and recycling of resources. However, the reported p-value should be verified because $t = 1.991$ is only marginally significant at 5%.

The result reveals that reverse logistics has a positive but statistically insignificant effect on competitive advantage ($B = 0.186$, $\beta = 0.192$, $t = 1.788$). Although product returns, recycling, reuse and waste recovery may improve environmental performance, the result suggests that these practices have not translated into significant competitive advantage among the sampled firms. This finding differs from [Barasin and Ihunwo \(2022\)](#), who found that reverse logistics improves marketing effectiveness and customer loyalty. From the perspective of Circular Economy Theory, the insignificant result may reflect inadequate recycling infrastructure, recovery systems and supporting logistics capabilities in the Nigerian business environment.

6. Conclusion and Recommendations

Based on the empirical findings, the study concludes that sustainable supply chain practices constitute important strategic drivers of competitive advantage among listed consumer goods companies in Nigeria. The findings specifically establish that green procurement and green manufacturing have positive and statistically significant effects on competitive advantage, demonstrating that environmentally responsible sourcing and production can strengthen firms' operational efficiency, product differentiation and market position. Green packaging also exhibits a positive effect on competitive advantage, although its statistical significance should be confirmed from the original SPSS output. In contrast, reverse logistics has a positive but statistically insignificant effect, suggesting that its potential competitive benefits may be constrained by infrastructural, technological and coordination challenges. Overall, the study demonstrates that integrating environmental sustainability into supply chain activities can contribute to stronger competitive positioning through improved resource utilisation, corporate reputation, customer value and operational efficiency. The study is, however, limited to listed consumer goods companies in Nigeria; future studies could extend the investigation to other sectors, employ broader measures of competitive advantage and examine relevant mediating and moderating variables.

Based on the findings and conclusion of the study, the following recommendations are proposed:

- 1) Strengthening green procurement, procurement managers should institutionalise environmental criteria in supplier selection, evaluation and contract

management, while prioritising suppliers that provide environmentally friendly materials and demonstrate sustainable production practices.

2) Enhancing green manufacturing, production managers should intensify the adoption of energy-efficient technologies, waste-minimisation techniques, pollution-control measures and efficient resource utilisation.

3) Improving green packaging, packaging and marketing managers should promote the use of recyclable, reusable and biodegradable packaging materials while reducing excessive packaging.

4) Strengthening reverse logistics, logistics managers should develop more effective systems for product returns, material recovery, recycling, reuse and remanufacturing. Given the insignificant effect observed in the study, firms should prioritise improvements in collection infrastructure, reverse distribution networks, technology and coordination with distributors, recyclers and customers before expecting substantial competitive benefits from reverse logistics.

5) Adopting an integrated sustainability strategy, management should integrate sustainable supply chain practices into the firm's overall corporate and competitive strategy rather than treating them as separate operational activities.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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