SUPPLY CHAIN RESILIENCE AND SUSTAINABLE PERFORMANCE OF SELECTED LISTED FIRMS IN THE FOOD AND BEVERAGE INDUSTRY IN LAGOS STATE

Jonathan Ehimen Ekpudu
Email: jekpudu@unilag.edu.ng
Department of Business Administration, University of Lagos. Nigeria.
Martins Eromose Odigie
Email: eromosem@yahoo.com
Department of Business Administration, University of Lagos. Nigeria
Ajao G. Rahim
Email: arahim@unilag.edu.ng
Department of Business Administration, University of Lagos. Nigeria.
&
O. Okpala
Email: ookpala@unilag.edu.ng
Department of Accounting, University of Lagos. Nigeria.

ABSTRACT

This study investigated the effect of supply chain resilience on sustainable performance of selected listed firms in the food and beverages industry in Lagos State. A cross-sectional survey research design was employed by the study. Three companies- Nestle Foods Nigeria Plc, Guinness Nigeria Plc, and Dangote Flour Mills Plc were purposively selected for the study. Of the 4,829 employees of the companies, a sample size of 369 was purposively chosen and used by the study. Primary data were collected from the respondents using questionnaire. Data collected were analysed using descriptive statistics to determine the frequency, percentage and mean distribution of the data collected. On the other hand, inferential statistical tool (multiple regression analysis) was employed to test the study's hypotheses with the aid of SPSS version 26. Results of study show that Supply Chain (SC) flexibility, SC agility, and SC collaboration have individual and collective effect on sustainable performance of firm. Sequel to the findings, the study recommends that managers of food and beverage firms implement supply chain flexibility strategy to mitigate risks, proactively redesign their supply chain networks strategy to swiftly respond to emerging market opportunities, foster trust and strong relationships with key suppliers and adopt strategies that minimise supply chain disruptions. These lead to better responds to customer demands and ultimately enhance sustainable performance.

Keywords: Supply Chain Agility, Supply Chain Collaboration, Supply Chain Flexibility, Supply Chain Resilience, Sustainable Performance.

1.0 INTRODUCTION

Sustainability performance represents a comprehensive and integrated approach to company management, balancing social, environmental, and economic factors to foster resilience and long-term value creation (Ofoegbu & Laguo, 2024). The dominant paradigm has undergone a significant shift, transitioning from a sole focus on financial gain to a more holistic examination of sustainability, commonly referred to as the triple bottom line. This paradigm shift is crucial for business' long-term survival. Organisations are increasingly under pressure to incorporate

social and environmental indicators into their performance metrics in addition to financial profits (Esangbedo & Zhang, 2024). Through environmental conscious practices, social responsibility, and economic sustainability organisations can effectively navigate today's complex and interconnected challenges, ultimately contributing to a more sustainable and equitable future for stakeholders. Therefore, resilience is essential for achieving sustainable goals, specifically in the event of supply chain disruptions. Moreover, sustainability is increasingly being prioritised in supply chains (Usman, Shehu & Nuraddeen, 2023).

The importance of sustainability in global supply chains has grown significantly. Sustainability is no longer just a buzzword; it has become imperative for food and beverage firms to adopt eco-friendly practices in their supply chain, such as ethical sourcing and optimising transportation routes to reduce carbon emissions. The primary objectives of this shift are to meet legal requirements, enhance brand reputation, and cater for the needs of an increasingly environmentally conscious customers. This shift is driven by growing consumer demand for sustainable practices and products, as well as increasingly stringent legislative requirements. Meanwhile, circular supply chains, which prioritise material recycling and reuse, are gaining popularity and aligning with the global movement toward environmental sustainability. furthermore, recent events have highlighted the vulnerability of global supply networks to various disruptions. Recent disruptions, including the Israel-Hamas conflict, Red Sea assaults, Russia-Ukraine war, and US-China tensions, have underscored the importance of resilient supply chains. In response, businesses are adopting strategies such as local sourcing and supplier base diversification to mitigate the risks associated with unforeseen events. Moreover, this necessitates the implementation of dynamic risk assessment techniques and comprehensive contingency planning (Adeleke, 2024).

Supply Chain Resilience (SCR) is essential for ensuring operational continuity, achieving sustainability performance, and recovering from unforeseen events (Alsmairat & Al-Shboul, 2023). The COVID-19 pandemic serves as a prime example of SC disruptions, underscoring the importance of resilience in attaining sustainable supply chain performance (Mehmood, Nazir, Fan & Nazir, 2024). SCR has emerged as a critical dynamic capability essential for achieving sustainable performance amidst unforeseen circumstances, where environmental uncertainty is escalating and disruptive events can have a profoundly detrimental effect on businesses (Guoli, Shuting & Ju, 2023). By implementing SCR, Nigerian manufacturing firms can foster stronger relationships with their supply chain partners and attain sustainable performance. This could enable them to effectively manage the risk of supply chain disruptions

and rapidly recover to their initial operating level, or even improve upon it, within a specified timeframe.

Despite its importance, the concept of SCR, a critical business integration strategy that can provide a competitive edge and guarantee business continuity in the face of SC disruptions, has not been fully embraced by some manufacturing companies in Nigeria and other developing countries. Many Nigerian manufacturing firms often lack a culture of business continuity planning and operational resilience, leaving them vulnerable to supply chain disruptions.

The importance of SCR in enhancing sustainability performance is widely acknowledged. However, there is a knowledge gap regarding how Nigerian manufacturing companies specifically explore SCR strategies and their impact on sustainable performance, specifically in comparison with their global counterparts. This knowledge gap is especially pertinent in the face of global disruptions, such as the COVID-19 pandemic, and increasing environmental uncertainties.

Although SCR techniques have been proven to enhance sustainable performance, most Nigerian manufacturing firms have not fully adopted these strategies, thereby diminishing their chances of survival in the market. To ensure uninterrupted operations during supply chain disruptions, Nigerian manufacturing businesses must establish a requisite level of SCR. Furthermore, to respond to potential future disruptions, they will need to adopt innovative working practices and implement controls throughout the supply chain. Failure to do so will severely jeopardise the manufacturing companies' ability to sustain operations and function sustainably.

Existing studies have shown a strong correlation between SCR and business performance. Research has found a positive correlation between SCR strategies and the success of Kenyan food and beverage manufacturing enterprises (Muricho Nofryanti & Muli, 2021). Similarly, Aityassine et al. (2022) study’s findings revealed that SCR tactics such as agility, flexibility, and collaboration have a significant impact on business success. Moreover, Singagerda, Fauzan, and Desfiandi (2022) found that SCR tactics have a positive impact on business success. However, most of these studies did not consider the impact of SCR on sustainable performance. Furthermore, several Nigerian studies failed to investigate how SCR affects manufacturing companies' sustainable performance in the event of a supply chain disruption.

A review of existing literature reveals that most studies on Supply Chain (SC) resilience and sustainable performance have been conducted in developed countries, with only a handful of studies focusing on Nigeria. This highlights a significant research gap in the Nigerian context.

Furthermore, the relationship between SC resilience and sustainable performance in the food and beverages industry remains understudied, specifically in terms of how firms can optimise their sustainable performance and maintain competitiveness in the face of SC disruptions. Hence, the study investigates the effect of SC resilience on the sustainable performance of selected listed firms within the food and beverage industry in Lagos State.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Resource-Based View Theory

The Resource-Based View (RBV) theory was introduced in 1991 by Jay Barney. The theory has been broadly applied in various management areas in the understanding of how organisations acquire a competitive advantage through their unique resources. Based on Barney (2012), the theory posits that a company's resources and capabilities are the primary factors influencing its ability to achieve sustainable performance and sustain a competitive advantage. According to the RBV, a firm's strategic advantage is rooted in its distinctive resources, which are valuable, rare, inimitable, and non-substitutable (Bals & Rosca, 2022). The theory suggests that businesses can achieve long-term benefits by integrating resources, such as core competencies, dynamic capabilities, and absorptive capacities, in a unique way (Ki-Hyun & Sang-Man, 2019). Furthermore, RBV theory posits that a purchasing company can enhance its fundamental value by investing in relation-specific assets and leveraging the resources, expertise, and know-how of its major suppliers, thereby making it challenging for rivals to replicate.

The RBV underscores the strategic importance of sustainability in supply chain management. By incorporating sustainable practices, businesses can achieve a long-term competitive advantage, while meeting legal and social requirements (Khan, Ajmal, Jabeen, Talwar & Dhir, 2023). Sustainable resources, such as environmentally friendly products and processes, become key differentiators in the market, boosting the company's reputation and enhancing customer loyalty. Khan et al. (2023) contend that these resources are increasingly being recognised as vital components of a company's resource portfolio, enabling it to maintain a competitive edge in a market where environmental concerns are growing in importance. In essence, businesses can reap long-term benefits by integrating sustainability into their core strategies, thereby enhancing their market positioning and compliance with international standards.

This theory is relevant to this study, as it underscores the importance of collaboration among key resources within an organisation to facilitate effective implementation of resilience strategies in a supply chain, ultimately enhancing sustainable performance and competitive

advantage in an industry. The theory is closely linked to the variables adopted in this study, providing a foundational framework for understanding how these variables could be applied in organisation to improve supply chain resilience towards attaining sustainable performance.

2.2 Conceptual Review

2.2.1 Supply Chain Resilience

Supply chain resilience refers to the capacity of supply chain to adapt and mitigate the detrimental consequences of event shocks (Zhu & Wu, 2022). It is characterised by proactive anticipation, adaptive containment, and rapid recovery capabilities, enabling organisations to mitigate disruptions and maintain operational stability (Kamalahmadi & Parast, 2016). SCR is not only a critical component of a company's existence but also a responsive capacity that enables a company's performance. It encompasses both the ability to adapt to changing conditions and the capacity to absorb shocks in the event of supply chain disruption (Nneji, 2023). Furthermore, SCR involves not only mitigating the development of disruptions but also implementing swift and efficient response measures to restore normal operations by maintaining control over the supply chain's structure and function (Kamalahmadi & Parast, 2016). In other words, the capacity to manage risks and adapt to disruptions are integral components of SCR. By possessing this capacity, supply chain businesses can dynamically respond when a disruption occurs, enabling them to either enhance or return to their prior performance level.

2.2.2 Supply Chain Flexibility

Supply Chain Flexibility (SCF) refers to the capacity of a well-designed organisation to adapt to disturbances and resume regular operations (Juan, Li, & Hung, 2022). According to Xiao, Yu, and Gong (2012), SCF is the ability of a supply chain to recover from external disruptions and return to its optimal or initial state. This concept encompasses the ability to adapt to changing environments and recover from setbacks (Al-Swidi, Al-Hakimi, Al Halbusi, Al Harbi & Al-Hattami, 2024). Implementing appropriate technologies can enhance SCF (Cui, Fan, & Ci, 2022). In the face of supply and demand uncertainty, SCF facilitates efficient risk management by improving the coordination of risk mitigation strategies (Simchi-Levi, Wang, & Wei, 2018). SCF encompasses various procedures, including managing customer complaints, fostering long-term customers' relationships, enhancing customers' satisfaction, forming strategic partnerships or alliances with suppliers, and facilitating information

exchange. Maintaining market competitiveness is essential, and having a flexible supply chain can be instrumental in achieving this goal (Agrawal, Sharma, Raut, Mangla, & Arisian, 2024).

2.2.3 Supply Chain Agility

Supply Chain Agility (SCA) refers to a strategic capability that enables organisations to rapidly adapt their operations and strategies in response to changes in the external business environment (Gligor, Feizabadi, Russo, Maloni, & Goldsby, 2020). Organisations that possess agility can anticipate changes in the external environment, quickly adjust course, empower customers, and operate their supply chains with greater flexibility (Cantele, Russo, Kirchoff, & Valcozzena, 2023). Furthermore, suppliers' agility is crucial for effectively and efficiently implementing changes in the global competitive landscape (Al Humdan, Shi, Behnia, & Najmaei, 2020). A company's ability to attain agility is crucial for thriving in unstable business environments. In today's globalised world, the industrial sector must develop strategies to respond promptly to daily changes (Mali & Shrimali, 2019). SCA refers to the ability to react quickly and adaptively to shifts in demand; companies must explore this concept to succeed in a constantly evolving supply chain environment (Ali, 2024). A company's capacity to anticipate and respond promptly to changes in demand is closely tied to SCA. For businesses, an agile supply chain is essential, as a disrupted supply chain flow pattern can have far-reaching consequences, specifically in a competitive product mix and when faced with sudden and unforeseen changes to the product (Çetindaş, Akben, Özcan, Kanuşağı & Öztürk, 2023).

2.2.4 Supply Chain Collaboration

Collaboration throughout the supply chain has become a strategic imperative for businesses seeking to achieve sustainable goals, which encompass economic, social, and environmental dimensions. According to the prevailing research opinions, Supply Chain Collaboration (SCC) refers to a partnership process wherein at least two separate parties collaborate to plan and execute SC activities, with the aim of achieving shared objectives and mutual benefits (Chen, Zhao, Tang, Price, Zhang, & Zhu, 2017; Ladipo, Udofia, Onikun & Ekpudu, 2022; Ekpudu & Udofia, 2023). SCC represents a collaborative partnership between supply chain partners, which involves modifying company operations to enhance profitability and exchanging information to improve joint performance. These cooperative partnerships are long-term initiatives where partners actively collaborate to create innovative practices, fostering a mutual understanding of each other's needs and capabilities (Singha, Garga, & Sachdevaa, 2018). Whether triggered by natural disasters, societal upheaval, or other unforeseen circumstances, collaborative supply networks are more resilient to shocks. By collaborating to develop contingency plans, share resources, and provide mutual support during emergencies,

companies can ensure the long-term sustainability of their supply chain (McVeigh & Rennie, 2024). SCC enables businesses to share critical information, leverage resources and expertise beyond national borders, and distribute benefits and risks, ultimately leading to enhanced performance and reduced total costs (Chen et al., 2017).

2.2.5 Sustainable Performance

The triple bottom line, or sustainability, is increasingly replacing economic profit as the dominant paradigm, and this shift is crucial for businesses' long-term survival. The dominant paradigm has undergone a significant transformation, evolving from an exclusive focus on financial gain to a more holistic examination of sustainability, which encompasses the triple bottom line. This paradigm shift is essential for ensuring businesses' long-term sustainability. Organisations are facing increasing pressure to incorporate social and environmental indicators into their performance metrics, in addition to financial profits (Esangbedo & Zhang, 2024). Organisations are acknowledging their moral responsibilities and developing strategies to operate in a more secure and ethical manner, with the aim of protecting the environment and conserving natural resources. Mitigating the negative impacts of social, economic, and environmental sustainability factors, organisation promotes progress and development, striving to create a better world (Siddiqui & Salleh, 2024).

Sustainability performance is an integral and comprehensive strategy in corporate management, balancing social, environmental, and economic factors (Ofoegbu & Laguo, 2024). Sustainable performance is a key objective of companies, encompassing compliance-based responsibilities and standard performance reporting to meet stakeholder expectations (Nofryanti, Sembel, Augustine, & Arsjah, 2021). Sustainability refers to a corporation's ability to achieve its objectives and enhance long-term shareholders’ value by integrating the triple bottom line into its corporate strategy.

In the context of globalisation, supply chain competition has emerged as a key aspect of corporate rivalry. The importance of prioritising sustainable performance and integrating the sustainability approach into management systems is now widely recognised by supply chain stakeholders (Wan Ahmad, Brito & Tavasszy, 2016).

2.5 Empirical Review

2.5.1 The Effect of Supply Chain Flexibility on Sustainability Performance Measures

Al-Mekhlafia and Al-Kahtanic (2025) investigated the influence of SC governance (SCG), SC flexibility (SCF), and green supply chain practices (GSCPs) on SC performance (SCP). In addition, they examined whether Total Quality Management (TQM) moderates the relationship

between SCG, SCF, GSCPs, and SCP in medium-sized industrial enterprises in Saudi Arabia. To achieve this, primary data were collected from 312 employees at medium-sized industrial companies in Saudi Arabia and analysed using Structural Equation Modeling (SEM) with Smart PLS 4 software. The result show that while SCF and TQM do not directly enhance SCP, GSCPs and SCG have a positive, significant, and direct impact on SCP. The study further found that TQM moderates the relationship among GSCPs, SCF, SCG, and SCP.

Wang, Chan, Kumar, and Tsolakis (2024) examined the relationship between enhanced SCF and a supply chain's (SC) ability to support a firm's sustainability performance (SP). They investigated further on how supply chain visibility affects a firm's SP by improving supply chain agility in the model. Both the measurement and structural models were validated using the partial least squares SEM approach. Additionally, the study employed mediation, moderation, and multi-group analysis to test the different effects in the model. The results revealed a positive and significant association between the organisation's SP and both supply chain visibility and agility. This study highlights the crucial moderating role of SCF in the relationships between the organisation's SP, supply chain visibility, and agility.

Jafari, Ghaderi, Malik, and Bernardes (2023) investigated the relationship between SCF and responsiveness. The study empirically tested a proposed model using data from 225 Swedish manufacturers and found evidence that SCF characteristics enhance customer responsiveness. Moreover, the study revealed that innovation orientation strengthens the relationship between internal flexibility and consumer responsiveness. The empirical confirmation of the link between customer responsiveness and multi-dimensional SCF moderated by innovation orientation, contributes novel insights to both theory and practice.

Uddin (2022) examined the impact of SC flexibility and integration on operational effectiveness. The study further tested the resource-based perspective theory using pharmaceutical manufacturing companies in Karachi, Pakistan as a case study. A structured questionnaire was designed to collect primary data, and regression analysis was employed to test the hypotheses. The results revealed that all independent variables – internal and external information integration, reactive and proactive SC flexibility– had positive and significant effect.

2.5.2 The Effect of Supply Chain Agility on Sustainable Performance

Akram, Islam, Chauhan, and Yaqub (2024) examined how SC technological skills enable organisations to enhance their sustainability by strengthening their SCR. The study employed a cross-sectional design and survey-based methodology to test the hypotheses. The study utilised factor analysis and SEM approaches to assess the goodness of fit between the

measurements and structural models. The results revealed that SC technological capabilities, agility, and visibility significantly impact SCR, which in turn has a positive impact on SC sustainability. The study found that the success of initiatives aimed at improving technological capabilities may be influenced by SCR. To develop robust and sustainable supply chains, businesses must collaborate and enhance their technological skills.

Shelbayeh and Darwazeh (2024) investigated the effect of various aspects of SCA, including speed, responsiveness, flexibility and efficiency on operational performance indicators such as quality, cost, and delivery in Jordanian dairy manufacturing enterprises. Employing a descriptive research approach, the study administered computerised copies of questionnaire to managers, which yielded 285 valid responses for statistical test via SPSS software. The findings revealed that agility variables had positive impact on operational success. To enhance flexibility and operational efficiency, the study recommended implementing Enterprise Resource Planning (ERP) systems to improve response times to demand changes and adopting Just-In-Time (JIT) techniques to optimise inventory management.

Aityassine et al. (2022) utilized three distinct metrics– supply chain (SC) agility, SC collaboration, and SC flexibility – to examine the impact of supply chain resilience (SCR) on SC performance. Data were collected from a sample of Jordanian chemical industry employees using an electronic questionnaire. The results of the data analysis, using Smart PLS 3.0, revealed that while SC flexibility had a minimal impact on SC performance, SC agility and collaboration, two critical components of SCR, had significant influence. Therefore, managers are encouraged to enhance their organisations' ability to collaborate effectively and respond swiftly to unforeseen events.

Alshahrani and Salam (2022) assessed the influence of SCR on the performance of small and medium-sized enterprises (SMEs) in Saudi Arabia, utilizing three resilience dimensions: agility, robustness and adaptability. The study employed a quantitative research approach to address its research questions. Data were collected through a self-administered questionnaire, yielding responses from 255 managers of Saudi Arabian SMEs. The findings revealed a strong positive correlation between supply chain agility and adaptability and the sales/marketing and production performance of SMEs. A significant positive correlation was found between production success and supply chain robustness, although no correlation was observed with sales or marketing outcomes. Overall, the study disclosed a favourable association between SCR and SME performance.

2.5.3 The Effect of Supply Chain Collaboration on Sustainability Performance Measures

Mehmood et al. (2024) investigated the relationship between Organisational Performance (OP) and SCR, examining the moderating role of Information Sharing (IS) and the mediating role of innovation (INN). The study explored the relationships among SCR, OP, INN, and IS, employing both quantitative and exploratory methodologies. Online questionnaire surveys were administered via WeChat and email to collect data from SME manufacturing businesses in three Chinese cities: Xi'an, Hainan and Guangzhou. Data analysis was conducted using SmartPLS-4. The results revealed that sustainability initiatives benefit from SCR. Furthermore, the relationship was mediated by INN and moderated by effective IS, both of which played a crucial role in enhancing supply chain sustainability.

Novijanti, Siagian, and Tarigan (2023) examined the effect of SCC on SC performance using new product development, product expertise and production technology as mediating variables. A survey of 148 manufacturing organisations was conducted at the management level using questionnaire. Data analysis was performed using SmartPLS software version 4.0. The findings revealed that SCC has a beneficial effect on SC performance, as well as on product knowledge, manufacturing technology, and new product development. Furthermore, the study showed that the indirect effect of SCC on SC performance is mediated by production technology, new product development and product expertise.

Bhaskara, Santosa, and Triwulandari (2023) investigated and analysed the impact of SCR and SCC on manufacturing Firm Performance (FP) across various industrial sectors in the Jabodetabek area, with Supply Chain Uncertainty (SCU) as a moderating variable. Using a purposive sampling strategy, copies of questionnaire were administered on 289 respondents as part of the data collection process. The PLS-SEM was employed for data analysis, utilizing SPSS V. 22 and PLS 3 software. The study revealed that SCC has a beneficial effect on SCR, and Supply Chain Performance (SCP) influences FP. However, the study did not find evidence that SCR and SCC directly influence SCP or that SC uncertainty moderates the relationship between SCR and SCP or SCC and SCP.

Riofiandi and Tarigan (2022) examined the effect of Supplier Collaboration Practices (SCP) on business performance in Java, Indonesia, using inventory control and lean manufacturing as mediating variables. A survey of 88 manufacturing businesses on the Island of Java, operating in the non-metallic minerals and chemical products industries, participated in this study. The hypotheses were tested using SEM analysis with SmartPLS software. The findings revealed that supplier collaboration strategies have a positive and significant impact on business success. The study further found that the relationship between SCP and business success is positively

and significantly mediated by inventory control. In contrast, lean manufacturing was not found to be a significant mediator of the link between SCP and business success.

Hypotheses of the Study

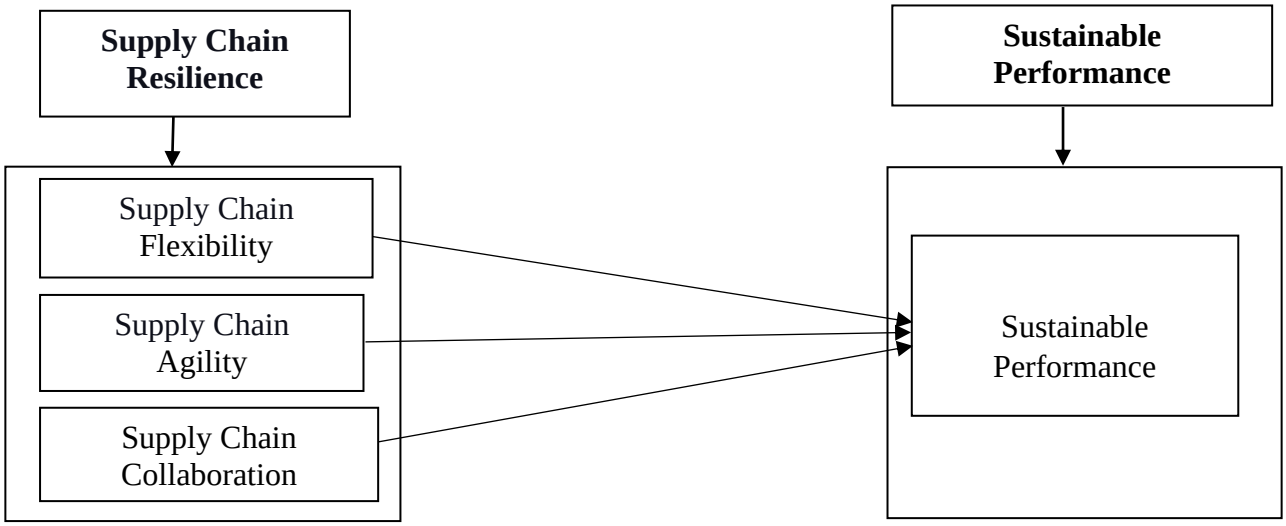
Based on the empirical review, the study tested the following null hypotheses:

H_{01}: Supply chain flexibility has no significant effect on sustainable performance in the manufacturing industry in Lagos State.

H_{02}: Supply chain agility has no significant effect on sustainable performance in the manufacturing industry in Lagos State.

H_{03}: Supply chain collaboration has no significant effect on sustainable performance in the manufacturing industry in Lagos State.

2.3 Conceptual Review



Source: Researcher (2025)

Figure 1: Conceptual framework for SC Resilience and Sustainable Performance.

3.0 METHODOLOGY

The study employs a cross-sectional survey research design to ascertain the causal-effect between the observed variables. The population consists food and beverage firms quoted on the Nigerian Exchange Group. Specifically, 4,829 employees of Nestle Foods Nigeria Plc, Guinness Nigeria Plc, and Dangote Flour Mills Plc, were the target audience upon which sample was drawn. The sample size was computed based on Taro Yamane's (1967) formula:

$$n = \frac{N}{1 + N(e)^2}$$

Were n = Sample size; N = Population size = 4,829; e = Margin of errors (0.05)

Hence

$$n = \frac{4{,}829}{1 + 4{,}829(0.05)^2}$$

$$n = 369$$

This study employed primary data, collected through copies of questionnaire. The use of questionnaire is justified as it ensures the confidentiality of respondents, thereby eliciting objective response. The questionnaire was structured into distinct sections, including Section A, which captures respondents' socio-demographic characteristics, and Section B, which comprises statements on SC collaboration adapted from Muricho and Muli (2021). Section C comprises statements on SC agility, adapted from Aityassine et al. (2022). Section D comprises statements on SC flexibility, adapted from Singagerda et al. (2022). Section E includes statements on sustainable performance indicators developed by this study. Furthermore, the statements in Sections B-E are designed in line with five-points Likert scale, ranging from Strongly Agree (SA) to Strongly Disagree (SD), to facilitate ease of response and data analysis. To establish the validity of the research instrument, face and content validity techniques were employed. A draft questionnaire was submitted to management experts for review and feedback on the relevance, appropriateness, and clarity of the measurement items, ensuring that the instrument accurately captured the constructs under investigation.

4.0 ANALYSIS

4.1 Reliability Test

To evaluate the internal consistency and reliability of the research instrument, Cronbach's alpha test was conducted. This test yields a reliability coefficient ranging from 0 to 1. According to Bhatnagar, Kim, and Many (2014), a minimum threshold of 0.7 is required to establish reliability. If the coefficient falls below this threshold, the variable(s) in question may be considered unreliable and potentially excluded from further analysis to ensure the validity of the findings.

Table 4.1 Cronbach's Alpha Test

S/N	Variable	Number of Items	Cronbach's Alpha
1	Contract Management	5	0.704
2	E-Procurement	5	0.800
3	Strategic Sourcing	5	0.783
4	Operational Efficiency	2	0.841
5	Cost Minimization	2	0.930
6	Competitive Advantage	3	0.755

Source: Computed by the Researcher 2025

The reliability test summary indicates that all variables surpassed the minimum Cronbach's alpha threshold of 0.7, demonstrating satisfactory internal consistency reliability. This finding confirms the reliability and suitability of the research instrument for data collection, thereby ensuring the collection of relevant data. Consequently, the instrument was deemed adequate for achieving the study's objectives.

4.2 Test of Hypotheses

The hypotheses developed in this study were tested using multiple regression analysis. The criterion for testing each hypothesis was set at a significance level of 0.05 ($p < 0.05$). Specifically, if the p-value is less than 0.05, the null hypothesis is rejected, indicating a statistically significant effect.

Table 4.2 Model Summary

Model	R	R^2	Adjusted R^2	Std. Error (SE)	Durbin-Watson
1	0.863[a]	0.745	0.743	0.48624	1.900

a. Predictors: (Constant), SC Collaboration, SC Flexibility, SC Agility

Table 4.3 ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	216.630	3	72.210	305.422	0.000[b]
	Residual	74.002	313	.236		
	Total	290.632	316			

a. Dependent Variable: Sustainability Performance.
b. Predictors: (Constant), SC Collaboration, SC Flexibility, SC Agility

Table 4.4 Coefficients[a]

Hypotheses	Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		β	Std. Error	Beta		
	(Constant)	0.279	0.125		2.232	0.026
H_1	SC Flexibility	0.211	0.050	0.216	4.22	0.000
H_2	SC Agility	0.399	0.040	0.406	9.975	0.000
H_3	SC Collaboration	0.329	0.056	0.333	5.875	0.000

a Dependent Variable: Sustainability Performance

The multiple linear regression model for the study is hereby specified:

DY = f (SCC, SCA, SCF) ……...eq. (i)

The above function in a linear mathematical form:

$DY = \beta_0 + \beta_1 SCC + \beta_2 SCA + \beta_3 SCF + E$……(ii)

Where:

DY: Dependent variable measured by sustainable performance (SP) measures

SCC: Supply Chain Collaboration

SCA: Supply Chain Agility

SCF: Supply Chain Flexibility

E: Error terms

β_1, β_2, β_3 = Parameters.

β_0 = Intercept

The R value of 0.863 in Table 4.2 indicates that SCR practices had a strong positive relationship with sustainable performance. R^2 value of 0.745 implies that 74.5% of the variation in sustainable performance is explained by variations in SCR practices (SC collaboration, SC flexibility, SC agility), taken as a group. The Std. Error of the Estimate (0.486) reflects a high degree of accuracy. The Durbin-Watson value of 1.900 is close to 2, indicating no significant autocorrelation. This suggests that the regression model is a good fit for the data, and the residuals are randomly distributed.

According to Table 4.3, the F-test result (F = 305.422, p = 0.000) shows the model is statistically significant. This indicates that SCR practices, taken as a group can explain the variations in sustainable performance. This suggests that SCR practices have a statistically significant effect on sustainable performance.

Table 4.4 presents the unstandardized coefficient of the independent variables (SC collaboration, SC flexibility, SC agility).

The unstandardised coefficient ($\boldsymbol{\beta}$) of SC flexibility is 0.211 which implies that in SC flexibility explains 21.1% variation in sustainable performance. Also, SC flexibility recorded a t-value of 4.22 with a p-value of 0.000 which is statistically significant at 0.05 level of significance. Thus, the study rejects the null hypothesis, and the alternate hypothesis which states that SC flexibility has a significant effect on sustainable performance is accepted.

Also, the unstandardized coefficient ($\boldsymbol{\beta}$) of SC agility is 0.399 which implies that SC agility explains 39.9% variation in sustainable performance. SC agility recorded a t-value of 9.975 with a p-value of 0.000 which is statistically significant at 0.05 level of significance. Thus, the study rejects the null hypothesis, and the alternate hypothesis which states that SC agility has a significant effect on sustainable performance was accepted.

Furthermore, the unstandardized coefficient ($\boldsymbol{\beta}$) of SC collaboration is 0.329 which implies that SC collaboration explains 32.9% variation in sustainable performance. Also, SC collaboration recorded a t-value of 5.875 with a p-value of 0.000 which is statistically significant at 0.05 level of significance. Thus, the study rejects the null hypothesis, and the alternate hypothesis which states that SC collaboration has a significant effect on sustainable performance was accepted.

4.3 Discussion of Findings

The study findings reveal that SC flexibility has a positive and a significant effect on sustainable performance. The findings indicate that the firms under study can rapidly redesign their supply chain network to take advantage of new markets' opportunities. Observations reveal that these firms possess the ability to identify and respond to potential risks and disruptions in the supply chain. Furthermore, they demonstrate resilience in recovering from disruptions and crises in the supply chain. In addition, the firms exhibit the capability to swiftly form partnerships with new suppliers in response to demand for sustainable products, thereby enhancing their prospects for achieving superior sustainable performance. Consequently, these firms can achieve economic, social, and environmental sustainability even in the event of disruptions in the supply chain. These findings align with Jafari, Ghaderi, Malik, and Bernardes (2023), who found that innovation orientation strengthens the relationship between internal flexibility and consumer responsiveness. Uddin (2022) finding shows that internal and external information integration, as well as reactive and proactive supply chain finance, have a favourable and significant impact on operational performance. However, Wang et al. (2024) present a contrasting finding, revealing that firms with high SC flexibility may perform worse than those with low SC flexibility with respect to sustainable performance, and that increasing supply chain flexibility may not directly result in enhanced sustainable performance.

Besides, the study's findings reveal that SC agility has a positive and a significant effect on sustainable performance. The findings suggest that the firms' supply chains possess the agility to rapidly respond to fluctuations in customer demand. They can swiftly adjust their supply chain operations to mitigate disruptions and ensure sustainability. Furthermore, the firms demonstrated the ability to optimise their sustainable performance in the face of disruptions by promptly responding to customer demand. This is an indication that the firms can quickly adopt and integrate new technologies to respond to shifts in market demand for sustainable practices, thereby enhancing their resilience and competitiveness. This facilitates the attainment of sustainable goals for the firms and enhances their chances of survival in the market. The finding aligns with Akram, Islam, Chauhan, and Yaqub (2024) findings that supply chain resilience is significantly influenced by SC technological capabilities, agility, and visibility, ultimately contributing to improved SC sustainability. The study revealed that the success of initiatives aimed at enhancing technological capabilities may be contingent upon SCR. Shelbayeh and Darwazeh (2024) corroborate this finding, demonstrating that supply chain agility variables have a beneficial impact on operational success. Aityassine et al. (2022) revealed that SCA has a significant influence on SC performance. This finding is further supported by Alshahrani and

Salam (2022), who found a strong positive correlation among SCA and adaptation, and the sales/marketing and production performances of small and medium-sized enterprises (SMEs). The study's findings reveal that SC collaboration has a positive and a significant effect on sustainable performance. The findings indicate that the firms' studied share relevant information with suppliers to enhance visibility in the supply chain. By fostering trust and strong relationships with key suppliers, these firms mitigate disruptions in the supply chain. This enables them to improve their sustainable performance, particularly when customers demand eco-friendly products in the market. Furthermore, the firms establish strong ties with key suppliers on risk management and reducing vulnerability in the supply chain. This enables the firms to maintain their sustainable performance, optimise their sustainable competitive advantage, and enhance their resilience in the face of disruptions. The firms actively engage their supply chain partners in strategic planning process to ensure compliance with sustainable practices, even in the event of supply chain disruptions. This finding is consistent with Aityassine et al. (2022), who revealed that SCA and SCC- two essential components of supply network resilience, have a significant impact on SC performance. Additionally, Riofiandi and Tarigan (2022) support this finding, demonstrating that supplier collaboration strategies have a favourable and substantial impact on business success. Furthermore, the study revealed that the relationship between supplier collaboration practices and business success is favourably and significantly mediated by inventory control. This finding is supported by Novijanti, Siagian, and Tarigan (2023), who demonstrated that the indirect impact of supplier collaboration capability (SCC) on SC performance is mediated by production technology, new product development, and product expertise.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the major findings, the firms under study effectively and efficiently implement SCR practices, including supply chain collaboration, agility, and flexibility, to enhance their performance.

The study concludes that SC flexibility has a positive and a significant effect on sustainability performance. By implementing SC flexibility, the firms can rapidly redesign their SC network to take advantage of new market opportunities. Moreover, they possess the ability to quickly recover from disruptions and crises in the supply chain. This enhances their prospects for achieving superior sustainable performance, enabling them to attain economic, social, and environmental sustainability even in the face of disruptions in the supply chain.

The study concludes that SC agility has a positive and a significant effect on sustainable performance. With SC agility, the firms' supply chain rapidly responds to fluctuations in customer demand. They can swiftly adjust their SC operations to mitigate disruptions and ensure sustainability. This enables the firms to optimise their sustainable performance in the supply chain by promptly responding to customer demand.

The study concludes that SC collaboration has a positive and a significant effect on sustainable performance. Through SC collaboration, the firms can foster trust and strong relationships with key suppliers, thereby mitigating disruptions in the supply chain. This enables the firms to enhance their sustainable performance, particularly when customers demand eco-friendly products in the market.

Based on the conclusions drawn, this study recommends that managers of manufacturing firms implement supply chain flexibility to mitigate risks in the supply chain. Specifically, they should rapidly redesign their supply chain network to capitalize on new market opportunities related to sustainability. This would enhance their prospects for achieving superior sustainable performance. Furthermore, it is imperative for managers of manufacturing firms to cultivate SC agility, enabling their supply chains to respond swiftly to disruptions. They should also ensure that their supply chains promptly respond to changes in customer demand, thereby fostering resilience and competitiveness. This would enable the firms to optimise their performance in the supply chain by promptly responding to customer demand. Moreover, managers of manufacturing firms should leverage supply chain collaboration to mitigate disruptions in the SC. By fostering trust and strong relationships with key suppliers, they can effectively mitigate supply chain disruption and enhance their performance.

5.1 Contributions to Knowledge

This study provides a perspective on the dimensions (SC collaboration, SC agility, and SC flexibility) that food and beverage firms uses to facilitate sustainable performance. The study's framework serves as reference point for other food and beverage firms to assess their performance in the face of SC disruption. This study developed a SCR practices model for the food and beverage sub-sector that can be used to enhance their economic, social, and environmentally sustainable performance. Furthermore, the study contributes to the existing body of knowledge on the application of SCR practices to enhancing sustainable performance, in addition to serving as a valuable empirical reference for future research.

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