UNIVERSITY OF CAPE COAST

EFFECT OF SUPPLY CHAIN DISRUPTION ON SUPPLY CHAIN PERFORMANCE: THE ROLE OF SUPPLY CHAIN RESILIENCE

ALFRED YAMOAH

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BY

ALFRED YAMOAH

A thesis submitted to the Department of Marketing and Supply Chain Management of the School of Business, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of a Master of Commerce degree in Procurement and Supply Chain Management.

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DECLARATION

Candidate's Declaration

By signing this document, I certify that this thesis is the outcome of my original research and that it has not been submitted either in part or whole for credit toward a different degree at this university or elsewhere.

Candidate's Signature …… Date ……...

Name: Alfred Yamoah

Supervisor's Declaration

I hereby certify that the preparation and presentation of the thesis were guided by the standards established by the University of Cape Coast for thesis supervision.

Supervisor's Signature …… Date ……

Name: Prof. (Mrs.) Gloria K.Q. Agyapong

ABSTRACT

The study investigated the effects of supply chain disruption on supply chain performance: the role of supply chain resilience in food and beverage manufacturing firms in Accra. The research employed the theory of constraints and the notion of dynamic capability. Regarding the study's objectives, seven hypotheses were formulated and investigated further. The study adopted a quantitative technique and an explanatory research design. At the same time, 152 Procurement/purchasing/supply chain managers, Production/Operations managers, and other management of food and beverage manufacturing companies completed standardised questionnaires to collect primary data. The data were then processed using version 26 of IBM SPSS Statistics and SmartPLS4. All hypotheses were tested using the partial least square-structural equation modelling (PLS-SEM). The study revealed that supply chain disruptions significantly and negatively influence the supply chain performance of food and beverage manufacturing firms in Accra. Again, the introduction of supply chain resilience strategies significantly and positively strengthens the relationship between supply chain disruption and supply chain performance. Finally, supply chain resilience has a beneficial impact on supply chain performance. It was determined that supply chain disruption significantly undermines the supply chain performance of food and beverage manufacturing enterprises in Accra. Therefore, the study recommends that policymakers, practitioners, and management pay close attention to disruptions within the supply chain, as they negatively impact the performance of their supply chains, and also pay close attention to resilience strategies, as they can enhance the performance of chain networks during interruptions.

KEYWORDS

Supply Chain Management

Supply Chain Disruption

Supply Chain Performance

Supply Chain Resilience

Agility

Collaboration

Food and Beverages Manufacturing Firms

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DEDICATION

To my parents, siblings and cousins

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LIST OF ACRONYMS

SC	Supply Chain
SCM	Supply Chain Management
SCR	Supply Chain Risks
SCD	Supply Chain Disruption
SCR	Supply Chain Resilience
SCP	Supply Chain Performance
DD	Demand Disruption
SD	Supply Disruption
PD	Process Disruption
ED	Environmental Disruption
AG	Agility
CL	Collaboration

CHAPTER ONE

INTRODUCTION

The Ghanaian food and beverages manufacturing sector plays a pivotal role in the country's economic development and job creation. For it to operate at its best, supply chains must be reliable and efficient, just like they are in every manufacturing industry globally. Ansah and Osei-Tutu (2021), state that the complex network of suppliers, manufacturers, and distributors in the Ghanaian supply chain ecosystem exposes it to a variety of disruptions, from transportation challenges to political and economic concerns. As a result, the performance of the supply chains of the companies that produce food and drinks has been affected, resulting in delays in production, increased costs, and lower consumer satisfaction (Awuah & Nyame-Asiamah, 2020).

However, the importance of building adaptive capabilities and proactive strategies by businesses to lessen the effects of these disruptions, recover from them, and maintain operational continuity has gained more attention in Ghana as a result of these issues. his study, therefore, seeks to examine the effect of supply chain disruption on supply chain performance, the role of supply chain resilience in food and beverages manufacturing firms in Accra, Ghana. This chapter particularly discussed the background to the study, statement of problem, research purpose, objectives, research hypotheses, study's significance, limitations of the study, delimitations, explanation of key terms and organisation of the study.

Background of the Study

Manufacturing industries in Ghana are known for their high level of supply chain involvement. This makes sense because most of their actions are

related to supplying materials to firms or distributing final items to clients, sometimes via business intermediaries and other stakeholders. According to Kirilmaz and Erol (2017), the high level of involvement of supply chains in manufacturing enterprises, the engagement of a significant number of stakeholders, processes, stages, and the expected link among these stakeholders, processes, and steps all combine to form a network, commonly referred to as the supply chain network.

Individual organizations can no longer vie on their own as independent institutions in the global economy of the twenty-first generation; instead, they must do so as integrated components of the supply chain. The capability of a firm's management to integrate and arrange the intricate web of economic links between actors of the supply chain will ultimately determine the level of success that the company enjoys (Carnovale, Rogers & Yeniyurt, 2019). Supply chains are virtual organisations made up of legally independent firms tasked with coordinating and securing goals through mutually derived competitive advantages by easing the transportation of products (Carnovale et al., 2019). As a result of the globalisation of markets, organisations have broadened the scope of their linkages to include locations in various countries, cities, and continents (Dey, 2016).

As a result, the supply chain has grown in size, complexity, and interconnectedness. However, businesses continually suffer from rising levels of disruption in their operations.

According to Kovács and Falagara-Sigala (2021), the complicated nature of the networks that make up supply chains leads to most of the disruptions that occur in commercial supply chains. Most Ghanaian companies

and businesses find it problematic to deal with outside business partners due to the uncertainties in the supply chain and the worldwide complexity of the networks that comprise the supply chain (Ganiyu, Yu & Providence, 2020). According to Katsaliaki, Galetsi and Kumar (2021), supply chain interruptions are catastrophic occurrence that negatively impacts a company's regular supply chain activity (flow of materials, information and funds). These supply chain disruptions can occur at any part of the network, impacting the efficiency of a single or more supply chain actors and their flow. The recent Coronavirus (Covid 19) outbreak, which has affected practically every country in the world, including Ghana, has brought mayhem to worldwide supply chains, with the manufacturing (electronics, food), hotel, and logistics industries as the most brutally affected (Donan, Edwards, Iyer, Karamete, Myers, Olson & Lambert, 2020).

According to a survey published in 2020 by Accenture in partnership with the World Economic Forum, supply chain interruptions destroyed around 7% of a company's value (Khan, Razzaq, Yu, Shah, Sharif & Janjua, 2022). In extreme situations, a single disruption at a specific place can substantially disrupt an enterprise's plan operations, and the interruption's catastrophic implications may compel the organisation to halt operations. The story of Ericsson is an example of a common scenario that resulted in significant corporate losses. Ericsson was reported to have lost $400 million due to this incident (Norrman & Jansson, 2004). Due to the virus outbreak, China's industrial sector is predicted to have a nearly 2% drop in output, substantially impacting all sectors of the economy, including the automobile, electronics, and pharmaceutical industries (Zhang & Tong, 2021).

Businesses in Ghana operate in a dynamic and difficult business climate, where interruptions may have a big influence on how they operate and succeed. Demand interruptions might result in inventory imbalances, higher carrying costs, and worse profitability for Ghanaian manufacturing enterprises, according to a study by Balenmilen (2021). Agyapong et al. (2018), further emphasised that, particularly in fast-moving consumer goods sectors, demand interruptions can lead to product obsolescence, stockouts, and market share losses. Adu-Gyamfi et al. (2017) once more emphasised how process hiccups can cause production delays, decreased productivity, and higher rework or scrap rates in Ghanaian manufacturing enterprises.

The food and beverages manufacturing sector plays a vital role in Ghana's economy, contributing to employment, GDP growth, and export earnings. The sector may play a special role in boosting economic prospects because it is essential to both life and health (Pfitzer & Krishnaswamy, 2007). Additionally, the food and beverage sector has developed into a crucial driver of a country's global competitiveness, supporting both other businesses and the vital socioeconomic needs of developing countries all over the world.

In terms of structure, economic contributions, and manufacturing sector performance in Ghana, the food-processing sector, which includes food and beverages, continues to be the largest industry within the industry. According to government pronouncements, food and beverage (F&B) processors will benefit from government attempts to boost domestic manufacturing, with more than half of applications for the One District, One Factory program coming from within the industry. This should assist lower Ghana's $2.4 billion food import bill in 2017, as well as boost the decentralization program, create jobs, and

increase the value of the country's agricultural output. This demonstrates the sector's importance in driving economic growth and development. According to the Ghana Investment Promotion Centre (GIPC), the sector has attracted significant foreign direct investment (FDI) over the years, leading to increased competition (GIPC, 2021).

Food and beverages manufacturing firms in Ghana encounter various challenges that affect their performance. These challenges include inadequate infrastructure, high energy costs, limited access to finance, and difficulties in obtaining raw materials (World Bank, 2020). Additionally, fluctuations in commodity prices, currency exchange rates, and changes in government policies and regulations can impact the sector's performance. The performance of food and beverages manufacturing firms in Ghana is influenced by various factors, including market trends, competition, operational efficiency, and compliance with quality standards.

According to the findings on the study of resiliency of supply chains, the Business Community Institute (2020), identifies the top five (5) consequences and effects of supply chain interruptions as being a decrease in productivity, a decrease in customer loyalty and complaints, an increase in the cost of working, a loss of revenue, and a worsening of service outcomes (Dua, Sharma, Mishra & Kulkami, 2020). In the current environment of international commerce, every company must contend with its unique risks, any one of which has the potential to obstruct the flow of information and components across its supply chain. Although the ramifications of inevitable disruptions might be reasonably manageable, the performance of supply networks over the long run might be significantly impacted by others in a far more significant way (Van

Der Vegt, Essens, Wahlstrom & George, 2015). Interruptions in the supply chain are evidence that a corporation cannot satisfy demand and supply (Khan et al., 2022).

According to Asante-Poku and Van-Huellen (2021), production delays, inadequate packing, transport delays, defective products, and logistical challenges account for most disruptions in Ghana. These are primarily human-caused issues that are challenging to prevent. These disruptions to the supply chain (upstream, focal firm and downstream) encompass events that happen naturally (pandemics (Covid 19, SARS), flooding, hurricane, fire outbreak, tsunami (in the case of Japan in 2011), accidental (loss of supply chain personnel, IT system breakdown), to international rules and regulations governing trades between corporations (embargos) (Seddoh & Moore, 2021).

The performance of a supply chain is in jeopardy when it is impacted by a disruption, such as a decline in competitiveness or a decline in short-term financial performance (Quang & Hara, 2019). To continue to thrive, organisations must develop the capacity to respond to unforeseen disruptions and quickly return to their former condition or transition to a new one (Strong, Carpenter & Ralph, 2020). Researchers and practitioners have given increasing consideration to Supply Chain Resilience (SCR) in recent years as a dynamic activity that respond to disruptions within the supply chain. According to Sharma, Joshi, Luthra, and Kumar (2022), resilience significantly reduces traditional risk in many businesses. SCR transcends the limitations of conventional risk prevention and protection strategies and addresses the complexities of global supply chains (Adams, Donovan & Topple, 2019).

To maintain their competitive edge and reduce the severity of supply network disruptions, businesses have developed resilience enhancers, which are organisational attributes that can increase their responsiveness to supply chain disruptions, a top priority. Consequently, the resilience of a firm's supply chain may be seen as a dynamic talent that increases the organisation's performance in times of crisis and in an unpredictable environment (Azadegan, Syed, Blome & Tajeddini, 2020; Gu & Huo, 2017).

Niresh and Thirunavukkarasu (2014) explained that large manufacturing firms have the ability to quickly access additional resources in order to respond to changes in the current competitive and dynamic market. These firms also boast of highly skilled and experienced management team who ensure that the firm remain competitive; unlike the micro and small enterprises. As a result, various firm sizes have different impact when hit by disruptions within the supply chain.

Theoretically, the theory of constraints posits that limiting or prohibiting factors within a system can halt the whole system, thereby preventing it from achieving its objectives. Notwithstanding the impact of these constraints on the performance of a system (supply chain), Guo, He and Gen (2019), observed that entities or organisations could deal with this impact by dynamically varying their capabilities to prepare, respond, and recover. This is achieved by introducing Supply Chain Resilience enhancers that can mitigate the effect on the chain's performance.

The primary goal of SCR is to deal with temporary disruptions. It is defined as the ability to build and develop the supply chain network to anticipate and respond to unexpected, challenging or unfavourable events while

maintaining control over the web and structure of the supply chain. SCR can return to its previous position before the disruption or be better and more profitable (Koberg & Longoni, 2019). Upstream, operational stream, or downstream (supply side, operational side, and demand-side) supply chain interruptions are thought to impact supply chain performance.

Statement of the Problem

In the twenty-first century, manufacturing companies cannot successfully compete in the global market without a functional supply chain network. As globalisation has gotten more intense, diverse, and extensive, important supply chain links have become vulnerable to disruption (Kiritmaz & Erol, 2017).

The supply chain within which the food and beverages manufacturing firms operate have grown in size, complexity, interconnectedness and competitiveness, exposing them to severe threats to food security in Ghana (Asante-Poku & Van Huellen, 2021). Over the years, Ghanaian manufacturers have expanded their operations to nations with more efficient and effective supply chain networks, such as the United States of America (USA), China, and the United Kingdom (UK) (Dey, 2016). However, the unexpected outcomes and economic difficulties, market uncertainties (Asamoah, Nuertey, Agyei-Owusu & Acquah, 2021), natural phenomena (Nduhuura, Garschagen & Zerga, 2021) and varying levels of trust among members of the network portray what the Ghanaian manufacturing firms constantly face in delivering goods to their final consumers (Andam, Ragase, Asante & Amewu, 2019).

In Ghana, the connection between focal firms (manufacturing firms) and their partners within the chain network is characterized by headwinds of raw material shortages (Subban, 2020), quality issues (Asamoah et al., 2021), constant power outages (Nduhuura et al., 2021), political unrest (Beecroft, Osabuohien, Efobi, Olurinola & Osabohien, 2020) and higher operational variations (Subban, 2020). It is reported that the manufacturing sector of the Ghanaian economy is on a downward trajectory with less than 6% in contribution to Gross Domestic Product (GDP) as compared to previous years, according to the Ghana Statistical Service (GSS) (2021), (Nduhuura et al., 2021). As further emphasized by the Association of Ghana Industries (AGI) (2021), business in Ghana losses was attributed to several factors, including covid – 19 (Mamo, 2020), lack of credit (Nduhuura et al., 2021), over-reliant on foreign substitute (Peter-Brown, 2020) and fierce competition from larger institutions (Jnr, 2022); representing about 65.8 per cent of manufacturing firms experiencing these kinds of disruptions (Adams, 2019).

Jnr (2022), further discovered shortages, increased cost of operations, unpredictability in attaining and managing raw materials, jejune logistics performance, energy inefficiencies, price, inflation and exchange rate fluctuations as significant disruption-related matters in the supply chain. The emergence of the novel coronavirus further aggravated the global economic downturn, which was already being hampered by the headwinds of trade disputes, economic uncertainties, and armed conflicts (Shekarian, Nooraie & Parast, 2020). Within a short period, COVID–19 extended throughout the continents, compelling the World Health Organisation (WHO) to proclaim it a worldwide health emergency (WHO, 2020). Although occurrences of this kind

are less frequent, their effect on supply chain performance is significant (Hosseini, Morshedlou, Ivanov, Sarder, Barker & Al Khaled, 2019).

In the case of Ghana, activities that were termed non-critical were placed on hold (Asamoah et al., 2021). Agricultural produce within the country battled with transportation issues as borders were closed to the movement of goods and services (AGI, 2020). Not only did materials for production become a challenge, but the workforce and human resources of food and beverages manufacturing firms also faced a severe challenge as cutting down the workforce became necessary for organisations (Asamoah et al., 2021). On the other hand, others had to accept the shift ties to accommodate the protocol on social distancing, resulting in a loss of productivity and immersed undesirable influence on the overall performance of supply chains.

To bounce back from disruptions, organisations must advance the capacity to respond to an unanticipated interruption and quickly return to their initial condition or transition to a new one (Ivanov & Dolgui, 2019). While studies provide some evidence about how firms can reduce the adverse effect of these disruptions on supply chain performance, limited studies have explained the role of supply chain resilience in moderating these disruptions' effects on supply chain performance. Also, in the researcher's opinion, none of these studies has addressed the impact of supply chain resilience on the supply chain performance of food and beverages manufacturing firms in Ghana.

The literature also identified a further distinct gap, demonstrating that supply chain industry researchers continue to focus on the risk management process at the pre-disruption stage by analysing the likelihood and effects of the risk of "possible disruption" in construction projects (Shekarian et al., 2020;

Mamo, 2020; Seddoh & Moore, 2021). In post-disruption operations, the reaction and recovery of the supply chain following a "genuine interruption" are rarely mentioned. Because of this, researchers have not paid much attention to how well the supply chain can use its current capabilities to prevent problems and learn from past disruptions. This study tries to change that. Even though such proactive techniques may be favoured in practice since they may be used to plan for disruption rather than to respond to it, supply chain specialists may be reluctant to utilise them due to the financial costs of preventing potential disruptive events (Khan, Razzaq, Yu, Shah, Sharif & Janjua, 2022).

Therefore, the drive of this study is to explore how the performance of the supply chain is affected when there is an interruption in the supply chain. In addition, this study aims to determine the extent to which the resilience of supply chains can affect performance of those chains.

Purpose of the Study

This study aims to understand the impact that various types of disruptions to supply chains (demand, supply, process, and environmental) on the supply chain's efficiency. In addition, the study aims to determine the extent to which supply chain resilience affects such chains' performance.

Research Objectives

The ultimate objective of this research is to assess the effect of supply chain disruptions on supply chain performance, using supply chain resilience as a moderator.

1. examine the effect of supply chain disruptions on the supply chain performance of food and beverage manufacturing firms in Accra.

2. examine supply chain resilience's effect on the supply chain performance of food and beverage manufacturing firms Accra.
3. examine supply chain resilience's role in the relationship between supply chain disruption and supply chain performance of food and beverages manufacturing firms in Accra.

Research Hypothesis

The research tested the hypothesis below.

H1: Supply chain disruptions significantly and negatively affect the supply chain performance of food and beverages manufacturing firms.

H1a: Demand disruption significantly and negatively affect supply chain performance of food and beverages manufacturing firms.

H1b: Supply disruption significantly and negatively affect supply chain performance of food and beverages manufacturing firms.

H1c: Process disruption significantly and negatively affect supply chain performance of food and beverages manufacturing firms.

H1d: Environmental disruption significantly and negatively affect supply chain performance of food and beverages manufacturing firms.

H2: Supply chain resilience significantly and positively affect the supply chain performance of food and beverages manufacturing firms.

H3: Supply chain resilience significantly and positively moderates the effect of supply chain disruption on the supply chain performance of food and beverages manufacturing firms.

Significance of the Study

In addressing the purposes, the study seeks to contribute in two respects. Theoretically, the study extends supply chain disruption research by showing

that global and local supply chains can experience interruptions. These disruptions may have a devastating effect on the performance of supply chains and organisations at large. Again, the study contributes by focusing on how the resiliency strategies of firms can help mitigate the effect of these disruptions on the performance of supply chains.

Managerially, the study seeks to provide policymakers, institutions or organisations and other stakeholders interested in implementing resilient strategies with adequate information on the effectiveness of these strategies in mediating the effect of supply chain disruptions. Furthermore, it is anticipated that this research will encourage professionals and experts to manage their entire supply chain when prone to interruptions.

Delimitation

Even though Ghana is home to many manufacturing enterprises, the research focused on supply chain disruptions, supply chain performance, and supply chain resilience among Accra food and beverage manufacturing firms. Consequently, all other food and beverage manufacturers outside the towns were not included in the study (region). References to other manufacturing companies will be made only to support a fact or draw comparisons.

Limitation

The study's findings were limited to food and beverages manufacturing firms registered with the Association of food and beverages manufacturing firms within Accra. However, they could be helpful to firms in other geographical locations. The study's outcomes were also restricted to the opinions and suggestions of key personnel within the selected food and beverage manufacturing firms. Thus, the outcomes could be affected by

possible biased or false information provided by any respondent. The use of structured questionnaires, generally regarded as the most reliable method of data collecting for quantitative research, did, however, restrict the amount of information that could be gleaned from the respondents, which in turn could limit the study's findings. The study findings might also be influenced by factors such as a lack of answers, poor data, or missing values.

Definition of Terms

Supply Chain

It refers to institutions and events carried out by multiple companies that interact with one another along the entire value chain to acquire raw materials, turn these commodities into final goods that have been defined, and then distribute these finished products to clients.

Supply Chain Disruption

It refers to any occurrence in the supply chain that was not planned for and could not have been foreseen and poses a significant risk to the routine operations of a supply chain.

Supply Chain Resilience

A flexible supply chain capability to plan for unforeseen occurrences, react to disturbances, and gain back from them.

Supply Chain Performance

This is defined as how thriving a supply chain accomplishes its market-oriented and financial objectives.

Organisation of the Study

This study is organized into five chapters of which, chapter one presents the background to the study and the statement of the problem, purpose of the

research, research objectives, hypotheses, significance of the study, delimitations ad limitations, definition of terms and lastly organisation of the study. Chapter two discussed the literature review of the study which particularly focused on theoretical review, conceptual review, empirical review and lastly, the conceptual framework of the study. Additionally, the third chapter, chapter three presented the research methods employed in the study. This includes, research philosophy, research approach, research design, population of the study, sample and sampling procedure, data collection instrument and data collection processes and concluded with data processing and analysis. Also, chapter four captioned results and discussions. Chapter five discussed summary, conclusions and recommendations of the study. Again, the study presented suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

This section provides a comprehensive literary analysis of the study's research objectives. This chapter summarizes material from linked literature by discussing theories, key concepts, and empirical reviews. It concludes with a presentation of the research's structural framework; in terms of the theoretical review, the theory of constraints and the dynamic capabilities view theories were chosen because of their relevance to the study's focus.

Theoretical Review

The theory of constraints and the dynamic capabilities view are the foundations of this study because of the significance of both of these theoretical frameworks concerning the research aims. This section examined the ideas of the dynamic capabilities perspective and the theory of constraints.

Theory of Constraints (TOC)

Eliyahu Goldratt first presented the theory of constraints (TOC) in 1984 (Goldratt, 1990). According to Mabin and Balderstone (2020), a constraint is any limiting activity that inhibits a system from operating correctly. The theory gives a methodical, explicit, and persistent emphasis on eliminating a particular limitation until it no longer exists (Zhao & Hou, 2022). According to Imşit, Günay, and Vayvay (2014), the theory is based on the supposition that every process has at least one stumbling block that stops it from achieving its goals. This limitation is essential to accomplish the goals that have been set and enhance the performance of the supply chain.

Levinson (2019) categorizes constraints into four groups: physical, policy, paradigm, and market. Physical constraints are tangible things like a lack of room and resources, recurring machine failures, and a lack of supplies that harm firms' operations (Goldratt, 1990). The policy limitation concentrates on the required specifications for a particular activity (Levinson, 2019). It includes government legislation, collective bargaining agreements, and firm practices. In addition, paradigm restriction includes deeply ingrained behaviours and attitudes that influence the efficiency of a system (Zhao & Hou, 2022). To conclude, market constraint arises when unfavourable market behaviours (such as fluctuating demand, intense competition, and inadequate supply) hinder the operation of a system (Levinson, 2019).

The theory applies equally to the operations of actors in Ghana's manufacturing supply chain. These limitations include fluctuating demand, intense rivalry, a lack of technology, capital, and qualified staff, unfavourable macroeconomic conditions, inadequate government backing, and lack of access to credit. These constraints put operators in a precarious position, stifled their growth, and threatened their existence. Players in the supply chain must create clear policies, processes, and tactics for recognizing these risks, their chance of occurring, and the ensuing influence on supply chain performance to overcome these constraints (disruption).

Dynamic Capabilities View (DCV)

The dynamic capabilities view (DCV) is an extension of the resource-based perspective (RBV) given by the theory of constraints (TOC) (Barney, 1991). According to the DCV, an organisation looking to gain a long-term market edge can either develop new resources and capabilities or rearrange

current ones to capitalise on growth possibilities (Teece, 2018). A dynamic capability is an organisation's ability to integrate, build, and reconfigure internal and external competencies to respond to rapidly changing environments (Kaur, 2019). It is incorporated as a procedure or a collection of functions associated with the management of resources (Eisenhardt & Martin, 2000). More specifically, a dynamic capacity is a pattern of behaviour that describes how an organisation modifies its standard operating procedures to improve its efficiency (Kaur, 2019).

Research done in the past has characterised supply chain resilience (SCR) as a flexible ability to plan for inevitable risk events, react to them, and regain from them (Brusset & Teller, 2017; Fernández Giordano, 2022). SCR is a dynamic capability that enables companies to absorb the negative consequences caused by various risk sources (Teece, 2018). Dynamic capabilities provide sustained high performance. They change the resource allocation to achieve or preserve a competitive edge. Thus, they can maintain a high level of performance for an extended period (Pereira, Mellahi, Temouri, Patnaik & Roohanifar, 2018).

SCR is a dynamic process that assists businesses in efficiently managing change, hence reverting operations to their prior or improved performance level (Pereira et al., 2018). The theory of constraints and the dynamic capabilities view can be attributed to the study's aims by explaining the various disruptions within the manufacturing supply chain and how actors can dynamically vary their capabilities as mitigation strategies to rectify the disruptions that hinder an effective and efficient supply chain performance. As a result, the Theory of Constraints and the Dynamic Capabilities View theories served as the basis for

this investigation because of the relevance both of these theories have to the goals of the research.

Concept of Supply Chain

The old techniques of conducting business have experienced tremendous modification in this age of globalisation. As a result, corporate operations are becoming increasingly sophisticated, requiring senior management to pay close attention to guarantee that the company's operations run smoothly. Enterprises are now involving their suppliers' and customers' businesses to compete in today's business environment (Helo & Hao, 2019). In recent years, businesses have begun to focus more on the movement of materials, the style and packaging of the products supplied by their vendors, and the methods used to transport and preserve their commodities. Ivanov, Blackhurst and Das (2021), presented a recent attempt to describe a supply chain. The following is how they represent a supply chain:

A supply chain (SC) is a system of institutions and procedures in which many different businesses collude along the entire value chain to attain commodities, turn these commodities into defined finished goods, and convey these finished goods to people.

According to the definition, the supply chain begins with acquiring raw materials and concludes with delivering products and services to customers' and consumers' doorsteps. It can be determined that this, particularly in modern times, necessitates a significant amount of coordination work. Today's products comprise a broad range of parts and components from various supply chain partners located worldwide. As a result, the ramifications of getting a product to market add significantly to the supply chain's complexity, which is well

documented in the literature (Koberg & Longoni, 2019; Inman & Blumenfeld, 2014). Calvo, Olmo & Berlanga (2020), stress customers' "better, cheaper, now" approach. In other words, one of the essential purposes of a supply chain is to create a steady, functional link between suppliers and customers (Ivanov et al., 2019).

The movement of goods and services from their origin to their consumption site is facilitated by a complex network of organisations, individuals, data, activities, and resources collectively termed the supply chain. As a direct consequence, the supply chain is comprised not only of the producers and the suppliers but also of the logistics firms, the facilities, the sellers, and the clients of the retail establishments that make up its components. The fundamental objective of the steps carried out along the supply chain is to generate a finished good or service (Subban, 2020). This is accomplished by converting materials, natural resources, and a variety of other components into something that can be acquired by the consumer, the chain's terminal link.

Supply Chain Disruption

According to Wang, Wang, and Wang (2020), a supply chain disruption is a confluence of unanticipated and unplanned triggering events that take place in the supply system, the inbound logistics system, or the sourcing environment and pose an adverse threat to a focal company's regular business operations. Supply chain disruptions have been defined as unforeseen and undesirable occurrences that negatively impact the functioning of the supply chain system. For instance, natural disasters, the breakup of partnerships, and changes in client preferences (Mandal, 2014).

Any step along the supply chain is vulnerable to interruptions, whether the supply side further upstream, the production operations in the middle, or the demand side further downstream. A disruption at home can propagate across the supply chain, an interdependent and interrelated system, and wreak havoc for the entire supply chain (Dolgui, Ivanov & Sokolov, 2018). Many disruptions in the flow of commodities are often caused by supply chain exposures (Jeuttner & Maklan, 2011). Disruption risks can come from artificial or natural calamities, including economic recessions, technological changes, hurricanes, labour unrest, and terrorist attacks. These unforeseen events can constrain a supply chain system (Parast & Shekarian, 2019).

However, even though the effects of some disruptions may be relatively simple to control, the repercussions of other disruptions could significantly influence the long-term profitability of supply networks. It is essential to remember that disruptions in a company's supply chain can have short-term and long-term effects on its profitability. The literature on the short-run detrimental effects of supply chain interruptions on businesses is extensive (Hong Zhang & Ding, 2018). Regarding the impact of supply chain malfunctions, Zsidisin, Petkova & Dam (2016), confirmed that they can reduce shareholder wealth. Additionally, when a supply chain disruption is not adequately managed, it causes significant delays that make it harder to meet consumer demand and raise operational expenses. The upshot is that they frequently cost businesses money since they significantly harm supply chain participants' operational and financial results and the whole supply chain (Xu, Zhang, Feng & Yang, 2020).

Sources of Supply Chain Disruption

The research conducted by DuHadway, Carnovale, and Hazen is notable for being one of the few studies that directly classify the several types of sources of disruptions (2019). Similar classifications of disruptions are provided by Revilla and Saenz (2014). These classifications emphasise disruptions that affect communications, supplies, logistics, internal systems, and supply chains. Ambulka et al. (2022), provide context from the real world by asking supply chain experts about the interruptions they have seen. Their survey findings indicate substantial supply disruptions, delivery or logistics issues, and in-process issues. They also advise adding a new category of external disturbances for natural disasters and regulatory and political problems.

Christopher (2011) presents a list of five "major sources of risk," while Parast and Subramanian (2021) simplify the sources of risk collected from numerous studies into four (4) key sources of supply chain disruption. This study chooses these four (4) primary sources of supply chain disruption as the focus of its investigation.

Table 1: List of articles including sources of risk (most recent publication date first)

Author(s)	No. of sources	Sources of Risk
Parast & Subramanian, (2021)	4	Demand related disruption Supply related disruption Process related disruption Environmental disruption
Chen, Sohal & Prajogo, (2013)	3	Demand-side disruption Supply-side disruption Process-side disruption
Christopher, (2011)	5	Demand disruption Supply disruption Process disruption Control side disruption Environmental disruption
Trent & Roberts, (2010)	4	Operational risk Natural disasters Political interruptions Commercial risk
Wagner & Bode, (2008)	5	Regulatory side disruption Demand side disruption Supply side disruption Infrastructure disruption Catastrophic disruption
Tang & Tomlin, (2008)	6	Process risks Intellectual risk Demand risks Supply risks Behavioural risks Social risks
Manuj & Mentzer, (2008)	8	Demand risks Supply risks Operational risks Security risks Macro risks Policy risks Competitive risks Commodity risks

Table 1 Cont'd

Khan & Burnes, (2007)	4	Infrastructure risks Business control risks Business values risks Relationship risks
Wagner & Bode, (2006)	3	Demand side disruption Catastrophic disruption Supply-side disruption
Kersten, Hohrath and Borger, (2006)	5	Control side disruption Environmental disruption Demand side disruption Process side disruption Supply-side disruption
Jüttner, (2005)	3	Demand-side disruption Supply-side disruption Environmental disruption
Christopher & Peck, (2004)	5	Demand side risks Supply side risks Process side risk Control risks Environmental side risks

Demand-side Disruption

Demand-side disruption stems from an interrupted flow of materials, information and funds from the focal firm (organisation) to the downstream side of the chain (customers). According to Ambulkar et al. (2022), the interruptions in the order of goods for onward delivery can be attributed to demand disruption. These disturbances include the likelihood of a gap between the actual and predicted demand, the risk of interruptions in the flow of goods and information within the network or among the individual enterprises and the market, volatile demand, insufficient or incorrect customer data regarding orders or demand amounts, unexpected payment delays on the part of customers, shifts in the market, deceptive projections, and innovative competitors.

Disruption in the demand-side supply chain can be created by the uncertainty caused by consumers' unpredictable requests (Pi, Fang & Zhang, 2019). Here, the disturbances may result from mismatches between an organisation's projections and actual demands and poor supply chain coordination. The bullwhip effect is a well-known illustration of a supply and demand mismatch. This phenomenon describes the situation in which demand swings are magnified throughout the upstream portion of the supply chain. This variation has a detrimental impact on the accuracy of forecasts, capacity utilisation, and production planning, all of which contribute to operational problems (Yan, Jin, Liu & Yang, 2018).

The bullwhip effect refers to the magnifying of demand volatility as orders move up the supply chain and happen in forecast-driven supply chains (Forrester, 1958). According to Yan et al. (2018), bullwhip is caused mainly by disrupted and inaccurate statements, sales promotions, order batching, price changes, scarcity or shortage gaming, backlashes, unnecessary interventions, and mistrusting second-guessing.

Supply-side Disruption

Supply risk is the “possibility of an event occurring in incoming supply that affects the organisation's capacity to satisfy consumers.” This event could be caused by either the individual or the market supply side. In supply, disruptions start from the supplier's supply to manufacturers (backward integration). Supply risk is the potential emergence of an incident related to incoming supply from autonomous supplier failures or the supply market. The outcomes of supply risk can either result in the inability of the purchasing firm to meet the demands of its clients or in threats to their existence and well-being.

Supply disruption can be caused by a supplier's dependability, moral risks, environmental compliance requirements, buying decision, multiple sourcing issues, or security issues, or it can be brought on by a sudden price change, quality problems, a supplier's bankruptcy, conflicts of interest, inventory issues, delays, complex products, and issues with technology access (Sawik, 2017). Supply-side risks are involved in purchasing, contacts with suppliers, and relationships with suppliers. These include hazards to the business of the supplier, constraints on production capacity in the supply market, concerns over quality, changes in technical aspects, and adaptations to the product's design (Guo, He, & Gen, 2019).

The many occurrences that impact a supplier's viability and cause a temporary or long-term disruption or end to the buyer-supplier relationship are referred to as supplier business risks. This relates to the risk of financial instability among suppliers and the effects of supplier default, insolvency, or bankruptcy (Guo et al., 2019). Organisations that make purchases are subject to various hazards because of their suppliers and supply chain. For no other reason than one of its suppliers experiencing a fire event in their factory and ceasing supplies, Toyota was compelled to shut down operations and stop 50% of its assembly for six (6) weeks (Juttner, 2005).

When a supplier is vertically integrated by a direct competitor of the customer firm, it causes another sort of disruption and forces the end of the relationship (Ivanov et al., 2019). Opportunistic supplier behaviour has also been documented in the literature as a cause of supply risk in cooperative settings (Spekman & Davis, 2004). When a purchasing organisation is so reliant

on one supplier that it has little leeway for manoeuvring, organisational lock-in is a threat.

Process side Disruption

According to Gunessee and Subramanian (2020), process disruption happens when internal business operations are disrupted; examples include capacity restrictions, equipment failure, quality issues and inadequate IT infrastructure. Potential variations from manufacturing the intended quantity and quality at the appropriate time constitute this disruption; inbound and outbound logistics and internal operations include quality, schedule, and capacity risks (Valença, Mugge, Schoormans & Schifferstein, 2014). The two primary forms of variance in a manufacturing system—flow and process variability are the sources of process interruptions.

The efficiency with which a process is carried out is also heavily influenced by other aspects, such as the dependability of the supporting communication system, transportation system, and infrastructure. Other causes of process-side disruption include downtime or loss of own production capacity as a result of local upheaval (such as labour unrest, fire, explosion, or workplace injuries); downtime or failure of own production capacity as a result of technical reasons (such as equipment breakdown, backlogs, stringent processes, equipment unreliability, lengthy set-up times); perturbation or complete collapse of internal IT connectivity (such as caused by computer viruses or software bugs); and human error.

Businesses are more susceptible to information technology-related issues like cyberattacks or hardware failure as they depend more and more on their information technology (IT) infrastructure to sustain supply chain

functionality (Ivanov et al., 2019). Most aspects of business are now dependent on information and communication technology systems, which have risen significantly over the past ten years (Linton, Boyson & Aje, 2014). With a rising prevalence of complex resource planning and communication systems throughout all aspects of the supply chain, from forecasting to manufacturing and distribution, this reliance on ICT has also expanded to supply chains (Khan & Estay, 2015). The supply chain operations have become more networked and digitalized, creating what researchers refer to as "cyber-supply chains," in which the entire supply chain is altered by cyberspace (Colicchia, Creazza & Menachof, 2019).

Environmental side Disruption

According to Tang and Musa (2011), the environmental source of risk refers to an external source. This refers to a source of disruption that happens outside an organisation's supply chain but has an intricate effect on the organisation's entire value chain. According to Jüttner and Maklan (2011), scholars and practitioners have paid a lot of attention to disturbances outside the supply chain as a cause of disruptions during the past few decades. Researchers contend that because so many linkages link a vast network of businesses, global supply chains are intrinsically riskier than domestic supply chains of the past (Ivanov et al., 2019).

Competitiveness in the market, difficulties obtaining raw materials from the market, political unrest, financial market interruptions, catastrophic occurrences like earthquakes, pandemics (Ebola, SARS, COVID-19), and terrorism are possible risk factors (Louis & Pagell, 2019). Environmental issues are to blame for many supply chain disruptions in the last ten years. These

occurrences range from shifting political priorities and financial slumps to major natural disasters like earthquakes, floods and drought, as well as terrorist attacks and acts of war (Olson & Wu, 2017). Even the threat of piracy has increased over the past ten years, with incidents along the horn of Africa affecting maritime trade networks (O'Sullivan, 2010).

Political risk is a source of environmental disruption that has recently attracted much attention (Min & Smith, 2019). Security is no longer a stand-alone concern; instead, it is becoming increasingly entwined with trade and economic challenges (Rice & Zegart, 2018). Political risk to supply chains has become a significant worry for businesses due to these increasingly quick changes in political ties and the more complex political environment (Min & Smith, 2019).

Supply chain political risk can take many forms, including trade tariffs, quota limitations, and taxation changes (Louis & Pagell, 2019). Examples include the recent Brexit and the strained relationship between the USA and China. The conflict between the USA and China has resulted in tariff rises and import delays, which influence businesses' supply chains ranging from pet food makers to care manufacturers (Mitchell et al., 2018). Due to Brexit, some UK-based businesses have had to expand their hoarding of goods in anticipation of a trade disruption (Bounds, 2018).

These rare, exogenous occurrences significantly impact a firm's supply chain despite being exogenous to the company and its supply chain. Due to the vulnerability of production facilities, logistics, and transportation networks to natural catastrophes and terrorist attacks, environmental disruptions can

significantly negatively affect supply chains (Kamalahmadi & Parast, 2016; Kamalahmadi & Parast, 2017).

Supply Chain Performance

Supply chain performance measures how successfully a supply network achieves its commercial aims and financial targets (Huang, 2006). Costs or a combination of costs and non-costs performance have been the two performance measures most frequently used in supply chain literature (i.e., customer responsiveness and flexibility). Operating expenses and inventory costs are two examples of cost measures. In comparison, lead time, quality, fill rate, stock-out probability, and the propensity to alter productions and offer new items are examples of non-cost performance.

The various metrics used in measuring the performance of supply chain have very significant roles in establishing objectives, comprehending supply chain process, assess performance and help the firm to take future initiatives and actions (Ambe, 2014). As such, it is imperative for manufacturing firms to constantly monitor, control and evaluate their daily operations to get desired performance from their supply chains. Measuring supply chain performance is somewhat a daunting task because no single metric suffices for measuring the performance of a firm's supply chain (Sung & Kim, 2019). Thus, supply chain performance is best measured using a multi-dimensional approach. Ambe (2014) classified supply chain performance measurement models into cost, customer responsiveness, flexibility and active time. Other studies (Mandota, 2015) used financial indicators (e.g., profits and business growth), competitiveness, lead time and agility to measure the performance of the supply chain. Drawing from the various literatures, this study used responsiveness, lead

time, profitability, competitiveness and cost (operating cost) in measuring the supply chain performance.

Supply Chain Resilience

Commercial supply chain interruptions can have severe adverse economic effects. As a result, there is a pressing need to manage the risk and vulnerability associated with supply chain operations. The ability of a system to respond to change and deal with unforeseen events while retaining the system's essential operation and structure is what we mean when we talk about resilience. Today, supply chain risk and vulnerability management rely on resilience (Eltantawy, 2016; Pettit et al., 2010).

In the volatile and uncertain global space, businesses need to use supply chain resilience (SCR) strategies to control unquantifiable and unexpected difficulties (Ali, Mahfouz & Arisha, 2017). According to the existing analysis, SCR is a responsive ability of the supply chain that allows it to prepare for unforeseen events, respond to disruptions, and recover from them by sustaining uninterrupted operations at the desired level of interconnectivity and control over structure and function. This description is based on prior studies (Ponomarov & Holcomb, 2009). An earlier study examined SCR as a potent capability enabling the supply chain to suitably modify, react, and overcome interruptions (Blackhurst, Dunn & Craighead, 2011). An SCR assimilates unforeseen disruption and reinstates the supply chain to a necessary functionality condition, resulting in a competitive edge (Pereira, Christopher & Da-Silva, 2014).

The ability of a company to survive disruption, return to its pre-disturbance state after the disruption, or advance toward a more desirable state after the disruption is what is meant by resilience in a supply chain (Christopher and Peck 2004). Pettit, Croxton, and Fiksel (2013), define the characteristics of resilience as the "four Rs," which are ruggedness, resourcefulness, restoration, and review. Twenty-four distinct methods for obtaining SCR were listed by Tukamuhabwa, Stevenson, Busby, and Zorzini (2015). They demonstrated that fostering collaborative supply chain partnerships and enhancing supply chain agility are essential strategies for achieving resilience and increasing SCR.

Agility

According to Inman and Green (2021), agility is one of the essential skills for improving SCR. Gligor, Gligor, and Holcomb (2019) assert that agility is necessary for a rapid and effective response to minimise interruptions.

Their definition of agility states that it is a risk management technique that enables a corporation to react swiftly to market changes and future or actual interruptions in the supply chain. The use of responsive suppliers is one way that supply chain managers can lower the risks associated with inventory management (Chen, 2018).

Aslam, Blome, Roscoe, and Azhar (2018) define supply chain agility as the capacity to adjust swiftly to unexpected modifications in demand or supply. This can be accomplished by timely revising organisational rules and systems (Chen, 2018). According to Aslam et al. (2018), transparency and speed are the two most important factors contributing to supply chain agility. The supply chain is the visible portion of the supply chain (Christopher & Peck, 2004). It enables clear chain visibility, which may help identify early indicators of future

interruptions. According to Ayoub and Abdallah (2019), supply chain velocity concentrates on the rate of adaptable modifications. Thus, it affects how quickly the supply chain returns from a risk event (Louis & Pagell, 2019).

Abdallah, Alfar, and Alhya (2021) state that agility is necessary for a rapid and effective response to avoid disturbances, and this requires a level of flexibility. According to their understanding, agility refers to a risk management approach that gives a business the ability to respond rapidly to shifts in the market as well as potential or actual disruptions in the supply chain. Supply chain managers can use responsive suppliers to reduce inventory management risks (Mandal & Saravanan, 2019).

According to Gilgor (2016), supply chain responsiveness and agility are distinct concepts. Instead, agility is a skill that enables businesses to function more effectively and quickly (Gilgor, 2016). According to Gilgor et al. (2015), cost effectiveness and supply chain agility are directly related. They demonstrated how a company can satisfy the constantly shifting demands of its consumers while doing so in an effective way by developing supply chain agility. In a study of 144 US businesses, Chiang, Lee, Chu, Wu, and Hsiao (2012) discovered that strategic sourcing and strategic flexibility are key factors in supply chain agility. Demand response, collaborative planning, customer responsiveness, and visibility, according to Braunscheidel and Suresh (2009), are the facilitators of supply chain agility. According to Chen (2018), two organisational flexibility factors—strategic flexibility and manufacturing flexibility are crucial preconditions for supply chain agility.

They showed that strategic flexibility and manufacturing flexibility can positively influence supply chain agility. Supply chain agility can be achieved through the synergy of flexibility, and it can facilitate the achievement of resource efficiency, a high level of customer service, and responsiveness in the supply chain (Mohammed et al., 2019; Um et al., 2017; Swafford et al., 2008).

Collaboration

Alzoubi, Ahmed, Al-Gasaymeh and Kurdi (2020) define supply chain collaboration as productive cooperation with other entities for predicting, deferring, and risk-sharing those benefits both parties. The partnership may include the potential for the transfer of information, which can enhance the development and dissemination of knowledge, reduce ambiguity and enhance visibility. This exchange of information may also include information concerning the dangers and risks associated with supply chains (Al-Doori, 2019). Through collaboration, participants in the supply chain may be able to divide the costs of establishing security and resilience into more manageable portions (Yang & Lin, 2020).

Additionally, it affects the procedures used by supply chain participants to guarantee supply chain recovery (Um & Kim, 2019). Collaboration, for instance, can make it easier to share resources and other complementary talents required to recover from a disruption (Zhang & Cao, 2018). Supply Chain Resilience can be improved by allowing supply chain partners to assist each other during a disastrous incident, offering a flexible and synchronized reaction, and working together (Chi, Huang, & George, 2020).

Collaboration can be seen as going a step farther than cooperation, according to Chi et al. (2020). Therefore, according to Prakash, Kumar, Soni, Jain, Dev, and Chandra (2022), supply chain integration is a strategic partnership of intra-organizational and inter-organizational operations. According to him, deep integration is made possible by actors in the supply chain cooperating, coordinating, and working together. Collaboration inside a supply chain makes a significant contribution to decision synchronisation and incentive alignment, both of which are critical for effectively responding to supply chain disturbances. Both are necessary for effective supply chain collaboration (Jain et al., 2017).

Supply chain collaboration enables the development of synergies among partners, facilitates joint planning and encourages real-time information exchange (Whipple & Russell, 2007) required to prepare for, respond to and recover from supply chain disruptions while reducing their impact. Many authors cite mutuality of benefit, rewards and risk-sharing together with the exchange of information as the foundation of collaboration (Barratt, 2004).

Information sharing, decision synchronisation, incentive alignment, goal congruence, resource sharing, collaborative communication, and shared knowledge generation are the seven elements of SCC that have been discovered (Cao & Zhang, 2011). One of these is information sharing, which acts as a glue to join all other cooperation components into one cohesive whole and encourages productive behaviour to achieve shared goals.

Control Variable

A control variable is held constant to ensure that the study's results, conclusions, and generalizations are unaffected (Swink & Song, 2007). Firm

size was considered for this study, and it explains variances in supply chain performance (Antonio, Yam & Tang, 2007). Based on the idea of economies of scale, a company's expected growth is assessed in terms of its size (Kartikasari & Merianti, 2016). According to Niresh and Thirunavukkarasu, large institutions, for example, are more likely to do better than small businesses (2014).

Large manufacturing companies can quickly access new resources to adapt to changes in the current competitive and dynamic market, according to Niresh and Thirunavukkarasu (2014). In contrast to micro and small businesses, these companies also claim highly qualified and experienced management staff that ensures the company's competitiveness. As a result, firm size was considered while generalising all Ghanaian food and beverage manufacturing companies without affecting the study's conclusions.

Empirical Review

The focus of this section was to subject previously related literature on the research objectives into the extensive review. The results of several investigations were compared to criticise earlier research.

Supply Chain Disruption and Supply Chain Performance

Risk is an enigmatic concept; thus, how it is defined depends on the research topic, claims Jemison (1987). According to Ho, Zheng, Yildiz, and Talluri (2015), risks (disruptions) are any circumstances that stop one of the chain's three main flows (material, financial, or informational) and alter the distribution of possible outcomes. In their study on the factors influencing the growth of businesses in Ghana. According to the findings of Agyapong and Ojo (2018), major factors that cause major glitches in the performance of various

supply chains include poor product quality (supplier quality issues), ferocious rivalry for resources, supplier insolvency, scarcities in the market place, and substandard performance by auxiliary service providers (logistics service).

Baghersad and Zobel (2021), examined more than 300 businesses that experienced disruption between 2005 and 2014 as part of their study to empirically analyse the lasting effects of supply chain disruptions on firms' supply chains. It was discovered that supply chain disruption substantially impacts how well businesses function over the long and short terms. Therefore, it was determined that supply chain disruptions were connected to abnormal shareholder value declines, customer disloyalty, and supply chain underperformance. This finding was further corroborated by Chowdury et al. (2021), who conducted a quantitative investigation into the influence of supply chain disruption on supply chain performance. They concluded that supply chain disruptions have substantial adverse effects on the ability to achieve corporate goals related to customer loyalty, shareholder expectations, and overall company objectives.

Abubakar (2018), highlighted supplier quality problems, sudden default of a supplier (bankruptcy), the poor performance of logistics service providers, and capacity fluctuations in the supply market, all as contributing factors of supply risks that any business will likely face. According to the findings of his research, these disruptive occurrences can have an individual result (such as affecting only one supplier, having a piece of equipment break down, or having a fire), a local result for suppliers in a geographic region, or a global result that affects all suppliers at the same time. In addition, Nguyen, Nguyen, Nguyen, Nguyen, Nguyen, Do, and Ngo (2022), investigated the impact of supply chain

risk, supply chain risk resilience, and efficiency of small and medium-sized enterprises (SMEs) in Vietnam in the global supply chain, unearthed that vulnerabilities have a significant negative influence on performance.

In addition, natural disasters and other types of catastrophic catastrophes or disruptions have a relatively low likelihood, according to Scheibe and Blackhurst (2018). Despite this, high-impact activities will substantially affect the SC network. According to Ivanov et al. (2017), environmental and external related disruptions manifest within the supply chain due to policy changes (such as tax, import, export, confiscation of assets, etc.). Ivanov et al. (2017) also hypothesized that environmental and externally related disruptions cause these changes.

Baryannis, Validi, Dani, and Antoniou (2019) found that African local authorities present several problems to manufacturing enterprises in Africa. These challenges include a variety of obstacles. Taxes, fees for import and export, and rigorous and unfavourable laws are examples of these challenges. He then presented an example of small and medium-sized firms (SMEs) in Ethiopia, which frequently complain about rigorous regulations and unfavourable policies such as taxation. He did this to illustrate his point.

Studies conducted in the past have shown that political unrest can prevent workers from performing their assigned tasks, cause exports to be delayed, raise the cost of security or logistics, and further deteriorate the operational continuity and performance of businesses, including SMEs in the supply chain for the production of food and beverages, of which Ghanaian businesses are not an exception (Dolgui et al., 2018).

Supply Chain Resilience and Supply Chain Performance

Ganiyu et al. conducted research in the year 2020 to investigate how different supply chain risk management methods and supply network hazards affect the performance of businesses in Ghana. The study findings were based on information collected from 210 businesses in Ghana. It was modelled by utilising the concepts of supply chain risks, supply chain risk management (SCRM), company performance, and procedures. A structural methodology was also used to measure the intricate interactions between the constructs. According to his findings, resilience and mitigation techniques significantly improved the performance of Ghanaian manufacturing enterprises. A supplier and customer partnership enhance the performance of the firms under consideration, according to Nelissen (2020), who performed a qualitative study to evaluate best practices for supply chain risk resilience initiatives among US organisations.

This result received additional backing from the research conducted by Olivares-Aguila and Vital-Soto (2021), who investigated supply chain resilience roadmaps for large disruptions. According to the findings, the event could seriously and quickly worsen supply chain performance, and ignoring that possibility could have disastrous repercussions. However, by enhancing supply chain resilience, businesses can increase supply chain performance, boosting shareholder wealth and customer loyalty and improving logistics performance.

Conceptual Framework

The conceptual framework was developed to shed light on the dependent, independent, and moderating variables involved in the study. The independent factors can be used to make predictions about the variation in the

dependent variable (Kothari, 2008). As a direct consequence, the value of the dependent variable is sensitive to any shifts in the value of the independent variable. In addition, the moderating variable can change the strength of the association between independent and dependent variables and the direction in which the association points. The independent variable of this study is supply chain disruption sources, whereas the dependent and moderating variables are supply chain performance and resilience, respectively.

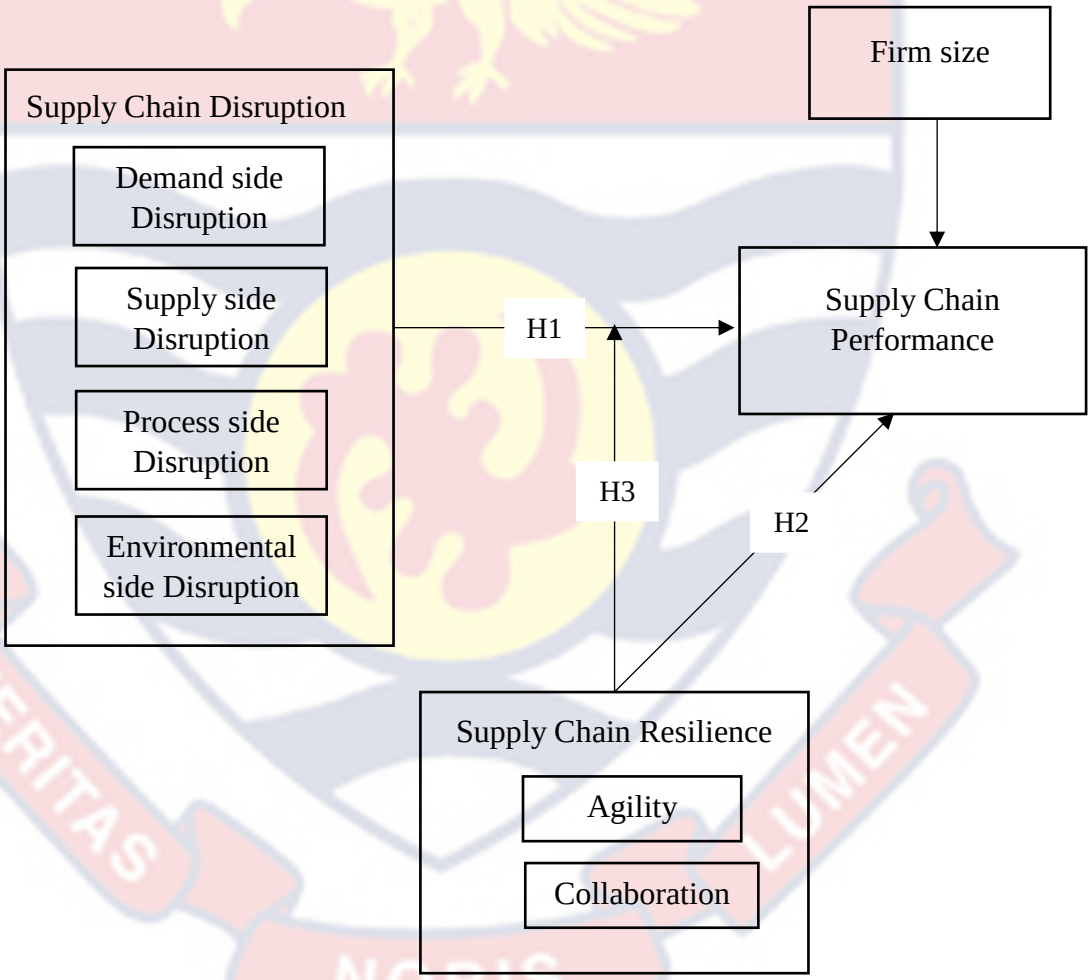

Figure 1: Conceptual framework

A conceptual structure that depicts the association between supply chain disruption, supply chain resilience, and supply chain performance. These relationships were controlled using firm size.

Source: Author's construct (2022)

Chapter Summary

The purpose of this chapter was to conduct a literature review on the theoretical and conceptual difficulties associated with demand-side disruption, supply-side disruption, process-side disruption, environmental-side disruption, supply chain performance, agility and collaboration, as documented by an earlier study. The conceptual structure of the study was based on the review's key themes and lessons. The techniques, analysis, presentation of data, comments, conclusions, and recommendations will all benefit from this review. The subsequent chapter describes the study's research methodologies.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter discusses the research methods that were used for the study. As Yin (2017) pointed out, this section validates the selected methodologies and demonstrates how well they fit the study's aims. Specifically, it discusses the study design and paradigm, methodology, study region, population, sample, and sampling mechanism. Other subheadings covered include study population; study region; sample; and sampling mechanism. In addition, it discusses the protocols for collecting data, the preparation of data, the design of equipment, the reliability testing, the data processing, and the ethical considerations and limitations of the study.

Research Philosophy

Guba and Lincoln propounded the concept of research philosophy in 1982. It is the "fundamental belief system or worldview that leads an investigation," as described by Appleton and King (2002). The natural world and the expansion of human knowledge are at the centre of research philosophy. On the other hand, Saunders and Lewis (2017) revealed that a research philosophy underpins any research. It includes social constructivism and positivism or objectivism (Zukauskas, Vveinhardt, & Andriukaitien, 2018); the social constructivist paradigm favours the qualitative approach because it emphasizes the socially constructed nature of reality through a complex understanding of people's experience. This philosophy is founded on subjectivism, which is formed by one's view of the world as a result of their interactions with it.

The positivist philosophy involves the application of scientific methods to reach objective findings (Ryan, 2018). It uses quantitative tools to collect information to test a given hypothesis. It is established on the idea that there is a single, fixed, measurable, and observable world (ontological presupposition); authentic knowledge is quantitative and objective (Ryan, 2019; Bell, Bryman & Harley, 2018). The philosophies broaden theories and ensure that only scientific methods are used to achieve genuine knowledge. It also presumes objectivity and precision are desirable qualities, whereas subjectivity is intrinsically deceptive (Ragab & Arisha, 2018).

The positivist paradigm was used for the study. This paradigm is based on the idea that there is an objective truth or truth concerning how the supply chain risk of SMEs in the manufacturing supply chain affects their supply chain performance (Klakegg, 2016). The positivists' paradigm was used for the investigation since it paves the way for survey research to statistically collect data through questionnaires distributed to a scientifically sampled number of participants (Kember & Corbett, 2018).

In addition, the positivists' paradigm was chosen for this research because it helps explain the disruptions that manufacturing companies experience and how those disruptions are related to the performance of their supply chains, which in turn moderates the influence that supply chain resilience has (Kember & Corbett, 2018). The study examined the association among the three variables (supply chain disruption, supply chain performance and supply chain resilience), which necessitates the quantification and objectiveness of the responses.

Research Approach

Creswell (2014) identified three (3) main approaches: mixed, qualitative, and quantitative. According to Creswell & Creswell (2017), the quantitative approach achieves its goals by creating generalisable theories and testing hypotheses. In the natural sciences, quantitative research is frequently used and is beneficial for numerical data (Creswell & Curtis, 2018). Creswell (2014) defines the qualitative approach as an inquiry methodology for understanding a social or individual issue based on creating a suitable, holistic view with words and reporting in-depth perspectives of informants. It uses systematic methods and is carried out in a natural environment. Because it emphasizes quantification in gathering and interpreting data, the quantitative approach was chosen for the study (Creswell and Creswell, 2017).

It also integrates the standards and guidelines of the natural scientific model, in specific positivism, which is an epistemological point of view that asserts the social world of how potential disruption in the manufacturing of food and beverages influences the performance of their supply chain is an external, objective fact that can be quantitatively assessed with reliable and valid methods. This view holds that the social reality of how supply chain disruption in the industrial production of food and beverages influences their supply chain performance is a reality. Positivism believes that the social reality of how supply chain disruption in the manufacturing of food and beverages impacts the performance of their supply chain is external (Hollway & Schwab, 2018). Due to the nature of the research's purpose, questions, and hypotheses, a quantitative technique was chosen since it has advantages over both the qualitative and the blended approaches.

Research Design

A research design is an all-encompassing method that may be used to find answers to the study's questions as well as solve some obstacles that could potentially develop. A study's specific requirements are considered when developing a research plan. Every successful researcher must select a design appropriate for the research being conducted. Research design has been termed a set of rules and instructions to tackle the research challenge (Leedy & Omrod, 2005). Research design assists the researcher in gathering, evaluating, and interpreting data from observation. It also specifies the generalisation domain, indicating whether or not the resulting interpretation may be applied to a new circumstance.

Three preliminary designs are employed in research: descriptive, exploratory, and explanatory. The study considered the explanatory research design. The fundamental goal of the research that seeks explanations for phenomena is to provide insight into their causes and make accurate projections regarding their outcomes (Viotti & Kauppi, 2019). Because this study investigates how the performance of supply chains is affected by disruptions, the function that supply chain resilience plays is being investigated.

Babbie (2020) added that researchers can have more control over their research procedures when they choose an explanatory design. The design also uses structured questionnaires to obtain data from respondents who are spread across a given area. Also, this design is the most appropriate for analysing cause and effect relationships between and among variables (Beins & McCarthy, 2016).

However, there are certain flaws in the explanatory design that could skew the results of a study (Robson & McCartan, 2016; Wildemuth, 2016). In order to guarantee a representative sample, this design may need a lot of time, according to Wildemuth (2016). According to Robson and McCartan (2016), data is collected based on respondents' ideas and opinions, which may result in biassed replies and compromise the objectivity of the findings (Creswell & Creswell, 2017). The explanatory research design was adopted since it better suited the investigation's objectives, research goals, and technique.

Study Area

Food and beverage manufacturing includes all companies and organisations involved in producing, packaging, and delivering raw food ingredients. This includes both manufacturers and retailers. This sector encompasses the production of alcoholic and non-alcoholic beverages, in addition to packaged, fresh, and prepared foods. The food and beverage industry encompasses, except for the pharmaceutical sector, the production of all goods intended for human consumption (Aryee, Li & Akpanyi, 2021). For many years, the Ghanaian food and beverage industry has contributed substantially to the country's economic development as well as to the general nutrition of its citizens. Ghana's industrial sector includes a variety of business types, such as food processors, beverage and water processors, pharmaceutical companies, wood and timber processors, textile, rubber and plastics, and metal and electronics manufacturers (Ackah, Adjasi & Turkson, 2014).

The manufacturing of food and beverages accounts for more than half of the sector's total market share. As a result, it significantly contributes to economic growth by collecting import and export duties and tax revenues,

creating jobs, efficiently using resources, and innovativeness (Aryee et al., 2021). According to the annual report published by the Association of Ghana Industries (AGI) in 2019, the manufacturing sector contributes roughly 35 per cent of Ghana's yearly GPD to the food processing industry. Owusu-Mensah, Naifei, Brako, Boateng, and Darkwah (2020) estimate that the industry contributed around US$812 million to Ghana's economy in 2014, although micro, small, and medium-sized firms predominate in the sector.

From GHS14 billion in 2016 to GHS25 billion in 2020, the industry saw a growth rate of 17%. The industry is in a solid position to accomplish its growth goals given Ghana's steadily growing population and reasonably favourable economic environment. But if supply chains are frequently disrupted, this objective will never be reached. This study, therefore, focused on the food and beverages manufacturing firms in Ghana. Emphasis was also given to Accra's food and beverage manufacturing firms due to the concentration of firms within the areas.

The Greater Accra Region of Ghana comprises 152 recognized manufacturing enterprises, as stated by the Association of food and drinks manufacturing firms in Ghana. Consequently, the area accounts for 82.5% of the total number of registered members across the nation.

Study Population

Kothari (2004), describes the population as a whole society with similar measurable features of individuals, events or artefacts. The population is the entire aggregation of causes that fulfil a designed set of criteria (Graneheim & Lundman, 2004). Kothari (2004), in a research-based investigation, describes the word population as a collection of elements, events, individuals, or groups

of things. The population can be seen as the target community in which the researcher is involved in gathering information and drawing conclusions, according to Taysum (2017). In addition, this study describes the target population as a complete collection of cases or elements with certain general measurable characteristics of a specific nature distinct from other populations.

Furthermore, Sekaran and Bougie (2016), agree that a population is a well-defined collection of investigated entities, resources, elements, activities, groups of items or households. The study targeted 152 registered Food and Beverage manufacturing firms in Accra, registered with the Association of food and beverages manufacturing firms.

Sample and Sampling Procedure

The research was conducted using the census approach, which involved collecting data from each unit (member) of the population that was being studied. It was decided to use the census approach to ensure that a study's findings were more accurate and trustworthy (Creswell, 2014). In addition, the study had a strong interest in every business included in the population it examined. As a result, information was collected from one (1) key representative at Accra's 152 food and beverage production companies. This is because their experience and work positions directly affect their companies' strategic directions regarding supply chain performance, and key employees were chosen as respondents (Saunders, Lewis & Thornhill, 2012).

Data Collection Instrument

To collect primary data, a structured questionnaire was utilized. The survey contains both open-ended and closed-ended questions. Explanatory investigations are, by their very nature (Maxwell, 2012), highly organized,

which makes the use of structured primary data-gathering methods essential. The researcher used questionnaires as the instrument of choice to collect data for the study. A questionnaire is a group of questions intended to gather data from persons by eliciting replies through questions (Malhotra & Birks, 2007). Questionnaire surveys are likely the data collection used most frequently in research. These types of surveys can measure factors vital to the organisation and growth of businesses (Malhotra & Birks, 2007).

In closed-ended questions, respondents are required to select one answer from a predetermined pool of alternatives and to evaluate each choice in isolation from the others in the pool. A checklist, a list of the behaviours, attributes, or other entities the researcher is looking into, and a Likert scale were examples of closed-ended items. A Likert scale is more useful when continually evaluating a behaviour, attitude, or another subject of interest is required. Closed-ended items also included a checklist, a list of the behaviours, qualities, or other entities the researcher is looking into (Leedy & Ormrod, 2005). When compared to interviewing, there are some advantages of employing questionnaires. It makes data collection easy (Zhao, Liang & Dang, 2020). Although time-consuming, it facilitates data processing (Kumar & Kumar Baradiya, 2019; Deshpande, Pradhan, Sikdar, Deshpande, Jain, & Shah, 2019).

Section A measured Supply Chain Disruptions (SCD). The SCD construct had four (4) key pillars (sources of supply chain disruptions) which included demand-side disturbances (with five items), supply-side disruption (with five items), process-side disruption (with five items), and environmental side disruption (with five items). Section B measured Supply Chain Performance (with ten items). Section C again measured Supply Chain

Resilience (SCR). SCR construct had two (2) key pillars which included agility (with five items) and collaboration (with five items). Also, Firm size was measured with five items in section D as a control variable. The respondents' demographic data and company profile were captured in Sections E and F of the questionnaire, which contained four (4) items and three (3) items, respectively.

A 7-point Likert scale, with the options "Strongly disagree" and "Strongly agree" on the items measuring the constructs considered in this study, was used to gauge the respondents' views and opinions. For example, the Likert scale employed the following points: "1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Neutral, 5 = Somewhat agree, 6 = Agree, and 7 = Strongly agree." According to Harpe (2015), this measurement enables researchers to relate qualitative aspects with quantitative metrics studies effectively. He went on to say that the scale is the most trustworthy instrument for determining people's thoughts and beliefs. The fact that this scale allowed for data analysis using descriptive and inferential statistics methods was another reason why it was helpful (Sartas, Schut, Proietti, Thiele & Leeuwis, 2020). Scales similar to this have been utilized in previous research (Parast and Subramanian, 2021) concerning the disruption and resilience of supply chains.

Validity and Reliability

For an instrument to be considered valid, it must be able to measure what it is intended to measure (Sürücü & Maslakci, 2020). In light of this, we can deduce that an account is valid or correct if it accurately depicts those elements of the events it imagined to depict, explain, or theorise. Because the process used to choose the participants for a study was done in a way that would not

influence the outcomes, validity was not affected. On the other hand, reliability relates to the instrument's capacity to measure an attribute with a certain degree of consistency. The questionnaire was pretested before the data collection commenced to ensure that the data collected and the conclusions reached would be reliable.

To ensure the robustness of the results, the study employed the following methodological validity and reliability tests. Common Method Variance (CMV)- The Single-Factor (1967) approach of Harman will be investigated using SPSS and Variance inflationary (VIF) in Structural Equation Modelling (SEM). Content Validity - Cross-loading and confirmatory factor analysis will be tested (CFA). Also, convergent validity- the average variance derived was evaluated (AVE).

In testing the validity, the researcher formulated the research questions in the questionnaire following the study objectives and questions, then provided the developed questions to the supervisor to verify whether the set questions were answering the intended research purpose. The researcher estimated the content validity index once the research supervisor approved the items in the questionnaire, as shown below. Orodho (2009), states that the recommended minimum CVI value is 0.7.

The Cronbach Alpha Coefficient test was used to determine the dependability of the research. This test focuses on the research items arranged logically in the questionnaire. All of the variables reflected in these grouped research items of the questionnaire were assessed using Cronbach's Alpha Coefficient following the research questions (CAC). A CAC output demonstrates the instruments ' reliability as a result of the SMART PLS-

SEM reliability test. According to Reynaldo, a research instrument is reliable between 0.7 and 1.0.

Data Collection Procedure

Before data gathering, the Head of Department for Procurement and Supply Chain Management, School of Business, UCC, issued an authority note, which was given to the management of all studied firms. This was done to secure approval to carry out the data-gathering activity at their location. The note also provided awareness to the various respondents concerning the relevance of their participation. The questionnaires were given to the respondents after approvals were granted. The activity of collecting data was given a period of four (4) weeks to guarantee the highest possible and most timely rate of response. Some respondents could not participate in the data-gathering activity for various reasons, including confidentiality concerns and inconvenient schedules.

In addition, due to solid organisational regulations and ethical codes of behaviour, some respondents refused to participate in the exercise. These difficulties, however, were made more manageable by ensuring participants that the activity was carried out primarily for academic reasons. It was accommodated for respondents who asked to be able to take their time filling out the questionnaire by giving them that option. Because the responses from the respondents were so crucial to the outcome of the study, these procedures were put into place to give respondents the confidence they needed to take part in the survey.

Response Rate

Only 147 of the 152 questionnaires were distributed to respondents since it was impossible to locate some companies within the industry under study. Of

these, 141 were retrieved from the respondents; however, eight (8) of them were disqualified from analysis due to significant incompleteness and non-responses. After collecting 135 valid data, the researcher could proceed with the analysis. The study used one hundred thirty-five data sets with a response rate of 88.80%. Table 4 illustrates the percentage of relevant responses received for the data collected for analysis.

Table 2: Response Rate

	Number of firms	Percent (%)
Target population	152	100.00
Reachable population	147	96.70
Receivable responses	141	92.80
Uncompleted responses	8	5.30
Usable responses	135	88.80

Source: Field Survey (2022)

Table 2 demonstrates that, as Babbie (2005) suggested, the study's rate of response was between 70% and 90%. According to Babbie, 50%, 60%, and 70% response rates indicate adequate, reasonable, and excellent responses, respectively. The survey received 141 (96.70%) responses, of which 8 (5.30%) were deemed useless. This is because examining these responses, which contained significant incomplete and non-responses, could have harmed the study's findings. According to Babbie (2005), if incomplete responses are not handled properly, they may result in missing data that could have an impact on a study's conclusion. According to the decision rule, partial responses could be disregarded if the study received a total useable response rate of more than 50%.

Incomplete replies must be disregarded because of the study's 88.80% response rate.

Ethical Consideration

Due to the numerous ethical conflicts that social science research is tainted with and that must be managed properly, the study considered and addressed some essential ethical difficulties in social sciences research (Green, 2019; Wax, 2019). The researchers formally consulted the necessary organisations for approval before this exercise. All parties involved in the study, especially volunteers, were adequately informed of its advantages and goals (Bell et al., 2018; Iphofen & Tolich, 2018). No responders were forced to participate in the study; instead, informed verbal consent was obtained from each participant. Instances where respondents had trouble answering some of the questions were actively addressed.

Concerns like confidentiality, privacy, and unanimity were thoughtfully addressed through the design of a solid, structured questionnaire (Chambers & Nimon, 2019; Chiauzzi & Wicks, 2019; Lo, Grotevant & McRoy, 2019). The study's data processing and analysis portion did not involve data manipulation. The results were accurately represented as generated.

Data Processing and Analysis

For quantitative research, the researcher employed Microsoft Excel for data entry and partial least squats structural equation model (PLS-SEM) version 4 to analyse the data. All the one hundred and thirty-five (135) valid questionnaire data were keyed into Microsoft Excel software and later extracted into the PLS-SEM version 4 for structural equation modelling and general analysis of the data.

The quantitative data were examined using descriptive and inferential statistics. The background characteristics and firm description were examined using descriptive statistical analysis, frequencies, and percentages. This comprised demographic (e.g., gender, age) and work-related characteristics (e.g., work experience, departments, position). With the help of Smart PLS 4 software, the descriptive variables in the study were assessed using means and standard deviations. The Structural Equation Models were developed to analyse data obtained on objectives one through four. This employed inferential statistics, including discriminant and convergent validity, correlation and regression, to ascertain the relationship between supply chain disruption, supply chain resilience and supply chain performance.

Justification for using the Structural Equation Modelling

There are two popular methods for estimating SEM with latent variables (Bagozzi & Yi, 2012). The first approach is factor-based covariance fitting exemplified by software such as LISREL, EQS, and AMOS (Bagozzi & Yi, 2012; Hair, Ortinau & Harrison, 2010). The second is the component-based PLS approach (Hair, Sarstedt, Hopkins & Kuppelwieser, 2014). For several reasons, many researchers widely use PLS, which is selected for this study.

First, the component-based methodology used in PLS eliminates the two major issues of unacceptable solutions and factor indeterminacy (Fornell & Bookstein, 1982). The PLS calculates the latent variables as precise linear combinations of the measured quantities. As a result, indeterminacy issues are avoided, and component scores are defined precisely (Chin, 2010). Secondly, the PLS approach allows the examination of indirect relationships among factors (Ringle, Wende & Becker, 2015). The indirect analysis is better

achieved using the PLS technique than by multiple regression analysis or other methods (Hamid, Sami & Sidek, 2017).

Furthermore, PLS allows simultaneous testing of an entire model instead of a simple examination of the relationship between two variables (Hair et al., 2010), which provides the researcher with a comprehensive means of assessing and modifying a given theory. The PLS technique does not require a normality assumption for estimating model parameters, observation independence, or variable metrics. A series of ordinary least squares analyses of the iterative algorithm are applied in this approach (Jannoo, Auchoybur, & Lazim, 2014).

The PLS algorithm resolves the multi-collinearity issue, which incorporates canonical correlation, redundancy analysis, multiple regression, multivariate analysis of variance, and principal components. The multi-collinearity issue is caused by the correlations between observed variables, which affect how well each variable's influence may be anticipated or explained by the other variables in the analysis (Dippe & Wold, 1985).

Additionally, it has modest sample size requirements (Hair et al., 2010). There has been considerable discussion on the appropriate sample size for an accurate estimate in the literature on structural equations. There are several recommendations for developing an efficient method of determining sample size in applying SEM. Hair et al. (2010), suggest that the minimum sample size for the number of limitations to be estimated in a model is a ratio of at least 10:1.

Finally, PLS could be used for theory confirmation and application and prediction. It identifies where relationships might or might not exist and suggests propositions for later testing (Chin, 2010). Given the advantages of

PLS over LISREL, AMOS, multiple regression, path analysis and other techniques, it was chosen to test this study's hypotheses.

Chapter Summary

This aspect has provided details regarding the methodological techniques used to gather the primary data, how the data will be assessed and analysed, considering the statistical tools and specific research objectives, and how the study findings were summarized and presented for straightforward interpretation and understanding.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The analysis of the data gathered about the study's goals is presented in this chapter. It precisely summarises respondents' and organisations' demographic and business characteristics. The chapter further investigates the linkages between supply chain disruption, supply chain performance and supply chain resilience. The researcher used the partial least squares (PLS) method in conjunction with structural equation modelling (SEM) to conduct the analysis.

Demographic Profile of respondents

The first part of the analysis focuses on the socio-demographic characteristics of the participants in the survey. This section analyses the respondents' gender, age, academic qualification, years of working experience, and position within the company. The findings are detailed in Table 1.

Table 3: Demographic Profile of Participants

	Frequency	Percent (%)
Gender		
Male	92	68.1
Female	43	31.9
Total	135	100
Age Bracket		
20 – 30 years	100	74.1
31 – 40 years	12	8.9
41 – 50 years	15	11.1
51 years and above	8	5.9
Total	135	100
Educational Background		
Senior High School	4	3.0

Table 3 Cont'd

Higher National Diploma	7	5.2
Bachelor's Degree	99	73.3
Postgraduate Degree	22	16.3
Others	3	2.2
Total	135	100
Working Experience		
1 – 5 years	101	74.8
6 – 10 years	12	8.9
11 – 15 years	10	7.4
16 – 20 years	10	7.4
> 20 years	2	1.5
Total	135	100
Position in Firm		
Procurement/Purchasing/supply chain Manager	101	74.8
Production/Operations Manager	13	9.6
Other Managers	21	15.6
Total	135	100

Source: Field Survey (2022)

From the demographic of respondents in table 3 above, the majority of respondents, 92, were males representing 68.1% of the total sample, whilst the remaining 43 representing 31.9%, were females. This indicates that the industry (food and beverages manufacturing firms in Accra is dominated by men.

In responding to the age ranges of the respondents, the ages between 20-30 years recorded a higher turnout rate of 100 (74.1%), followed by the 41 – 50 years with a frequency of 15, indicating 11.1%. 12 respondents were between the ages of 31 – 40 years, whilst the least number of respondents were between the ages of 51 years and above.

The educational background of survey participants was also presented in the table above. Bachelor degree holders recorded the highest number of

representations with 99 (73.3%), followed by Postgraduate degree holders with 22 responses indicating 16.3%. 7 responses were recorded for Higher National Diploma Holders, indicating 5.2%, whilst Senior High School and Other certificate holders recorded 4 (3.0%) and 3 (2.2%) in response, respectively.

Additionally, respondents' working experiences were further analysed. 101 (74.8%) responses were recorded for respondents with 1 – 5 years of working experience. 12 respondents (8.9%) have working experiences between 6 – 10 years, whilst periods between 11 – 15 years and 16 – 20 years received a response rate of 10 (7.4%) and 10 (7.4%), respectively. The least number of responses were recorded for working experience over 20 years, with 2 (1.5%).

Table 3 further presents the respondents' current job positions. It was revealed that 101 (74.8%) of responses were recorded for Procurement / Purchasing / Supply chain managers, 13 (9.6%) of the remaining 34 were Production / Operations managers, whilst the remaining 21 (15.6%) were respondents who hold other positions in the current jobs.

Table 4: Business Characteristics

Category	Frequency	Percent (%)
Age of firm		
Less than 5 years	85	63.0
6 – 30 years	42	31.1
More than 30 years	8	5.9
Total	135	100
Firm Size (Number of Employees)		
Less than 100	22	16.3
100 – 200	36	26.7
201 – 300	12	8.9
301 – 400	8	5.9
Above 400	57	42.2

Table 4 Cont'd

Total	135	100
Ownership Structure		
Local	93	68.9
Foreign	12	8.9
Local and Foreign	30	22.2
Total	135	100

Source: Field Survey (2022)

The business characteristics of the various firms were taken into consideration. It was observed that 85 (63.0%) firms have been in operation for fewer than 5 years. Whilst 42 firms representing 31.1% have been in operation for 6 – 30 years. The least number of firms 8 (5.9%), have been in operation for more than 30 years.

The survey firms' number of employees (firm size) was further analysed. It was observed that most firms employ more than 400 employees, with 57 responses representing 42.2%. 36 (26.7%) of firms employed between 100 – 200 employees. Whilst 22 (16.3%) of firms employing less than 100 employees, 12 (8.9%) of food and beverages manufacturing firms in Accra employed between 201 – 300 employees. The analysis further indicated that only 8 (5.9%) food and beverages manufacturing firms in Accra employed between 301 – 400 employees.

To conclude, the food and beverages manufacturing firms' ownership structure in Accra were also considered. The majority of these firms, 93, representing 68.9%, were locally owned, while 12 (8.9%) and 30 (22.2%) of the food and beverages manufacturing industry were foreign and local and foreign, respectively.

Descriptive of Supply Chain Disruption

This section discusses the disruptions encountered by food and beverages manufacturing firms in Accra. These different disruptions included Demand side disruption, Supply-side disruption, Process side disruption and Environmental side disruption. These individual constructs were assessed to ascertain the quality of the indicators measuring each construct's understudy. This assessment reveals whether the indicators are pertinent in describing the particular kinds of supply chain disruption within the context of the industry understudy. This analysis reports on the mean score and standard deviation. The interpretation of the mean score was based on previously grouped criteria as prescribed by Harpe (2015).

Table 5: Descriptive of Demand Disruption

Demand Disruption	Mean	Std. Deviation
We receive unanticipated or unstable demands from our customers	2.946	2.009
We are exposed to distorted information from our vendors about orders or demand quantities	3.601	2.158
Our firm experiences unusual customer payment delays	2.696	1.837
We receive requests from customers to expedite pending orders	2.791	1.791
Our customers easily switch to other product substitutes	3.277	1.952

Source: Field Survey, (2022)

The results relating to demand side disruption, as summarized in table 5 indicated that respondents generally agreed that the food and beverages manufacturing firms in Accra receive unanticipated or unstable demand from

their customers (Mean=2.946, SD=2.009), manufacturing firms are exposed to insufficient or distorted information from customers about orders and demand quantities with (Mean=3.601, SD=2.158). Also, the experience of unusual customer payment delays received a (Mean=2.696, SD=1.837), whilst requests from customers to expedite pending orders recorded a (Mean=2.791, SD=1.791), the highest mean was recorded for customers' quickly switching to other product substitutes (Mean=3.277, SD=1.952).

This result is consistent with Christopher and Lee (2004), Chen et al. (2013) and Asad et al. (2019). Christopher and Lee (2004), posited that the bullwhip effect or information distorting is a prevalent disruption in the demand side of a company's operation. Also, in a study conducted by Chen et al. (2013), a demand disruption can originate from the uncertainties caused by customers' unforeseeable demands, as indicated in the table above, with a Mean= 4.511 and SD= 2.217. To conclude, Asad et al. (2015), stressed that customers of manufacturing companies easily switch to other product substitutes, distorting their operations.

Table 6: Descriptive of Supply Disruption

Supply Disruption	Mean	Std. Deviation
Our suppliers perform poorly on their logistics capabilities.	4.919	1.407
We encounter supplier quality problems	4.811	1.332
We encounter supplier loyalty problems	4.872	1.311
Our suppliers are reliable	5.095	1.259
Our supply market is characterized by capacity fluctuations or shortages in the supply market	5.182	1.310

Source: Field Survey, (2022)

The extent to which respondents agree to disruption at the supply side of the chain was analysed in table 6. It was discovered that suppliers perform poorly on their logistics capabilities (delivery dependability, order fill capacity) with a mean and standard deviation of 4.919 and 1.407, respectively. We encountered supplier quality problems (Mean=4.811, SD=1.332), We encountered supplier loyalty problems (Mean=4.872, SD=1.311), Our suppliers were reliable (Mean=5.095, SD=1.259) and finally, it was found that the respondents further agreed that their supply market is characterized by capacity fluctuations or shortages on the supply market (Mean=5.182, SD=1.310).

These findings are supported by studies of Dolgui, Ivanov and Sokolov (2018) and Parast and Shekarian (2019), whose findings suggested that suppliers' logistics capability and capacity fluctuations or shortages on the supply market are all disruptions that affect the supply side of an organisation's operations.

Table 7: Descriptive of Process Disruption

Process Disruption	Mean	Std. Deviation
Unexpected technological setbacks are a common occurrence in our operations.	3.824	2.026
Our ability to deliver goods or services is somewhat constrained.	3.939	1.956
Our goods or services frequently have issues with quality.	3.926	1.966
Our supply chain is characterized by a large number of members	3.372	1.950
Our employees occasionally work in harsh or dangerous environments.	3.662	2.029

Source: Field Survey, (2022)

Again, the descriptive results relating to process side disruption in table 7 show that the respondents agreed in general that unexpected technological setbacks are a common occurrence in our operations (Mean=3.824, SD=2.026); our ability to deliver goods or services is somewhat constrained (Mean=3.939, SD=1.956), product or services often face quality problems (Mean=3.926, SD=1.966), the supply chain is characterized by a large number of members (Mean=3.372, SD=1.950) and our employees occasionally work in harsh or dangerous environments (Mean=3.662, SD=2.029).

The findings of Gunessee and Subramanian (2020) and Khan and Estay (2015) provide backing for the conclusions drawn here. Gunessee and Subramanian (2020) found that technology failures and quality problems due to operation failures hamper the supply chain's operations. Again, Khan and Estay (2015), concluded that a large number of supply chain members and partners impact the performance of the entire chain, thereby causing a disruption.

Table 8: Descriptive of Environmental Disruption

Environmental Disruption	Mean	Std. Deviation
International restrictions affect our company	5.189	1.221
Natural disasters frequently affect our company	3.797	1.935
Our industry is characterized by competition	3.736	1.991
Changes in the political environment affect our company negatively	3.682	1.842
Public opinion exerts significant pressure on our operations	3.473	1.858

Source: Field Survey, (2022).

In addition, table 8 presents the findings of environmental disruption. In general, respondents somewhat agreed that international restrictions affect our company (Mean=5.189, SD= 1.221), Natural disasters (flood, earthquake, extreme climate conditions) frequently affect our company (Mean=3.797, SD=1.935), Our industry is characterized by competition (Mean=3.736, SD=1.991), Changes in the political environment affects our company negatively (introduction of new laws, stipulations) (Mean=3.682, SD=1.842) and public opinion exerts significant pressure on our operations (Mean=3.473, SD=1.858).

Studies by Louis and Pagell (2019), Smith (2019) and Rice & Zegart (2018) buttress the findings indicating that political ties and increased complexities in the political environment pose a risk of disruption in the supply chain.

Table 9: Descriptive of Supply Chain Resilience (Agility)

Agility	Mean	Std. Deviation
We adjust supply chain resources to consider the abrupt changes in supply and demand.	4.777	2.030
We modify supply chain procedures to cut down on lead times.	4.939	1.783
We streamline supply chain operations to get rid of unnecessary steps.	4.973	1.819
We change how the supply chain works to shorten the time it takes to make a new product.	4.899	1.785
Our supply chain's information systems can help manage transportation and distribution.	5.020	1.726

Source: Field Survey, (2022)

Analyzing the supply chain resilience strategies (Agility) adopted by the food and beverages manufacturing firms in table 9, we adjust supply chain resources to take into account the abrupt changes in supply and demand (Mean=4.777, SD=2.030), we modify supply chain procedures to cut down on lead times (Mean=4.939, SD=1.783), we streamline supply chain operations to get rid of unnecessary steps (Mean= 4.973, SD=1.819), we change the way the supply chain works to shorten the time it takes to make a new product (Mean=4.899, SD=1.785) our supply chain's information systems can help manage transportation and distribution (Mean=5.020, SD=1.726).

According to the findings of the research conducted by Tukamuhabwa et al. (2015), an agile method of reacting to disruptions in the supply chain includes simplifying supply chain processes to eliminate non-value-added tasks and rerouting supply chain resources to react to sudden changes within the supply chain.

Table 10: Descriptive of Supply Chain Resilience (Collaboration)

Collaboration	Mean	Std. Deviation
Our clients are willing to postpone their orders when production capacity is impaired by disruption.	4.966	1.784
Our company shares risks by investing directly in suppliers and customers.	5.081	1.788
Our company works with supply chain partners to establish new markets and consumer responses.	5.047	1.737
Our company and its supply chain partners work together to make their products or processes.	5.027	1.819
Our company and supply chain partners frequently communicate when issues arise.	5.142	1.935

Source: Field Survey, (2022)

Again, the findings relating to the collaborative strategy adopted by food and beverages manufacturing firms in table 10 indicated that all respondents agree that clients are willing to postpone their orders when production capacity is impaired by disruption (Mean=4.966, SD=1.784), the firm company shares risks by investing directly in suppliers and customers (Mean=5.081, SD=1.788), our company works with supply chain partners to establish new markets and consumer response (Mean=5.047, SD=1.737), our company and its supply chain partners work together to make their products or processes (Mean=5.027, SD=1.819) and company and supply chain partners frequently communicate when issues arise (Mean=5.142, SD=1.935).

According to the research conducted by Jain et al. (2017) and Scholten et al. (2014), substantial integration in the supply chain is provided through cooperation, collaboration, and coordination among members of the supply chain. This integration helps to lessen the impact of disruptions. Additionally, teamwork can make sharing resources and other complementary talents that are important for recovery from disruption easier.

Table 11: Descriptive of Supply Chain Performance

Supply Chain Performance	Mean	Std. Deviation
Our company can provide desired quantities on a consistent basis	4.872	1.953
Our company is able to meet quoted or anticipated delivery dates on a consistent basis	5.068	1.947
Our company is able to satisfy customers within the supply chain on a consistent basis	5.061	1.752
Our supply chain is able to reduce manufacturing lead time	5.108	1.713
Our firm has recorded an increase in overall competitive position	5.182	1.816
We adapt supply chain processes to reduce new product development cycle time	4.01\47	2.058
Our supply network can change production settings and procedures.	4.588	1.852
Our supply chain's information systems can assist with managing transportation and distribution.	4.885	1.726
Our supply chain can change delivery modes	4.784	1.833
Our supply chain can adapt to and handle changes in demand, such as seasonality. .	5.041	1.763

Source: Field Survey, (2022)

In reporting on the performance of supply chains of food and beverages manufacturing firms in table 11, respondents generally agreed with the items measuring supply chain performance. Our company can provide desired quantities consistently (M=4.872, SD=1.953), our company can meet quoted or anticipated delivery dates consistently (M=5.068, SD=1.947), our company can satisfy customers within the supply chain consistently (Mean=5.061, SD=1.752), our supply chain can reduce manufacturing lead time (M=5.108,

SD=1.713), our firm has recorded an increase in overall competitive position (Mean=5.182, SD=1.816), we can adapt supply chain processes to reduce new product development cycle time (Mean=4.047, SD=2.058), our supply network can change production settings and procedures (Mean=4.588, SD=1.852), the supply chain's information systems can assist with managing transportation and distribution (Mean=4.885, SD=1.726), our supply chain can change delivery modes (Mean=4.784, SD=1.833) and our supply chain can adapt to and handle changes in demand, such as seasonality. (Mean=5.041, SD=1.762).

Assessment of the Partial Least Squares – Structural Equation Modelling

PLS-SEM, which stands for partial least square structural equation modelling, was applied to analyse the study's goals. The fundamental characteristics of the model, including its item loadings, indicator reliability (IR), construct reliability (CR), composite reliability (using average variance extracted), multicollinearity (VIF), and external validity, were all analysed to ascertain the study's tolerable cogency and dependability. This was done to determine whether the study could be relied upon (Statsoft, 2013; Hair et al., 2014). Additionally, the model's results were interpreted in a way that gave the main model results actual meaning (Hair et al., 2011; Henseler and Sarstedt, 2013).

Model Specification

In this section, the framework of the conceptual model is presented. Specifically, the study's independent, moderating, and dependent variables and their respective indicators are discussed. This section displays the general layout of the model's framework. One independent variable, one is moderating

variable, one dependent variable and a control variable. Figure 1, illustrated below, provides a visual representation of the structure of the model.

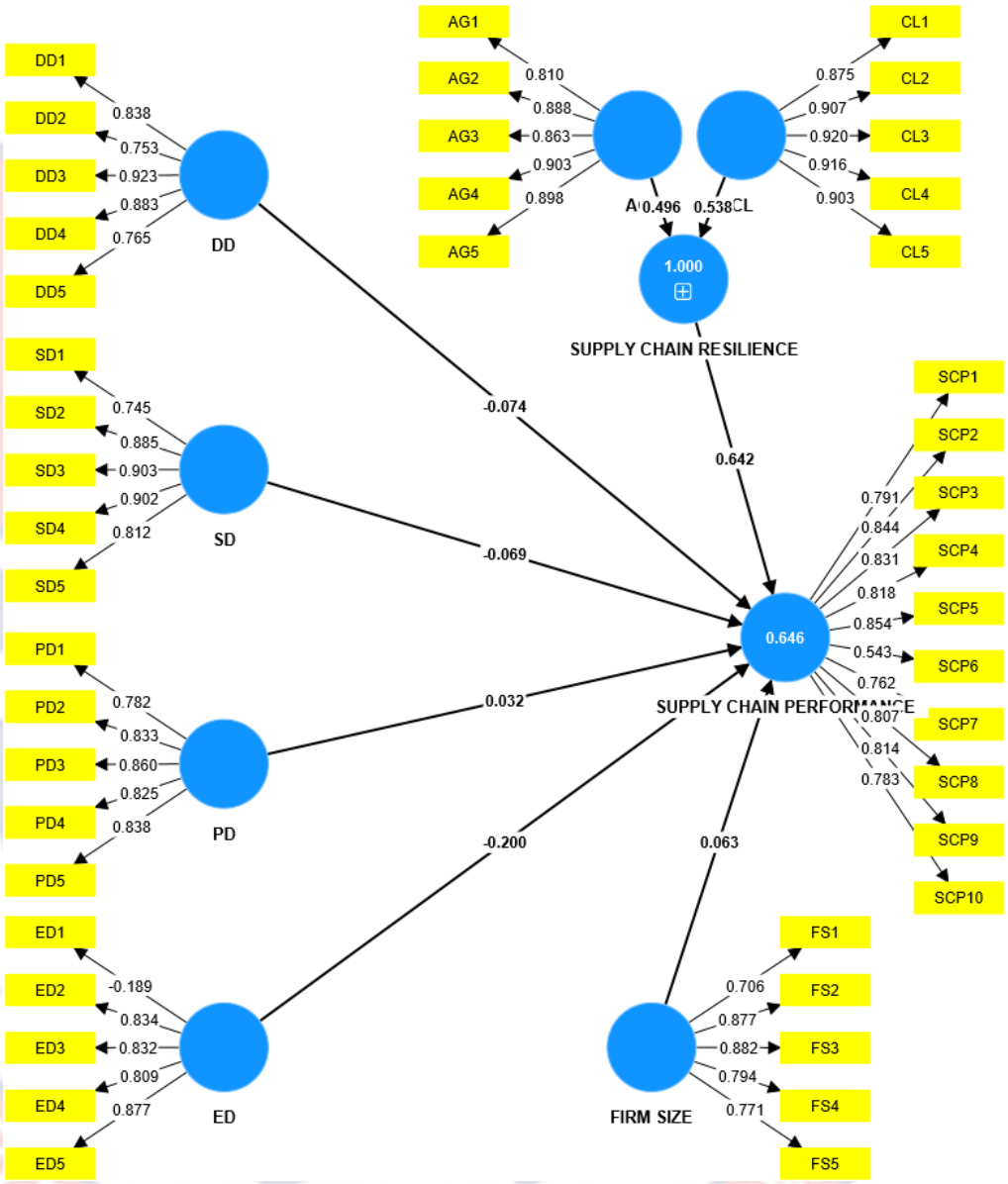

Figure 2: Outer and inner model loadings
Source: Field Survey, (2022)

From figure 1 above, the independent variable had twenty (25) indicators consisting of Demand Disruption (DD1, DD2, DD3, DD4 and DD5), Supply Disruption (SD1, SD2, SD3, SD4 and SD5), Process Disruption (PD1, PD2, PD3, PD4 and PD5) Environmental Disruption (ED1, ED2, ED3, ED4 and ED5) and Firm size (FS1, FS2, FS3, FS4 and FS5). Also, the study's

moderating variable had ten (10) indicators which consisted of Agility (AG1, AG2, AG3, AG4 and AG5) and Collaboration (CL1, CL2, CL3, CL4 and CL5). To conclude, the study's dependent variable, which was represented by Supply Chain Performance (SCP), had ten indicators: (SCP1, SCP2, SCP3, SCP4, SCP5, SCP6, SCP7, SCP8, SCP9 and SCP10). These constructs and their respective indicators were used to draw seven (7) paths using arrows to signify relationships among them.

From the figure above, four (4) arrows moved from the exogenous variables (DD, SD, PD and ED) to the endogenous variable (SCP). Furthermore, formative arrows pointed to the moderating variable (SCR). Again, an arrow from the moderating variable (SCR) pointed at the endogenous variable indicating the relationship between the moderating variable and the endogenous variable. Finally, firm size (FS) played a controlling role in the relationship established.

The model was further assessed by evaluating the constructs' indicator loadings. This evaluation was done to verify that each indicator provides a quality measure of its assigned constructs (Hair, Risher, Sarstedt & Ringle, 2019). The decision rule suggests that each indicator's loading must meet a threshold greater than or equal to 0.07 (≥ 0.70) to signify a quality measure of its construct. Thus, indicator loadings less than 0.70 (< 0.70) were removed from the original model (that is, figure 2 above) since they did not meet the quality criteria. As Hair et al. (2019) indicated, failure to remove them could affect the quality of the outcome of the model. Therefore, all indicator loadings < 0.70 in figure 3 were duly removed (EDI).

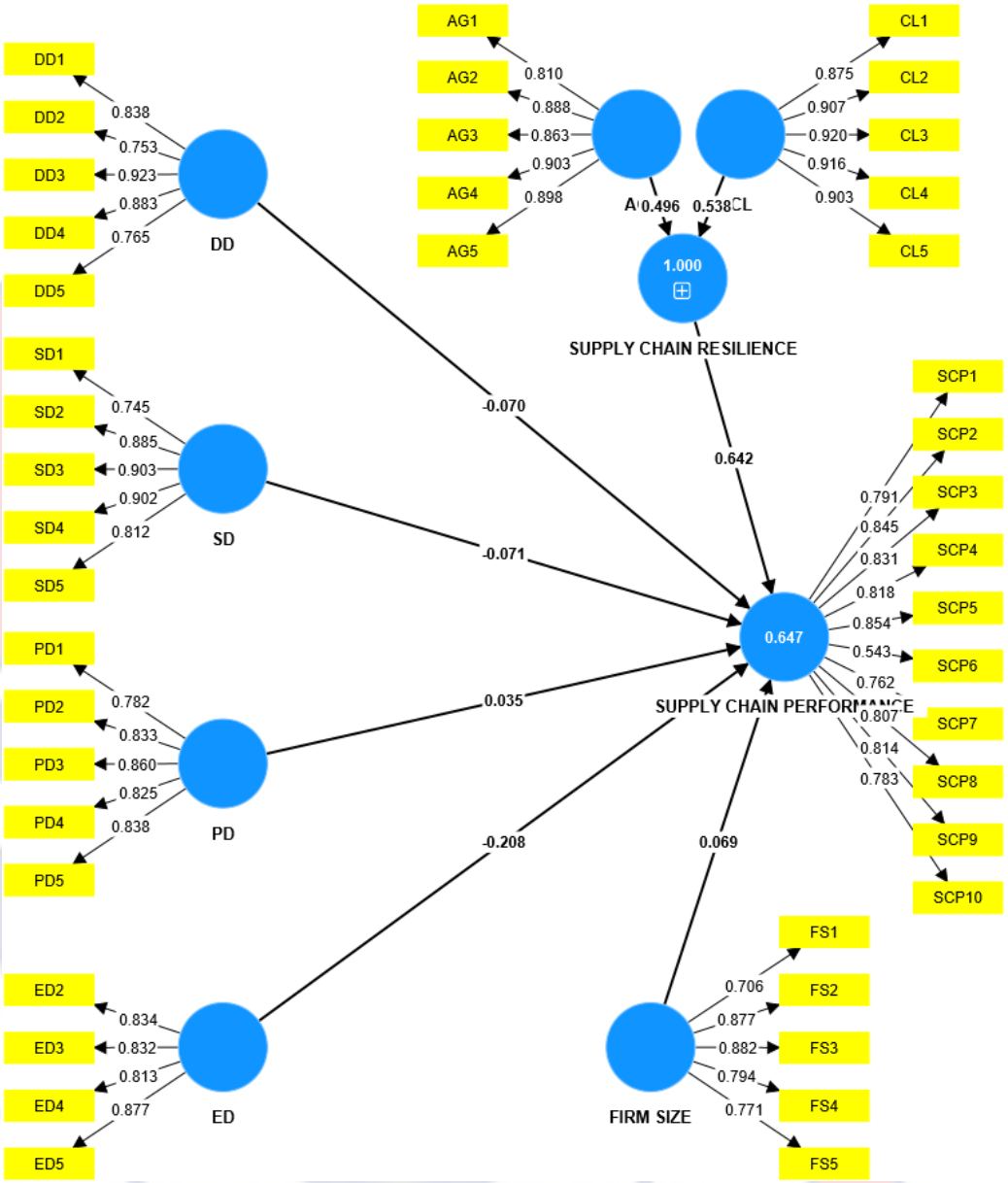

Figure 3: Final model extracted

Source: Field survey, (2022)

Figure 3 provides a clear illustration of the item loadings that demonstrated indication reliability using the minimal threshold of 0.70, following the advice provided by Henseler, Ringle, and Sinkovics (2009).

Measurement of Model Assessment

The findings of the model attributes, including convergent validity (using the average variance retrieved), structural reliability, internal consistency

reliability (IR), and multicollinearity, are shown in Table 12 below (using the Inner VIF values).

Table 12: Assessment of Indicator and Construct Reliability and Validity

Items	CA	Rho_A	CR	AVE	Inner VIF Values
DD	0.890	0.902	0.920	0.697	2.863
SD	0.908	0.936	0.929	0.725	1.068
PD	0.886	0.899	0.916	0.686	2.829
ED	0.861	0.867	0.905	0.704	2.728
FS	0.873	0.934	0.904	0.654	1.961
AG	0.922	0.925	0.941	0.762	3.163
CL	0.944	0.944	0.957	0.818	3.163
SCP	0.932	0.943	0.942	0.623	

CA – Cronbach's alpha, CR – Composite reliability, AVE – Average variance extracted

Source: Field Survey, (2022)

Internal Consistency and Reliability

The study's indicator and construct dependability are shown in table 12. According to Ringle, Sarstedt, and Straub (2012), construct reliability (CR) evaluates how well a construct is assessed by its composite indicators. This implies that CR calls for a strong reciprocal relationship between all indicators linked to a given construct. The construct reliability analysis was achieved using composite reliability to determine how effectively an assigned indicator measures a construct (Bagozzi & Yi, 1988). Henseler (2010) recommended that the minimum cut-off point for item loadings be 0.70 or higher based on the decision and proper regulation.

Convergent Validity

Additionally, Table 12 displays the findings of the study's convergent validity (CV). The most efficient way to check the model's convergent validity is to use the Partial Least Squares-Structural Equation Modelling (PLS-SEM) technique, also termed the Average Variance Extracted (AVE) method (Hair et al., 2011). According to Hair et al. (2012), the AVE demonstrates how the many markers used in the constructions are captured regarding the overall variation brought on by estimating error. The overall average value (AVE) of each variable in the structural equation modelling model was investigated in this study. Hair et al. (2011) and Fornell and Larcker (1981) recommend using an AVE with a minimum of 0.50. According to the data from AVE, all of the latent variables had values greater than 0.50 and ranged from 0.623 to 0.818. This finding established the convergent validity of the derived scale.

Multicollinearity among Exogenous Variables

During the process of analysing the data, multicollinearity was analysed by comparing the "inner" values of the variable information component (table 12) with the "outer" values (table 13). According to Hair et al. (2014), the goal of multicollinearity evaluation is to verify that the path coefficients are free of bias while disregarding the importance of nonlinear findings among independent or determinant factors. This is accomplished by performing the analysis so that the multicollinearity is downplayed. Pallant and Manuel (2007) postulated that VIF values more significant than ten (> 5) indicated multicollinearity among the exogenous variables, which played a role in the assessment of an appropriate PLS-SEM model. The VIF potential values for each construct should, according to O'Brien (2007) and Mingle (2014), be

below the acceptable cut-off point of 5. From table 13 presented below, the inner VIF ratings of the exogenous variable and moderating variables are detailed as follows: Supply chain disruption (DD = 2.863, SD = 1.068, PD = 2.829 and ED = 2.728) and Supply chain resilience (AG = 3.163. CL = 3.163).

Table 13: Multicollinearity among the constructs

	VIF
DD1	4.104
DD2	1.835
DD3	4.147
DD4	2.885
DD5	1.985
SD1	2.147
SD2	3.493
SD3	3.361
SD4	3.306
SD5	1.961
PD1	2.073
PD2	2.545
PD3	2.888
PD4	1.980
PD5	2.569
ED2	2.526
ED3	2.450
ED4	1.859
ED5	2.356
FS1	1.554
FS2	2.405
FS3	2.487
FS4	3.176
FS5	3.176
AG1	2.228
AG2	3.155
AG3	2.604
AG4	4.205
AG5	3.949
CL1	2.899
CL2	3.697
CL3	4.213
CL4	4.218
CL5	3.687
SCP1	2.876
SCP2	4.255
SCP3	3.290
SCP4	3.375
SCP5	3.795
SCP6	1.734
SCP7	3.226
SCP8	4.844
SCP9	4.615
SCP10	3.627

Source: Field survey, (2022)

Table 13 showed that the different indicators' outer Variance Inflation Factor (VIF) values ranged from 1.554 to 4.844. These strong arguments favour Pallant and Manuel's recommendation that all VIF values be less than five (5). (2007). As a result, this research demonstrates that the indicators used to measure various exogenous factors lack the features of multicollinearity. These verdicts align with Ringle, Weade, and Becker (2015) verdict.

Discriminant Validity

Following the suggestions offered by Hair et al. (2011), the researcher examined the model's discriminant validity to assess its quality. Recent researches have used the Heterotrait-Monotrait Ratio (HTMT) ratio and Fornell and Larcker's (1981) criterion to test the discriminant validity. Discriminant validity, as demonstrated by Fornell and Larcker in 1981, guarantees the latent variables' independence. The researchers demonstrated this idea. It is possible to check the underlying model for collinearity problems using discriminant validity (Hair et al., 2014). To satisfy the criteria set out by Fornell and Larcker (1981), the factorial loadings in the pertinent constructs must be greater than all interactions among the latent variables (Chin, 2010). The findings are summarised in table 14, which can be found below.

Table 14: Fornell – Larcker Criterion

	AG	CL	DD	ED	FS	PD	SCP	SD
AG	0.873							
CL	0.872	0.904						
DD	-0.616	-0.643	0.835					
ED	-0.458	-0.541	0.683	0.839				
FS	0.170	0.221	-0.229	-0.172	0.809			
PD	-0.400	-0.493	0.706	0.755	-0.187	0.828		
SCP	0.737	0.771	-0.608	-0.558	0.197	-0.474	0.790	
SD	0.174	0.158	-0.175	-0.201	0.678	-0.084	0.138	0.851

Note: Under the diagonal elements, there is a correlation among the constructs. Diagonal Elements highlighted in Bold

Source: Fornell and Larcker (1981)

Referencing the assessment of table 14's discriminant validity, the factor loadings in each construct are more significant than any other correlation ratings amongst some of the latent variables. Consequently, the discriminant validity that Fornell and Larcker postulated was realised.

The Heterotrait-Monotrait (HTMT) ratio was also utilised to improve the data's robustness to attain discriminant validity. Rigdon et al. (2014), claim that the HTMT is a new instrument for assessing the discriminant validity of notions. Compared to the Fornell and Larcker criterion, the HTMT has demonstrated special assessment by identifying a lack of discriminant legitimacy in studies. Table 15 explains the HTMT ratio in more detail.

Table 15: Heterotrait-Monotrait (HTMT) ratio

	AG	CL	DD	ED	FS	PD	SCP	SD
AG								
CL	0.832							
DD	0.677	0.702						
ED	0.508	0.602	0.779					
FS	0.185	0.214	0.244	0.184				
PD	0.438	0.535	0.791	0.873	0.194			
SCP	0.777	0.801	0.648	0.599	0.190	0.493		
SD	0.180	0.155	0.180	0.220	0.757	0.096	0.143	

Source: Field survey, (2022)

As stated by Wetzels et al. (2009), the correlation ratings among each construct (HTMT) value should be < 0.90 to achieve discriminant validity. Table 15 is an indication that all values met the criteria.

Item Loadings (Structural and Measurement). Validating Higher order construct

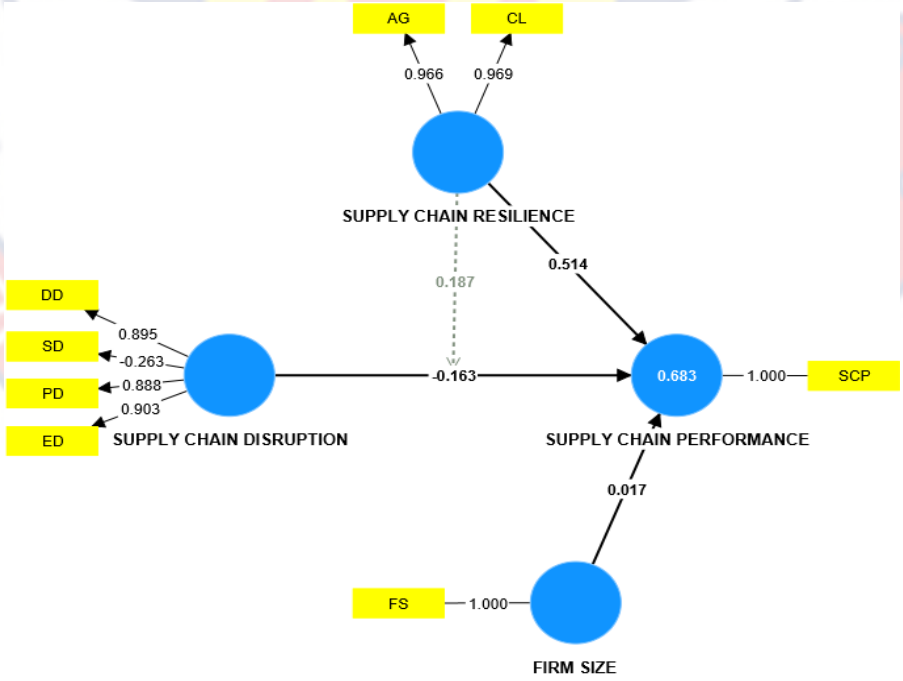

Figure 4: Inner and Outer model loadings for higher-order construct

Source: Field survey, (2022)

As indicated in the figure above, the independent variables (supply chain disruption) had four (4) indicators which consisted of Demand Disruption (DD), Supply Disruption (SD), Process Disruption (PD) and Environmental Disruption (ED). Also, the study's control variable was presented by Firm size (FS). In Addition, the study's moderating variable had two indicators: Agility (AG) and Collaboration (CL). Supply Chain Performance (SCP) represents the study's dependent variable. The model was subjected to evaluating the constructs' indicator loadings. This evaluation was done to verify that each indicator provides a quality measure of its assigned constructs (Hair, Risher, Sarstedt & Ringle, 2019). The decision rule suggests that each indicator's loading must meet a threshold greater than or equal to 0.07 (≥ 0.70) to signify a quality measure of its construct. Thus, indicator loadings less than 0.70 (< 0.70) were removed from the new model (that is, figure 4 above). As Hair et al. (2019) indicated, failure to remove them could affect the quality of the outcome of the model. Therefore, indicator loadings less than < 0.70 was removed in figure 4 (SD).

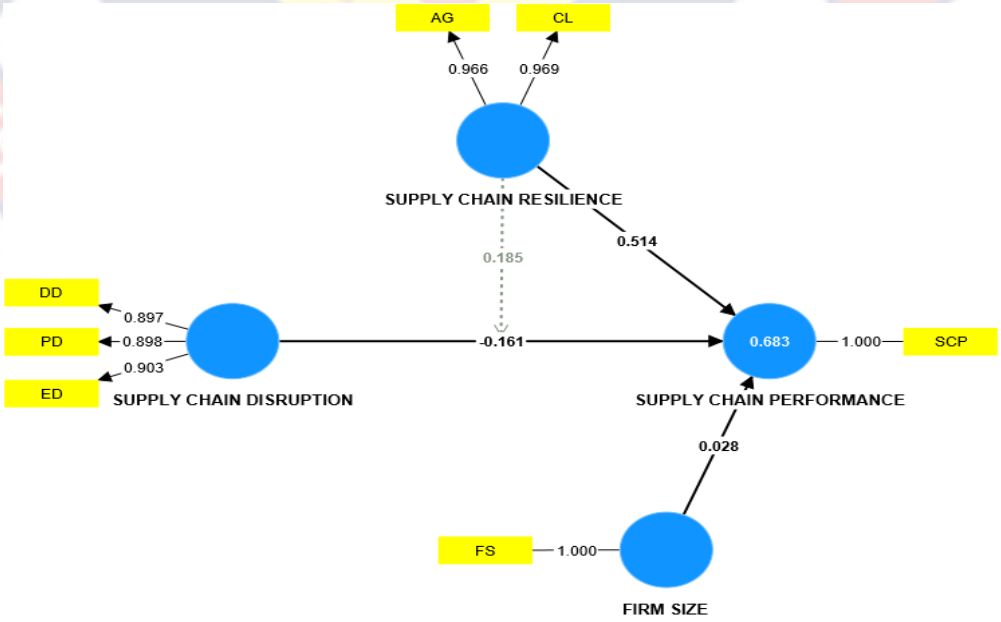

Figure 5: Final model extracted

Source: Field survey, (2022)

Figure 5 provides a clear illustration of the item loadings that demonstrated indication reliability using the minimal threshold of 0.70, following the figures provided by Henseler, Ringle, and Sinkovics (2009).

Measurement of Model Assessment (Higher Order Constructs)

The findings of the model attributes, including convergent validity (CV) utilizing average variance extracted (AVE), structural reliability, and multicollinearity, are shown in table 16 below.

Table 16: Assessment of Indicator and Construct Reliability and Validity for Higher Order Construct

Items	CA	Rho_A	CR	AVE	Inner VIF Values
SCD	0.883	0.893	0.927	0.809	1.669
SCR	0.931	0.933	0.967	0.936	1.977

CA – Cronbach's alpha, CR – Composite reliability, AVE – Average variance extracted

Source: Field survey, (2022)

Construct reliability (CR) describes the degree to which a particular construct is reliably assessed by its indicators while evaluating the indicator and construct consistency of the higher-order constructs shown in table 16. The CR requires a strong mutual association between each indicator linked to a particular construct. According to Bagozzi and Yi (1988), composite reliability was used to analyse the structures' dependability. The decision rule posits a threshold of 0.70 or higher (≥ 0.70) (Henseler, 2010). From the table, the construct reliability using Cronbach's Alpha and Rho_A met the criteria of a minimum cut point of 0.70 (Chin, 2010).

Convergent Validity

To measure the convergent validity of the higher-order constructs, the Average Variance Extracted (AVE), frequently employed to gauge convergent validity in PLS-SEM modelling techniques, was also applied. This was done to determine whether the higher-order constructs have convergent validity (Hair et al., 2012). A minimal cut-off point of 0.50 (0.50) was suggested for an AVE to show convergent validity (Fornell & Larcker, 1981). The table showed that the AVE threshold had been established, with values between 0.809 and 0.936.

Multicollinearity variables

Multicollinearity was examined while analysing the results utilizing the inner (table 17) and external variable information factor (VIF) ratings. According to Hair et al. (2014), the goal of multicollinearity evaluation is to guarantee that the path coefficients are unbiased while dismissing the importance of nonlinear findings across independent or predicting components. This is accomplished by performing the analysis in a manner that is multicollinear. According to Pallant and Manuel's (2007) hypotheses, VIF values that are more noteworthy than 5 (> 5) signify multicollinearity among the exogenous variables, which affects the evaluation of a good PLS-SEM model.

Table 17: Multicollinearity among Higher Order Constructs

	VIF
DD	2.228
PD	2.597
ED	2.987
FS	1.000
AG	3.163
CL	3.163
SCP	1.000

Source: Field survey, (2022)

The data in Table 17 above indicate that the VIF ratings of the different indicators ranged from 1.000 to 3.163, which supports Pallant and Manuel's (2007) assertion that the VIF ratings should be fewer than ten (>5). This suggests that the indicators employed to measure the different variables do not have multicollinearity features (Ringle et al., 2015).

Discriminant Validity for Higher Order Constructs

Discriminant validity (DV) checks for possible collinearity issues in a model (Hair et al., 2017). Hair et al. (2017) proposed that discriminately valid models mostly lack significant levels of collinearity. Studies (Hair et al., 2019; Henseler et al., 2012) have offered three practical approaches for checking for discriminant validity in a PLS-SEM model. These approaches included Fornell and Larcker (FL), cross-loadings and Heterotrait-Monotrait (HTMT) ratio. However, the HTMT approach was discussed because it shows superior output over the other approaches. This is also because it is more robust in detecting the absence of discriminant validity in basic research than the cross-loadings and Fornell-Larcker. The HTMT ratio's result is thus shown in Table 18.

Table 18: Heterotrait-Monotrait (HTMT) Ratio among Higher Order Constructs

	FS	SCD	SCP	SCR
FS				
SCD	0.232			
SCP	0.197	0.648		
SCR	0.209	0.666	0.808	

Source: Field survey, (2022)

When attempting to estimate the HTMT ratio, the "correlation values among the constructs should be less than 0.90" criterion serves as the decision rule (Wetzels, Odekerken-Schroder & Vab Oppen, 2009). To put it another way, discriminant validity is attained when the HTMT scores are less than 0.90. It is possible to determine from Table 18 that all of the HTMT values for the constructs are less than 0.90, with the value of 0.808 in the link between SCR and SCP having the highest significance. This result suggests that the constructs are different from each other. Therefore, it can be concluded that the model met the quality criteria in table 18.

Table 19: Explanation of Target Endogenous Variables' Variance

LV	R^2	f^2	Q^2
SCD		0.048	0.647
SCR		0.418	
SCP	0.683		

"Note: L.V. = latent variable, R^2 = R squared, f^2 = effect size, Q^2 = predictive relevance, q^2 = model's relative impact"

Source: Field survey (2022)

Coefficient of Determination (R^2)

The coefficient of determination indicated by the R^2 value was initially reported in table 19. Hair et al. (2017) proposed that R^2 represents the collective contributions of the exogenous variables (SCD) and (SCR) on the endogenous variable (SCP). Simply put, the R^2 suggests the change in supply chain performance that is linearly accounted for by supply chain disruption (SCD) and supply chain resilience (SCR). Henseler et al. (2009) offered that R^2 values

<0.29, 0.29 - 0.67, and >0.67 signify weak, moderate and robust contributions of the predictor constructs to the dependent constructs.

From Table 19 above, the R^2 value for supply chain performance (SCP) was 0.683, meaning that supply chain disruption and supply chain resilience linearly accounts for about 68.3% of the change in the performance of supply chains of the food and beverages manufacturing firms in Accra. The implication is that SCD and SCR significantly play roles in any change in supply chain performance.

Effect Size (f^2)

Table 19 further reported the independent variable's effect size (f2) by adopting Cohen's (1988) impact criterion. Cohen (1988), suggested that values of 0.02 signify small, 0.15 signify medium, and 0.35 indicates large effect size (f^2), respectively. From the table, SCD, for instance, reported f^2 of 0.048. This means that SCD had small effect sizes on the performance of supply chains. Thus, should there be any change in supply chain performance, SCD plays a minor role in triggering changes in the endogenous variable (SCP). Also, the f^2 of SCR on SCP was 0.418.

This result indicates that the SCR had a large effect size (f^2) on the performance of the supply chain. Therefore, supply chain resilience (SCR) has a large effect in contributing to any change in supply chain performance due to a disruption. Within the context of the food and beverage manufacturing companies in Accra, it is possible to draw the inference, through deduction, that supply chain resilience strategies play a more critical part in improving supply chains' performance when experiencing disruption.

Predictive Relevance (Q^2)

The subsequent analysis to discuss was the model's predictive relevance based on Stone-Geisser's (Q^2) test (Hair et al., 2014). Q^2 is analysed by removing an aspect of the data matrix, analysing the model and predicting the aspect removed based on estimations (Roldan & Sanchez-Franco, 2012). As suggested by Hanseler et al. (2009), $0.02 \leq Q^2 < 0.15$ (weak effect), $0.15 \leq Q^2 < 0.35$ (moderate effect) and $Q^2 > 0.35$ (strong effect). Sarstedt et al. (2014) also revealed that Q^2 is only used for prediction purposes but does not show the quality of the prediction. It could be deduced that all the Q^2 values were > 0 but < 0.35, showing either weak or moderate predictive relevance. More precisely, supply chain disruption (SCD) had a Q^2 of 0.647. Based on Henseler et al.'s (2009) criteria, SCR is a strong predictor of the performance of supply chains (SCP).

Significance of Path Coefficients

After a quality assessment of the PLS-SEM coupled with determining its predictive relevance, the study finally reported the results of the hypothesis. The hypotheses mainly focused on studying the effects of supply chain disruption (SCD) on supply chain performance (SCP): the role of supply chain resilience (SCR) of food and beverage manufacturing enterprises in Ghana, with a primary concentration on the Greater Accra Metropolis. It specifically tested whether SCD plays any significant role in determining the performance of supply chains whilst taking into consideration the significance level of the individual dimensions of SCD on SCP. Also, the model was tested to determine the relationship between SCR and SCP. Again, the model tested whether SCR significantly moderates the relationship between SCD and SCP.

The hypotheses were tested and their scores were reported to show whether significant effects exist among these relationships. It also provided the strength and direction of each relationship using 5000 bootstraps in the Smart PLS 4 software, as proposed by Hair et al. (2021). Table 20 presents the results after testing the hypotheses. The table contained five columns representing structural paths, path coefficients, t-stats, p-values and decision rule of each hypothesis.

Table 20: Structural Equation Model Output and Decision Rule

Structural Path	T Statistics (|O/STDEV|)	β-value	P Values	Decision Rule
SCD -> SCP	2.765	-0.161	0.006	H1 (supported)
DD -> SCP	0.843	-0.070	0.399	H1a (Not supported)
SD -> SCP	1.100	-0.071	0.271	H1b (Not supported)
PD -> SCP	0.593	0.035	0.590	H1c (Not supported)
ED -> SCP	2.826	-0.208	0.005	H1d (supported)
SCR -> SCP	5.113	0.514	0.000	H2 (Supported)
SCD × SCR -> SCP	3.611	0.185	0.000	H3 (Supported)

Note: * = t > 1.96; p < 0.05

Source: Field survey (2022)

The outcome of the control variable (firm size) was first reported in this section. Initial analysis found the firm size to have no significant influence on the relationships established in the study. This means that the size of the firms in terms of total assets and number of employees, for instance, plays no crucial roles in affecting the outcome of the relationships established. As such, firm size does not control any of the established relationships. Thus, the further

analysis excluded firm size (in table 20) since it played no crucial role in this research. The research hypotheses were tested using the t-stat scores proposed by scholars (Hair et al., 2021; Henseler et al., 2015; Ringle et al., 2015). They specifically proposed that t-stat scores ≥ 1.96 match with p-values < 0.05, implying that a significant association exists.

According to Hair et al. (2021), for any significant association to exist between the variables understudy, its t-stat scores should be ≥ 1.96 (p=0.05). This rule means that the directional hypothesis (as shown in the study) is supported if its t-stat is ≥ 1.96, indicating that the link between the constructs is significant. Therefore, "no significant relationship between the variables exists" if the model's t-stat is < 1.96 (i.e., rejecting the directional hypothesis). The hypotheses outcomes were reported and discussed below.

Supply Chain Disruption and Supply Chain Performance.

The study's first objective investigated the effect of supply chain disruption on the supply chain performance of food and beverages manufacturing firms in Accra. To achieve this, five hypotheses were tested to find out whether SCD significantly impart any change in the performance of supply chains in food and beverage manufacturing firms. Hypothesis 1, 1a, 1b, 1c and 1d, for instance, hypothesized that supply chain disruption (SCD) significantly and negatively affects supply chain performance (SCP), demand disruption (DD) significantly and negatively affect supply chain performance (SCP), supply disruption (SD) significantly and negatively affect supply chain performance (SCP), process disruption (PD) significantly and negatively affect supply chain performance (SCP) and environmental disruption (ED) significantly and negatively affect supply chain performance (SCP) within the

study area respectively. From table 20, the results revealed that supply chain disruption has a negative effect on supply chain performance (β=-0.161, t=2.765 and p=0.006). With a β score of -0.161, it could be deduced that about -16.1 per cent (-16.1%) of change in supply chain performance (SCP) is accounted for by supply chain disruption (SCD). Thus, for any unit increment in SCD, SCP is affected significantly and negatively by 16.4 per cent (-16.4%). Also, environmental disruption revealed a significant negative effect on supply chain performance with (β=-0.208, t=2.826 and p=0.005) this is because t-statistics value was greater than 1.96. As such, the direction of the results was in line with the hypothesis, thus the null hypothesis was rejected.

With hypothesis H1a, H1b and H1c, though the direction of the results were in line with the hypothesis, the significance level of these directions were not in line with the hypothesis, thus the null hypothesis was supported. Hence, the hypothesised that demand disruption, supply disruption and process disruption significantly and negatively affect supply chain performance respectively was not supported (β=-0.070, t=0.843, p=0.399 >0.05; β=-0.071, t=1.100, p=0.271 >0.05 and β=0.035, t=0.593 and p=0.590 >0.05).

The study's finding on the effect of supply chain disruption on supply chain performance was in line with the theory of constraints. This theory presents an argument that food and beverages manufacturing firms can be expose to various constraints notably demand disruption, supply disruption, process disruption and environmental disruption (DD, SD, PD and ED) which can hamper the performance of various organizations within the supply chain network. (Goldratt, 1990). This means that the firms understudy is prone to constraints in their operations. This is because, the study found supply chain

disruption as a significant contributor to a reduced performance in manufacturing industries.

This finding is consistent with Peide and Wang (2008), Kim, (2011), and Ocloo, Akaba and Worwui-Brown (2014), who indicated that demand and supply related disruptions do not significantly undermine the performance of manufacturing companies despite their negative effect on organizations. In contrast to this, these results contradict the theory of constraints. The theory of constraints posits that every organization has a limiting factor that prevents it from achieving its intended goals according to Imsit et al., (2014). These limitations including demand disruption, supply side disruption and process side disruption according to Mabin and Balderstone (2020), render a negative effect on the performance of supply chains. The study's finding is inconsistent with the study by Asamoah et al. (2021), Subban (2020) and Andam et al., (2019).

In summary, the results reveal that SCD (DD, SD, PD and ED) plays a significant negative role in determining supply chain performance. As such, a supply chain under disruption is key to determining the performance of supply chains. This means that for food and beverages manufacturing firms in Accra, supply chain disruptions need to be looked at holistically (DD, SD, PD and ED) as a potential limiting factor in improving supply chain performance to ensure better performance of their supply chains. This, in turn, will help the food and beverages manufacturing firms to pay particular attention to disruptions along the supply chain network in their bid to enhance the performance of their supply chains.

Overall, the study's results are consistent with those of Parast and Subramanian (2021), whose research shows that supply chain interruption in China negatively impacts the operation of the overall supply chain network. In 2020, Gunessee and Subramanian looked into how supply chain risks affected how well businesses performed. According to their research, SCD dramatically reduces supply chain performance regarding customer loyalty and dependability. Similarly to this, Gupta and Gupta (2019) concluded that SCD has a significant impact on determining the acceptable performance of manufacturing enterprises' supply chains. Providing evidence that three out of the four potential threats to the interruption of a company's supply chain have a significant impact on that company's performance (supply, demand, and process). Therefore, from a pragmatic standpoint, companies need to be aware of how supply chain disruptions impact their operations and the performance outcomes of the supply chain (Lu et al., 2017).

Supply Chain Resilience and Supply Chain Performance

The significant positive effect of supply chain resilience on the supply chain performance of food and beverages manufacturing firms in Accra was also investigated with one hypothesis. This research specifically hypothesized that supply chain resilience significantly and positively affects the supply chain performance of food and beverage firms. The hypothesis was tested based on the t-statistics (t-stat) scores and it revealed that H2, specifically, had a score of $5.113 > 1.96$ ($p = 0.000 < 0.05$). Based on the t-stat, the decision rule supported the hypothesis, indicating that SCR significantly and positively improved the supply chain performance of food and beverage-producing companies. Table 20 also revealed a Beta (β) score of 0.514, suggesting that about 51.4 per cent

(51.4%) of change in supply chain performance is significantly contributed by supply chain resilience. This outcome suggests that SCR is a vital predictor of the supply chain performance of food and beverages manufacturing firms studied.

These results mean that supply chain resilience strategies are crucial in improving supply chain performance. As a consequence, industrial companies that produce food and drinks need to apply supply chain resilience methods to improve their supply chain's performance output.

This discovery is backed up by the findings of Jain et al. (2017), who stated that implementing a supply chain resilience technique (collaboration) within the supply chain helps firms gain a competitive advantage, thereby reducing the devastating detrimental impact that disruptions have on the performance of supply chains. Similarly, Mofokeng and Chinomona (2019), added that supply chain resilience plays a significant role in determining the recovery speed of the supply chain from a risk event for superior performance of the organisation. Behzadi, O'Sullivan, Olsen and Zhang (2017) also buttressed this finding by concluding that enhancing resilience within the chain network in manufacturing leads to improved business performance of Ghanaian manufacturing Small and Medium Enterprises.

Supply Chain Disruption, Supply Chain Resilience and Supply Chain Performance

The moderating role of supply chain resilience in the relationship between supply chain disruption and performance was also assessed. With H3, a t-statistics (t-stat) value of 3.611 > 1.96 (p=0.000) was obtained, supporting the hypothesis. This result means that SCR significantly influences the

relationship between SCD and SCP, suggesting that any change in SCR leads to a significant change in SCP under disruption. With a β score of 0.185, It was possible to conclude that the investigation discovered a strong connection between the exogenous and endogenous variables. This implies that with any unit increase in SCR, the effect of SCP under disruption will strengthen the effect on SCP by 18.5 per cent (18.5%). Thus, for any unit increment in SCR, the relationship between SCD and SCP is affected significantly and positively by 18.5 per cent (18.5%)

Based on these findings, building resilience into supply chains is necessary if one wants to improve the performance of supply systems when confronted with disturbance. The capability of a supply chain to adjust to foresee unexpected events, react to disturbances, and recoup from them by guaranteeing operations continuity at the required level of interconnectivity and handling the system and function is what is meant by the term "supply chain resilience." It involves explicitly getting ready for and reacting to unforeseen circumstances. According to the study, supply chain resilience ensures that food and beverage manufacturing companies operate better and perform better under disruption.

The result for this finding can be linked with the dynamic capability theory (Eisenhardt & Martin, 2000). This theory highlights the important that the ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (disruption) will help organizations to achieve competitive advantage in their performance (Schoenherr et al., 2019). By leveraging dynamic capabilities, firms can build resilience, adapt to changing environments, and maintain a competitive

advantage even in times of uncertainty and disruption. Integrating dynamic capabilities into supply chain management practices is crucial for enhancing a firm's ability to navigate and recover from disruptions. The results from the study indicate that as manufacturing firms adjust, reconfigure, rebuild and capitalize on their current capabilities and resources in a dynamic environment, they tend to bounce back after a disruptive or rapidly changing environment to increases their performance to a more robust one.

This finding is consistent with Adobor and McMullen (2018), who postulated that supply chain resilience plays a crucial role in strengthening the impact of businesses under disruptions. Again, it was bolstered by the findings of Gligor, Esmark, and Holcomb (2015) and Gligor (2016), that supply chain resilience (Agility and collaboration) is used in strengthening the impact of SCD on SCP. Also, Gabler, Richey, and Stewart 2017 further bolstered the position that supply chain collaboration is a decision-planning tool utilized by businesses to bring the adverse repercussion of disruptions on supply chain performance

Chapter Summary

The chapter discussed the results after testing the hypotheses using the PLS-SEM. The model was initially assessed for quality purposes, and its outcome was discussed in detail. After meeting the decision rules of the quality criteria, the hypotheses were further investigated and the results were discussed. According to the findings of the study, supply chain disruptions (also known as SCDs) significantly impact the efficiency of the supply chains of companies that manufacture food and beverages in Accra. Again, the data pointed to a beneficial influence of supply chain resilience on improving supply chain performance. In conclusion, the resilience of supply networks had a favourable

effect on the performance of supply chains even when they were subjected to interruption in the evaluated food and beverage manufacturing companies.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter's highlights include an overview of the research, its conclusions, and some suggestions based on the research. The discussion was capped off with some recommendations for further investigation.

Summary

The study aimed to investigate the consequence of supply chain disruption (SCD) on supply chain performance, specifically the contribution of Accra-based food and beverage manufacturing companies' supply chain resilience. The aforementioned precise goals influenced the research:

1. examine the effect of supply chain disruptions on the supply chain performance of Accra's food and beverage manufacturing firms.
2. examine supply chain resilience's effect on the supply chain performance of Accra's food and beverage manufacturing firms.
3. examine supply chain resilience's role in the relationship between supply chain disruption and supply chain performance of food and beverages manufacturing firms in Accra.

Using the objectives of the investigation as a guide, three hypotheses were formulated and validated through the application of the quantitative methodology and an explanatory research design. The census method was used to collect data from 152 food and beverage manufacturing enterprises in Accra that were members of the Association of food and beverage manufacturing firms. The target population for this study was comprised of these firms. A viable data set of 135 was obtained with a participation rate of 88.80% due to

the objective usage of standardised questionnaires during the study's data collection phase. The study states that "IBM SPSS Statistics version 26 and Smart-PLS 4" were used to process the primary data afterwards. The study's premise was investigated through the utilisation of the partial least square-structural equation modelling (PLS-SEM), and the investigation findings were extensively addressed in Chapter four. In the parts that followed, the primary focus was on a summary of the significant findings from the study.

In objective one, the study was to investigate the impact of a supply chain disruption on the supply chain performance of food and beverage companies. The findings showed that disruptions in the supply chain had a considerable negative impact, on supply chain performance. The outcome suggests that Accra's registered food and beverage manufacturing enterprises may experience adverse effects along the entire supply chain due to disruptions in the demand, supply, process, and environmental sides. The result also implies that these sources of risks or disruptions along the supply chain can proscribe businesses from achieving the intended goals of the entire chain. As a result, the study discovered that supply chain disruptions could forecast a negative shift in the performance of companies that manufacture foods and beverages.

The second goal examined how the supply chain resilience (SCR) of food and beverage manufacturing companies in Accra affect supply chain performance (SCP). The study's findings indicated that supply chain resilience is essential in working toward improved supply chain performance. Based on this conclusion, it can be deduced that every unit improvement in supply chain resilience will lead to a large and robust unit rise in the performance of supply chains of companies that manufacture food and drinks. Therefore, companies

that manufacture food and beverages can considerably improve their overall performance by implementing efficient ways to increase their supply chain's resilience.

Finally, the study examined supply chain resilience's moderating role in the link between supply network disruption and supply chain performance in food and beverages manufacturing firms in Accra. Following the PLS-SEM analysis, the results showed that the moderating role of supply chain resilience strengthened the association between supply chain disruption and supply chain performance. This is because it was shown that the impact of supply chain disruption on supply chain performance was positively impacted by supply chain resilience. As a result, it is essential to any adjustment in the efficiency of supply chains that are troubled among Accra-based enterprises that produce food and drink. Therefore, each unit change in the resilience of supply chains will translate to a unit change in the performance of supply chains when they are subjected to disruption.

Conclusions

The study's objective was to investigate how supply chain interruptions affect the supply chain performance of businesses in Accra that manufacture food and drinks and investigate the role that supply chain resilience plays in this dynamic. This goal was accomplished by creating three primary objectives and seven hypotheses throughout the investigation. From the most important findings, we were able to make the following conclusions:

In terms of objective one, the study found supply chain disruption significantly affects food and beverages manufacturing firms' supply chain performance. This finding was supported mainly by related studies that

suggested that disruptions in the supply chain have significant negative consequences on the performance of supply chains. Researchers also added that though demand, supply and process disruptions insignificantly affect supply chain performance, the impact of the environmental side disruption is significant (Pagell et al., 2010). Therefore, the study concluded that disruptions within the supply chain holistically led to a significant negative impact on the supply chain performance of Accra's food and beverage manufacturing firms.

The study also discovered that supply chain resilience considerably enhances the performance of the supply chains of Accra-based companies that manufacture food and beverages. According to the study's findings, adopting supply chain resilience methods is essential for encouraging manufacturing companies that produce food and drinks to achieve high levels of supply chain performance.

Finally, it was discovered that supply chain resilience significantly and positively moderated the negative connection between supply chain performance and the supply chain performance of food and beverage manufacturing enterprises in Accra. The study concluded that supply chain resilience positively strengthens disruptions' negative consequences on supply chains' performance of food and beverages manufacturing firms in Accra.

The study concluded that supply chain disruption negatively impacts supply chain performance within Accra's food and beverages manufacturing firms. Among these disruptions, sources include demand-side disruption, supply-side disruption, process-side disruption and environmental-side disruption. The study also discovered that supply chain resilience significantly contributes to improving the performance of supply chains of food and beverage

manufacturing companies in Accra. Finally, the study's analysis reveals that supply chain resilience contributes significantly to moderating the association between supply chain disruption and supply chain performance of food and beverage manufacturing firms in Accra.

Recommendations

The report provides the following suggestions in light of its findings and conclusions.

Various literature mentioned in the study's chapters one and two indicates that Ghanaian food and beverages manufacturing firms are characterized by complex and nested supply chain networks, making it possible for various sources of disruption. To overcome this disruption, the study recommends that supply chain practitioners within the food and beverages manufacturing industry try as much as possible to reduce non-value-adding partners and streamline activities within the supply chain network to prevent specific risks associated with complex supply chain networks.

Again, the study revealed that food and beverages manufacturing firms are prone to various sources of disruptions, including demand disruption, supply disruption, process disruption and environmental disruption, which adversely affect the performance of supply chains. To overcome these issues, the study suggests that supply chain professionals within the food and beverage industry could improve the overall performance of their supply chain if they employ resilience strategies to reduce the negative effect on the supply chain.

To attain a competitive advantage, managers must also apply effective forecasting systems to prevent demand and supply-related disruptions. Furthermore, managers of food and beverages manufacturing firms should

constantly check and ensure maintaining the systems and equipment to avoid failure in the operations.

By combining the strengths of Theory of Constraints and Dynamic Capability Theory, manufacturing firms can develop a comprehensive framework to enhance supply chain resilience. Strengthening supplier relationships, improving visibility, developing contingency plans, and leveraging dynamic capabilities are essential strategies for building resilience. Policymakers should support these efforts by creating an enabling environment that fosters collaboration, investment, and innovation in supply chain resilience. The recommendations presented in this literature review offer valuable insights for manufacturing firms and policymakers seeking to navigate disruptions effectively and ensure the continued efficiency and sustainability of their supply chains.

Lastly, authorities and policymakers are urged to provide adequate infrastructure development and support to stabilise operating costs to facilitate material, financial, and information flow and prevent disruptions resulting from the delivery of final consumer items.

Suggestions for Further Research

This study examined the effect of supply chain disruption on supply chain performance and the role of supply chain resilience of food and beverages manufacturing firms in Accra, Ghana. However, the study was limited in geographical scope and industry; thus, subsequent studies could tackle this limitation by including food and beverage manufacturing firms across the country. This would help enrich the current data and enhance the generalisation of findings across all food and beverages manufacturing firms in Ghana.

Also, this study relied on the quantitative approach; thus, further researchers could adopt the mixed approach to obtain both qualitative and quantitative results. Finally, researchers could also improve the current literature by focusing on other manufacturing enterprises, including pharmaceuticals, paper and plastic processors, and sachet water producers, among others, across the country or other developing economies. These suggestions would help expand existing literature on supply chain disruptions, resilience and performance, thereby strengthening policies.

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APPENDIX

University of Cape Coast

School of Business

Dear Sir/Madam,

I am a graduate student in my final year at the University of Cape Coast, majoring in supply chain management. This survey is intended to gather responses on the "***Effect of Supply Chain Disruption on Supply Chain Performance, the role of Supply Chain Resilience***".

Please mark {√} in answer to the questions

SECTION A: SUPPLY CHAIN DISRUPTION

This part describes the sources of supply chain disruption. Four (4) measurements have been discovered, with their corresponding statements applying to you. Please check **(**√*)* in the appropriate box your extent of agreement with following statements. **With 1 – Strongly disagree to 7 – Strongly agree.**

No.	**Sources of Disruption**	1	2	3	4	5	6	7
	DEMAND DISRUPTION							
DD1	We receive unanticipated or unstable demands from our customers							
DD2	We are exposed to distorted information from our vendors about orders or demand quantities							
DD3	Our firm experiences unusual customer payment delays							
DD4	We receive a request from the customer to expedite pending orders.							

DD5	Our customers easily switch to other product substitutes							
SUPPLY-SIDE DISRUPTION								
SD1	Our suppliers perform poorly on their logistics capability (e.g. Delivery dependability, order fill capacity)							
SD2	We encounter supplier quality problems							
SD3	We encounter supplier loyalty problems							
SD4	Our suppliers are reliable							
SD5	Our supply market is characterized by capacity fluctuations or shortages on the supply markets							
PROCESS SIDE DISRUPTION								
PD1	Unexpected technological setbacks are a common occurrence in our operations.							
PD2	Our ability to deliver goods or services is somewhat constrained.							
PD3	Our goods or services frequently have issues with quality.							
PD4	Our supply chain is characterized by a large number of members							
PD5	Our employees occasionally work in harsh or dangerous environments.							
ENVIRONMENTAL DISRUPTION								

ED1	International restrictions affect our company							
ED2	Natural disasters (e.g. Flood, earthquake, extreme climate conditions) frequently affects our company.							
ED3	Our industry is characterized by competition							
ED4	Changes in the political environment affect our company negatively. (eg. Introduction of new laws, stipulations)							
ED5	Public opinion exerts significant pressure on our operations							

SECTION B: SUPPLY CHAIN PERFORMANCE

Kindly order your extent of agreement with the statement that the sources of disruptions impact your company's supply chain performance on a scale of 1 to 7. Kindly choose your extent of agreement with following statements. **With 1 – Strongly disagree to 7 – Strongly agree.**

No.	Supply Chain Performance	1	2	3	4	5	6	7
SUPPLY CHAIN PERFORMANCE								
SCP1	Our company is able to provide desired quantities on a consistent basis							
SCP2	Our company is able to meet quoted or anticipated delivery dates on a consistent basis							
SCP3	Our company is able to satisfy customers within the supply chain on a consistent basis							
SCP4	Our supply chain can reduce manufacturing lead time							
SCP5	Our firm has recorded an increase in an overall competitive position							
SCP6	We adapt supply chain processes to reduce new product development cycle time							
SCP7	Our supply network can change production settings and procedures.							
SCP8	Our supply chain's information systems can assist with managing transportation and distribution.							

SCP9	Our supply chain can change delivery modes							
SCP10	Our supply chain can adapt to and handle changes in demand, such as seasonality. .							

SECTION C: SUPPLY CHAIN RESILIENCE

This section describes various supply chain resilience strategies. Two (2) measurements have been discovered with their corresponding statements applying to you. Kindly choose your extent of agreement with following statements. **With 1 – Strongly disagree to 7 – Strongly agree.**

No.	Supply Chain Resilience	1	2	3	4	5	6	7
AGILITY								
AG1	We adjust supply chain resources to take into account the abrupt changes in supply and demand.							
AG2	We modify supply chain procedures to cut down on lead times.							
AG3	We streamline supply chain operations to get rid of unnecessary steps.							
AG4	We change the way the supply chain works to shorten the time it takes to make a new product.							
AG5	Our supply chain's information systems can help manage transportation and distribution.							
COLLABORATION								

CL1	Our clients are willing to postpone their orders when production capacity is impaired by disruption.							
CL2	Our company shares risks by investing directly in suppliers and customers.							
CL3	Our company works with supply chain partners to establish new markets and consumer response.							
CL4	Our company and its supply chain partners work together to make their products or processes.							
CL5	Our company and supply chain partners frequently communicate when issues arise.							

SECTION D: SIZE OF FIRM

On a scale of 1 – 7, kindly choose your extent of agreement with following statements. **With 1 – Strongly disagree to 7 – Strongly agree.**

	FIRM SIZE	1	2	3	4	5	6	7
FS1	Our organization has the needed resources to manage its disruption issues							
FS2	Our company has policies to contend to disruption related issues							
FS3	Our company has adequate employees to curb issues related supply chain disruption							
FS4	Total assets are of our company is adequate to guarantee better implementation of resilience strategies.							
FS5	Our firm has the needed capacity to detect disruption related issues.							

SECTION E: RESPONDENTS' DEMOGRAPHICS INFORMATION

1. Gender

[ ] Male [ ] Female

2. Age Range

[ ] 20-30 years [ ] 31-40 years [ ] 41-50 years [ ] 51 years and above

2. Educational Background

[ ] Senior High School [ ] High National Diploma [ ] Bachelor's Degree

[ ] Postgraduate

[ ] Others (please specify)…….....

3. Years of experience

[ ] 1-5 [ ] 6-10 [ ] 11-15 [ ] 16-20 [ ] Above 20

4. Position

[ ] Procurement/purchasing/supply chain manager [ ] Production/Operations manager [ ] Other managers

SECTION F: COMPANY PROFILE

1. Firm's Age

[ ] > 5 years [ ] 6 – 30 years [ ] < 30 years

2. Firm size (Number of Employees)

[ ] Less than 20 [ ] 21 – 40 [ ] 41 – 60 [ ] 61 – 80

[ ] 81 and above

3. Ownership structure

[ ] Locally [ ] Foreign [ ] Local and Foreign

THANK YOU FOR PARTICIPATING