UNIVERSITY OF CAPE COAST

EFFECT OF SUPPLY CHAIN UNCERTAINTY ON THE PERFORMANCE OF POULTRY FIRMS IN DORMAA AHENKRO MUNICIPALITY, GHANA: THE MODERATING ROLE OF SUPPLY RISK MANAGEMENT

BERNARD BONSU-BANDOH

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BY

BERNARD BONSU-BANDOH

A thesis submitted to the Department of Marketing and Supply Chain Management, School of Business, College of Humanities and Legal Studies, University of Cape Coast, in Partial fulfilment of the Requirements for the Award of Master of Commence in Procurement and Supply Chain Management

JUNE 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature …… Date…….....

Name: Bernard Bonsu-Bandoh

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast

Supervisor's signature …… Date ……

Name: Dr Dominic Owusu

ABSTRACT

Supply chain uncertainty associated with global supply chain management has created a discourse among practitioners and academics. This event is evident in the businesses as supply chain management uncertainties keep growing, thus threatening the entire network flow and performance. This study aims to provide empirical evidence for supply risk management moderating supply chain uncertainty and performance in poultry firms. The study used an explanatory research design backed by a quantitative research approach. The population of the study was 182 registered members of the Dormaa Poultry Farmers Association. The census sampling technique was used for the study, thus all 182 registered members. The study's findings showed that the predictive capacity of supply chain uncertainty to cause a positive but weak variance in performance was statistically significant, and the predictive capacity of supply risk management to cause a positive but weak variance in performance was also statistically significant. Again, the findings showed that supply risk management significantly moderated the relationship between Uncertainty and performance. It was, thus, concluded that the management of these poultry farms can, therefore, put in place clear measures that can help identify and deal appropriately with Uncertainty and supply risk management practices that brought about the positive variance performance. It was recommended for the various poultry farms to institutionalize periodic research in its management of Uncertainty to timely diagnose grey areas in its Uncertainty that could be well-managed scientifically to improve the impact and policies on the performance of the poultry industry.

KEYWORDS

Supply chain uncertainty

Supply risk management

Firm performance

Poultry firms

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Truly words cannot express my gratitude to you; God bless you. I cannot forget the positive influence of my course mates as a source of inspiration throughout my study and for assisting me in sourcing information and materials for this project.

DEDICATION

To my dear wife, Ms. Amina Ahmed

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LIST OF ACRONYMS

SRM: Supply Risk Management

SC: Supply Chain

CSR: Corporate Social Responsibility

GPP: Ghana Poultry Production

CMB: Common Method Bias

DPFA: Dormaa Poultry Farmers Association

CHAPTER ONE

INTRODUCTION

Introduction

Supply chains worldwide have always been stricken by both predictable or unforeseen activities that threaten their cost-effectiveness and steadiness. In addition, the uncertainty and risk management associated with supply chains usually lead to damage, delays, and losses, negatively affecting performance (Sanchez-Rodrigues *et al.*, 2010). Regardless of the significance of preventing and managing the uncertainty in the supply chain, relatively little is known about how supply risk management can effectively mitigate the negative impacts of these threats (Chang *et al.*, 2015).

However, practitioners and researchers have, hence, been interested in investigating the reasons of those events in an effort to moderate the results of the related risks. This concern has expanded drastically over the last two decades for three major motives. The chapter offers the basis for the entire study. It includes the introduction, study background, problem statement, study goals, research questions, importance, the study scope, restriction, meaning of words, and study organization. This study aimed to examine the effect of supply risk management on the relationship between supply chain uncertainty and performance of poultry farmers in Ghana.

Background to the Study

In Ghana, Commercial hen manufacturing consists commonly of layer manufacturing devices or broiler production devices. Commercial poultry production in Ghana can be categorized into large-scale (over 50,000 birds), medium-scale (10,000 – 50,000 birds) and small-scale (less than 10,000 birds)

enterprises. Individuals or a family privately own domestic and commercial farms. According to Azumah *et al.* (2018) the trend of farm animals in Ghana showed that poultry topped from 2007 to 2016 proportional to livestock- sheep, goats and even though the region grew by only 8.4% in 2017. According to the Ghana Poultry Project (GPP) there are 29 large scales commercial poultry farms currently in Ghana and mostly found in the Ashanti region (13), Brong Ahafo (12) and Greater Accra region (4).

The poultry supply chain in Ghana is highly characterized by multiple nodes with numerous actors whose activities are highly interdependent on the nature of the product they deal in (Nti, 2018; Kusi *et al.*, 2015). These actors perform different but interdependency functions within the commercial poultry chain, which collectively lead to improved performance among these supply chain actors. Horizontal and vertical industries characterise the sector with various value chain systems (Shamsuddoha *et al.*, 2013). Recent occasions, including the COVID-19 pandemic, are a shocking incident which refers to an excessive-effect low-chance event that exceeds in scale some of the biggest disruptions in the past two decades, including SARS in 2003 and H1N1 (Koonin, 2020). The Covid-19 pandemic substantially affected finance, lead time, customer, and manufacturing performance in many commercial enterprise corporations around the globe.

The transportation of farm produce like maize from food-producing areas within the country to market centres was in shortage during the Covid-19 pandemic. Also, decongestion and closure of some market centres to enforce social distancing among traders reduced food supplies for birds leading to a hike in food prices in most urban markets across the country, especially during the

early days of the lockdown (Asante & Mills, 2020; Gakpo, 2020). When the authorities announced and enforced the COVID-19 lockdown in Ghana, poultry farmers procured raw materials in advance as farmers were not sure how long the lockdown would be, which led to huge losses. There was no market for the finished products as most clients had downgraded or closed completely (Tasiame *et al.,* 2020). According to the Ghana Poultry Farmers Association, supply exceeded demand, and this glut in chicken and eggs has been a major loss to the poultry industry (Badu *et al.*, 2020).

In addition to a demand shock and limited flexibility in the egg supply chain uncertainty, there was a packaging shortage. The standard dozen-egg carton could not meet the shift from food service to retail. Consumers saw packaged eggs (if they were on the self) in large quantities (e.g., four dozen cartons) initially intended for the food service industry. With a surge in demand and a supply chain uncertainty that could not adjust quickly, prices at the wholesale level for eggs skyrocketed. Unlike all other proteins, which saw a decrease in prices at the wholesale level, egg prices peaked in the first week of April, which were 250% higher than in 2019. Overall, there have been serious income disruptions for women livestock farmers with serious consequences on household essentials and nutrition.

These uncertainties in the supply chain process in the poultry firms left many farmers handicapped and unable to meet the daily production requirement, leading to a subsequent decline in egg production in the nation. Consistent with these studies, the potential effects of the COVID-19 pandemic on enterprise and the worldwide economic system may be profound in both the short and long time. Supply chains are expected to enjoy the heat of the

worldwide monetary crisis in the longer term (Cui *et al.*, 2020). Supply chain uncertainty and risk management are not always new, as doing business calls for the popularity of a few degrees of risk inside organizations (Olson & Wu, 2011). Barry (2004) cited that it is also vital to hold the uncertainty lens as one of the firm's competencies and for its competitiveness and viability.

The sphere of supply chain uncertainty emerged because of several reasons, such as the latest crises like the Covid-19 pandemic, globalization, extra dynamic marketplace, and cutting-edge supply chains, which might be significantly greater susceptible than traditional integrated manufacturing techniques (Hoffmannn *et al.*, 2013). Again, the complexity of the modern supply chains and the improved reliance on the competitive advantage of the supply chains as real results in an accelerated exposure to supply chain uncertainty. In step with the Business Continuity Institute (BCI), 81 per cent of worldwide firms suffered a minimum of one supply chain disruption in 2013 as compared to 78.6 per cent in 2010 (Alcantara, 2014), indicating that the disruption of supply chains around the world has reached a pervasive stage.

Research in supply risk management has included many different methodologies, from qualitative ones such as empirical studies and conceptual theories to quantitative approaches such as mathematical optimisation, statistics and simulation (Ghadge *et al.*, 2012). In terms of implemented strategies, supply risk management can follow either a reactive or a proactive strategy: the former is applied after a risk materialises. At the same time, the latter allows identifying and assessing risks before they occur to prepare suitable mitigation and contingency plans. As far as this research is concerned, overall performance is

organizational efficiency, masking properly non-monetary and monetary overall performance.

One of the key traits of supply chain uncertainty is an underlying construct of the transaction cost theory: Uncertainty (conceptualized as environmental and behavioural Uncertainty (Ellis *et al.,* 2011). In conditions with high Uncertainty, transaction expenses may be better (Hoffmann *et al.*, 2013), while overall performance is probably lower whilst Uncertainty is present (Jun *et al.,* 2011). This observation implies that supply risk management is likely lower in a trade relationship comprising high Uncertainty – compared to conditions with low Uncertainty. On the other hand, supply risk management activities have a tremendous influence on firm performance (Giannakis *et al.,* 2008). Supply risk management consists of numerous levels.

Statement of the Problem

The uncertainty and risk management associated with supply chains usually lead to damage, delays, and losses, negatively affecting performance (Sanchez-Rodrigues *et al.,* 2010). Regardless of the significance of preventing and managing the uncertainty in the supply chain, relatively little is known about how supply risk management can effectively mitigate the negative impacts of these threats (Chang *et al.*, 2015). Moreover, most of the study on supply chain uncertainty is focused on the courier industry (Wang, 2016), manufacturing and construction (Ritchie & Brindley, 2017; Kern *et al.*, 2012), small and medium scale enterprise (Hariharan *et al.,* 2018), and automotive industry (Barvarsad *et al.*, 2014) and this has limited the application of findings in different industries. Therefore, the research models are investigated and validated in the poultry industry.

Preceding research focused on supply chain uncertainties (Simangunsong *et al.*, 2012); however, lack of decision on supply chain uncertainties is a problem, which has additionally been raised in preceding research (Borut *et al.*, 2012). However, some research (Hoffman, 2006) entreated that the supply chain uncertainty negatively affects the firm's performance. Others like Merschmann and Thonemann (2011) determined no sizable relationship between risk, Uncertainty and performance, even as Saminian-Darash and Rabinow (2015) argued that supply risk management and supply chain uncertainty might have positive influences on the future. Studies recommend that performance size is a challenging assignment confronted by practitioners and scholars (Agyabeng-Mensah, *et al.*, 2020).

Agyabeng-Mensah *et al.* (2020), in addition, claim that overall company performance was commonly measured from the financial perspective considering income-making corporations do not forget growing shareholder wealth as their essential aim without considering the non-economic performance of the firm. Again, researchers have been concerned about the lack of research on non-financial and financial indicators that combine company performance, so it is necessary to bridge the gap. However, it is possible to measure the impacts under the same category of uncertainties and supply risk management in the separate companies because the same category of uncertainties and supply risk management may cause common problems in companies.

Past studies on supply risk management presented varying strategies ranging from intra-organizational strategies (i.e., strategic stock investment, flexibility, risk management culture), supplier management (i.e., supplier

sustainability, flexible sourcing, alternative supplier) to demand management (i.e., postponement, dynamic pricing, multiple transportation modes) (Gouda & Saranga 2018; Namdar *et al.*, 2018; Vilko & Hallikas 2012). Experience drawn from cases such as the Philips/Ericsson one in 2000 (Lalon, 2020; Pavlov *et al.*, 2019) led researchers to focus more on proactive strategies since delayed risk responses have proven to be significantly damaging. However, even though these risk management tools are established, there are few empirical studies on the applicability and impact of these uncertainty and supply risk methods on the actual performance of firms, especially poultry farms (Agyabeng-Mensah *et al.*, 2019).

Regardless of the significant advances in research and practice, many organizations and, by extension, poultry farmers experience supply chain uncertainty not only in integrating activities with Supply Chain (SC) partners (Munir *et al.*, 2020) but they also find it difficult to integrate activities within an organization (Wang *et al.*, 2020). There are limited studies on the relationship and effect of supply chain uncertainty on inclusive firm performance (Raghunath *et al.*, 2021). However, businesses and, for that matter, the poultry industry that does not integrate Uncertainty and risk management are mostly disadvantaged by such negligence (Yang *et al.*, 2021). There is a specific gap in the studies regarding supply chain uncertainty, and the performance of poultry farmers in Ghana, with supply risk management as the mediating role.

A lot of studies have conducted on supply chain uncertainty and performance (Wang, 2017; Wang, Jie & Abareshi, 2015), but few of the studies included supply risk management as the moderating variable (Hoffmannn, Schiele & Krabbendam, 2013). In addition, a lot of studies have conducted on

supply risk management and performance, but none of the studies included supply chain uncertainty as the dependent variable (Munir, Jajja, Ghatha & Farooq, 2020; Munyuko, 2015). Again, few study has been conducted on supply chain uncertainty and performance with supply risk management as the moderating variable. That is why Hoffmannn, Schiele and Krabbendam (2013) suggested that further studies on supply chain uncertainty and performance should include one or more additional variables other than either supply chain uncertainty or performance or both.

With respect to the knowledge gap this study contributes to the literature by analyzing the influence of the various supply risk management on the relationship between supply chain uncertainty and performance of poultry farmers in Ghana, which is rapidly growing and facing a lot of risk and uncertainty issues. On the strength of the above submissions, this investigation was then piloted to evaluate the effect of supply chain uncertainty on the performance of poultry farmers in Ghana: The moderation role of supply risk management. Specifically, the study will focus on poultry farmers in the Dormaa Ahenkro Municipality in the Bono Region of Ghana.

Purpose of the Study

The research assesses the moderation role of supply risk management in the relationship between supply chain uncertainty and firm performance of poultry farmers in Ghana.

Research Objectives

Specifically, the study sought to:

1. assess the effect of supply chain uncertainty on firm performance in the poultry farms in Ghana.

2. determine how supply risk management practices moderates the relationship between supply chain uncertainty and firm performance of poultry farms in Ghana.

Research Hypotheses

These hypotheses were developed to regulate the conduct of the study.

H_1: Environmental uncertainty is negatively associated with firm performance.

H_2: Behavioural uncertainty is negatively associated with firm performance.

H_3: Risk monitoring weakens the effect of behavioural uncertainty on firm performance.

H_4: Risk monitoring weakens the effect of environmental uncertainty on firm performance.

H_5: Risk mitigation weakens the effect of behavioural uncertainty on firm performance.

H_6: Risk mitigation weakens the effect of environmental uncertainty on firm performance.

H_7: Supply risk management process maturity weakens the effect of behavioural uncertainty on firm performance.

H_8: Supply risk management process maturity weakens the effect of environmental uncertainty on firm performance.

Significance of the Study

The outcomes of the investigation will be of vast help to many different owners. Firstly, it is anticipated that the outcomes of this investigation will deliver insights that owners of poultry farmers in Ghana can rely on to make

scientifically informed decisions as to how to manipulate the predictors considered in the model to improve the level of performance in the poultry industry. Correspondingly, the conclusions will provide enough evidence on how these poultry farms' managers can validate their risk management to improve and upgrade their performance. For policy purposes, the study provides insights guided by the empirical findings in terms of policy recommendations to policymakers in the poultry industry as to how policies can be formulated to enhance the efficiency of supply chain integration among commercial poultry farmers.

Once more, the outcomes of this research will be useful for supply chain practitioners as it will provide information about the measurement of the constructs and how these constructs could be manipulated to produce the desired output state in work settings. Students and researchers may also tap into the rich information this study will bring on board after the research. The investigation will serve as a source of literature regarding the interrelationship between Uncertainty, risk and performance. It will also provide research gaps that can be exploited by students and researchers alike to build better knowledge concerning the association among the constructs that were investigated in this research.

Delimitation of the Study

The study sought to assess the how the moderating effect of supply risk management influence the effects of supply chain uncertainty on the firm performance of poultry farms in Ghana. The study employed an explanatory research design because the approach to data analysis was quantitative. The study targeted poultry farms in Ghana. Poultry farms in Ghana were chosen

because of the uncertainty poultry firms face in their supply chain activities and their implementation of supply risk management has influenced firm performance negatively. Also, their population was readily accessible. The study targeted 182 poultry farms within Ghana. All poultry farms were sampled and were selected through the census sampling technique. The study targeted owners and managers of poultry farm in Ghana and were surveyed through self-administration of the questionnaire.

Limitations of the Study

Given the nature of the statistical choice for the data analysis, it is imagined that the regression model was limited in the sense that it only relied on the averages of the methods (indicators) of the dependent variable (firm performance) to compute the transformed independent variable that aided the holistic approaching to analyse the dependent variable. This can be handled when Smart PLS is used to analyse the data. Similarly, since the study targeted only commercial poultry farms in Ghana, the findings cannot be generalized to cover all poultry farmers, including domestic poultry farms in Ghana. This can be handled by conducting the study on all poultry farms in Ghana when Smart PLS is used to analyse the data. The quantitative analysis approach often offers limited, impractical knowledge using measures that capture only a small percentage of the originally studied definition.

This raises the problem of whether the analysis really tests what the researcher says it is doing. Quantitative analysis is thus of poor validity. The selection of the questionnaire as the research tool could lead to a misinterpretation of the respondents' questions and the respondents' movements, reactions, statements and emotions remained unknown.

Definition of Terms

*Supply Chain Uncertainty***:** Is defined as uncertainties that may occur at any point within a global supply chain network, leading to positive or negative outcomes.

Supply Risk Management: Deals with firm's activities to recognize, monitor and mitigate these supply risks.

Performance: It is the extent to which firms achieve their production, human resource, marketing and financial goals.

Organisation of the Study

Chapter one is made up of the introduction and, consequently, the context of the studies, the declaration of the problematic statement, the investigation's aims, the examination's importance, delimitations, and limitations to the investigation. Chapter Two focuses on an extensive literature review guided by the study's theoretical, conceptual, and empirical themes and cognizance of specific research objectives. Interrelationships among the concepts will also be examined and established. This section will provide means to evaluate the findings in the light of empirical claims.

Chapter three illustrated the methodology employed for data gathering and the appropriate statistical and analytical tools that will be used for analysing the data outcomes accrued during the research. Chapter Four dealt with the presentation of the results and discussion. The discussion will cover both managerial implications and references to empirically established claims as directed by the study's findings. Finally, chapter five addressed the summary and conclusions, which could present the analysis of the important results,

conclusions and recommendations as well as further propositions for the research.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter observed literature that is very significant in this research. The research, therefore, sought to assess the moderating role of supply risk management in the relationship between supply risk uncertainty and firm performance in Ghana. The chapter provided appropriate materials relating to the key concepts under consideration in the framework of the investigation, theoretical review, empirical review and conceptual framework. The chapter was organized chronologically to reflect the central theme of the study, review key concepts underpinning this study, identify dispositions in literature, and provide a conceptual framework that brings to light the interrelationships among the major constructs of the study. The theoretical perspective of the study will consider the transaction cost theory. At the same time, the conceptual framework will summarise the relationship between the key constructs of the study.

Theoretical Review

The theoretical review explains the theory that will form the weight of this study, which will explain the research question and articulate the already published arguments for verification and critique following the outcomes that shall be realized from this study. The theories reviewed were the transaction cost theory and theory of planned behaviour. These theories were chosen because they were appropriate for discussing the relationship and the effect of uncertainty and supply risk management on performance.

Transaction Cost Theory (TCT)

Transaction cost theory emerged over eighty years ago yet still exert a crucial impact on advertising concept (Rindfleisch, 2020). Once more, transaction cost theory (TCT) has been fruitfully carried out to various organizational phenomena, as reflected in a huge and evolving research frame (Cuypers, Hennart, Silverman, & Ertug, 2021). Williamson (1975) prolonged the perspective via Coase, presenting the transaction fee idea. The idea assumed six elements for producing transaction fees: bounded rationality, uncertainty/complexity, opportunism, small transaction numbers, records impacted news, and atmosphere. Moreover, Williamson (1985) indicated that transaction costs originate in contract issues. Williamson (1985) similarly divided those costs into two classes, advance and subsequent. Improve costs consist of drafting, negotiating, and safeguarding expenses.

Subsequent costs include maladaptation charges, haggling costs, setup, strolling prices, and bonding expenses. Transaction cost theory was first used to explore why companies exist and how company limitations are decided. The choice-making and selection of agencies in every situation are exhibited through financial companies cantered on two simple binary bureaucracies: market or hierarchy agencies. Transaction cost theory examines the transaction cost of an exchange relationship to define the best governance structure: market or hierarchy (Coase, 1937). Or, as Shelanski and Klein (1995) state, transaction cost economics studies how trading partners protect themselves from the hazards associated with exchange relationships.

Transaction cost comprises coordination costs – the cost of exchanging in formation and using that information for managing the exchange relationship-

and transaction risk – the risk that the exchange partner will duck out of his responsibility (Grover & Malhotra, 2003). For low transaction costs, markets are the best governance structure, whereas vertical integration is the better option in situations so high transaction costs. Besides this vertical integration question, the transaction cost theory can also be used to study problems in inter-organizational relationships (Rindfleisch & Heide, 1997), as is the case for the underlying study. One of the key constructs of transaction cost theory is Uncertainty when unanticipated changes appear in the context of exchange relationships. The transaction cost theory distinguishes between environmental uncertainty and behavioural uncertainty.

Environmental uncertainty is about the unpredictability of the environment and can, for instance, occur in currency exchange rate fluctuations, natural disasters, complexity/volatility of the supply market or technological unpredictability (Anderson, 1988; Heide and John, 1990). Environmental uncertainty leads to adaptation problems for companies: when circumstances surrounding an exchange relationship change, it can be difficult to modify agreements (Geyskens *et al.,* 2006). Behavioural uncertainty originates from difficulties in monitoring the contractual performance of exchange partners (Williamson, 1985) and materializes, for instance, as delayed deliveries, poor quality or strategic supply manipulation. For companies encountering behavioural uncertainty, it will be difficult to verify and enforce compliance with the agreements of exchange partners (Rindfleisch & Heide, 1997).

The transaction cost theory dictates that high uncertainty leads to more transaction costs, comprising coordination costs and transaction risks. These transaction costs are very difficult to measure (Grover & Malhotra, 2003) but

are reflected in supply risk management: high coordination costs and high transaction risks are expected to lead to worse performance. The more uncertainty there is in an exchange relationship, the less ability the buyer has to (properly) identify and assess possible supply risks. The opportunity to manage supply risks is lower when there is little ability to predict supply risks. The relevance of the transaction cost theory to the supply chain uncertainty and supply risk management is that by integrating the different parts of a supply chain process into a hierarchy, opportunism problems in the poultry industry are more efficiently solved through hierarchical control.

Also, when estimated, transaction cost becomes an important cost element in the supply chain decision-making concerning the choice of products for the different supply chain processes in the poultry farms. With this theory, management can assess their uncertainty issues to provide satisfying desirable and risk-free working environment and leaving environment for their employees and poultries. This help employees and poultries to work and leave in a safe and risk-free environment as well as work freely with no injury which positively impact the firm performance of the organisation (Buhmann & Bronn, 2018).

Management that put measures in place to reduce the rate of risk and uncertainty at their work place and make sure that employees adhere to the risk management practices of the organisation as well as assess those practices on regular basis improves their firm performance (Satsios & Hadjidakis, 2018). Firms that engage in risk management practices, and make sure employees adhere to those practices, always have their employees performing at the highest level and in a more effectively and efficiently manner (Smith, Merna &

Jobbling, 2006; Xiao & Wu, 2008). This in a long run-in turn improves their firm performance (Bakar, Shahwahid & Eksan, 2018).

Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) was developed by Martin Fishbein and Icek Ajzen in the year 1967. The theory was formulated to estimate the discrepancy that existed between attitude and behaviour, and to explain how and why attitude affects behaviour (Ajzen & Fishbein, 1980). The theory of planned behaviour (TPB) aims to explain the relationship between attitudes and behaviours within human action. It is mainly used to predict how individuals will behave based on their pre-existing attitudes and behavioural intentions. The model of the theory of planned behaviour assumes that consumers make decisions by calculating the costs and benefits of different courses of action and choosing the option that maximizes their expected net benefits. The theory of planned behaviour belongs to the so-called group of rational choice models.

An individual's decision to engage in a particular behaviour is based on the outcomes the individual expects will come as a result of performing the behaviour. The primary purpose of the TPB is to understand an individual's voluntary behaviour by examining the underlying basic motivation to perform an action. TPB has been recognized as useful framework for dealing with the complexities of human social behaviour (Satsios & Hadjidakis, 2018) as well as explain behavioural patterns and better understand how individuals make behavioural decisions (Xiao & Wu, 2008). The Theory of Planned Behaviour (Ajzen, 1988) assumes that the best prediction of behaviour is given by asking people if they are intending to behave in a certain way. Here we note that the

intention will not express itself in behaviour if it is physically impossible to perform the behaviour or if unexpected barriers stand in the way.

TPB posits that individual behaviour is driven by behavioural intentions where behavioural intentions are a function of an individual's attitude toward the behaviour, the subjective norms surrounding the performance of the behaviour, and the individual's perception of the ease with which the behaviour can be performed (behavioural control). Attitude toward the behaviour is defined as the individual's positive or negative feelings about performing a behaviour. It is determined through an assessment of one's beliefs regarding the consequences arising from a behaviour and an evaluation of the desirability of these consequences. Subjective norm represents an individual's perception of whether people important to the individual think the behaviour should be performed (Dowd & Burke, 2013; Satsios & Hadjidakis, 2018).

The contribution of the opinion of any given referent is weighted by the motivation that an individual has to comply with the wishes of that referent. Behavioural control is defined as one's perception of the difficulty of performing a behaviour. TPB views the control that people have over their behaviour as lying on a continuum from behaviours that are easily performed to those requiring considerable effort, resources (Buhmann & Bronn, 2018). A person who believes that performing a given behaviour will lead to mostly positive outcomes will hold a favourable attitude toward performing the behaviour, while a person who believes that performing the behaviour will lead to mostly negative outcomes will hold an unfavourable attitude (Ajzen & Fishbein, 2005).

As a general rule, the more favourable the attitude and subjective norm with respect to engaging in the behaviour, and the greater the perceived control, the more likely it is that a person will form an intention to perform the behaviour in question. Intentions are expected to lead to performance of the behaviour to the extent that people are in fact capable of doing or to the extent that they have actual control over the behaviour (Baker, Shahwahid & Eksan, 2018). Although Ajzen has suggested that the link between behaviour and behavioural control outlined in the model should be between behaviour and actual behavioural control rather than perceived behavioural control, the difficulty of assessing actual control has led to the use of perceived control as a proxy.

The perceived control assesses the various interventions that put in place by management as well as the invisible role in risk management practices that controls the behaviour of employees to increase firm performance. The more favourable the attitude and subjective norm with respect to engaging in behaviour and the greater the perceived control, the more likely it is that a person will form an intention to perform the behaviour in question (Bakar, Shahwahid & Eksan, 2018). With this theory, management can assess their risk management practices to provide satisfying desirable and risk-free working environment for their employees. This help employees to work in a safe and risk-free environment as well as work freely with no injury which positively impact the firm performance of the organisation (Buhmann & Bronn, 2018).

Management that put measures in place to reduce the rate of risk at their work place and make sure that employees adhere to the risk management practices of the organisation as well as assess those practices on regular basis improves their firm performance (Satsios & Hadjidakis, 2018). Firms that

engage in risk management practices, and make sure employees adhere to those practices, always have their employees performing at the highest level and in a more effectively and efficiently manner (Smith, Merna & Jobbling, 2006; Xiao & Wu, 2008). This in a long run-in turn improves their firm performance (Bakar, Shahwahid & Eksan, 2018).

Conceptual Review

In research, conceptual review refers to looking at and studying previously published material to discover new information about a subject (Micheli, Wilner, Bhatti, Mura & Beverland, 2019). The conceptual review of the literature is presented in this portion of the review. Target setting, stress management and employee performance are three essential constructs examined in this study.

Supply Chain Uncertainty

Supply chain uncertainty is a prime subject in the supply chain literature (Sato, Tse, & Tan, 2020; Colicchia, Creazza, & Menachof, 2019; Simangunsong, Hendry & Stevenson, 2012). The definition of supply chain uncertainty was given by Vorst and Beulens (2002) as follows: choice-making conditions inside the supply-chain in which the selection-maker does not understand what to determine as he/she is indistinct about the goals; lacks statistics about (or know-how of) the supply-chain or its surroundings; lacks facts processing capacities; is not able to as it should be are expecting the impact of feasible control moves on supply-chain behaviour; or lacks powerful manipulate movements (non-controllability) (Vorst & Beulens, 2002). Supply chain uncertainty has been related to negative consequences on performance (Mukherji & Mukherji, 2017).

Uncertainties in supply, technique, and demand are diagnosed to primarily impact the producing characteristic. Supply chain uncertainty propagates throughout the network and results in inefficient processing and non-price activities. This supply chain uncertainty is expressed in questions: what is my customer going to order? How much merchandise should we have in inventory? And will the dealer supply the asked items on time and in step with the demanded specs (Roscoe, Skipworth, Aktas, & Habib, 2020; Liu & Lee, 2019; William *et al.*, 2015). Further, supply chain uncertainty stimulates the decision-maker to create safety buffers in time, capacity or inventory to prevent a bad chain performance. These buffers will restrict firm performances and suspend competitive advantage.

Those companies which cope best with supply chain uncertainty are most likely to produce internationally competitive bottom-line performances (Liu & Lee, 2019; Chen, Ming, Zhou, & Chang, 2020; Sato, Tse, & Tan, 2020; Pournader, Kach, & Talluri, 2020; Simangunsong *et al.*, 2012). According to Ahmed and Huma (2021), there is likely to be a significant degree of supply chain uncertainty surrounding many supply chain situations. High levels of supply chain uncertainty led to high levels of supply risks, as uncertainty is a key characteristic of risk (Yates & Stone, 1992).

Uncertainty is one of the core concepts of the transaction cost theory, which assumes that bounded rationality causes problems in situations of Uncertainty: not all possible future contingencies can be taken into account when specifying exchange contracts, exposing buyers to possible supply risks (Collier, & Sarkis, 2021; Fagundes, Teles, de Melo, & Freire's, 2020; Grover & Malhotra, 2003).

Environmental Uncertainty

Surely positioned, environmental Uncertainty can be described as the charge of alternate instability in the environment (Gligor *et al.*, 2016; Dess & Beard, 1984). Rasi, Abbasi and Hatami (2019) make bigger the definition to say that environmental Uncertainty refers to the lack of ability to determine possibilities with a degree of certainty about how environmental elements affect the achievement/ failure of a decision-making unit. In seminal paintings on supply chain uncertainty, Milliken (1987) states that the three most common definitions of environmental Uncertainty are (1) the inability to assign possibilities to the likelihood of future events, (2) a lack of records about cause-effect relationships and (3) an incapacity to expect as it should be the outcomes of a choice. That is a critical problem for companies and supply chains because it places excessive strain on them to correctly cope with the unknown (Panda & Rath, 2018).

Firms are then pressured to address those pressures strongly as is viable (Mukhejri & Mukherji, 2017). Understanding the company's surroundings is vital for the survival and growth of a firm. Although diverse elements of a company outside environment give a tremendous quantity of facts for selection-making however, it's far from the perception of the company's top management about the uncertainty of environmental forces, which shapes the strategic posture of an organisation and, consequently, the performance of an organization. Managers' handiest reaction and response to what they understand about environmental contexts that remain unnoticed no longer impact the managers' behaviour (Martin, Gözübüyük, & Becerra, 2015).

Further, its normally visible that alike businesses, due to their belief, normally reply to comparable environmental situations otherwise (Bedi & Puri, 2019). Corporations commonly fluctuate in characteristics and orientation, and in addition, they respond to the external surroundings and apply exceptional strategies. Firms inside the same industry may have heterogeneous reviews regarding similar environmental conditions because of their special market positions, dominant logic and aid endowments. As far as the conceptualization of environmental uncertainty is concerned, conceptual and empirical arguments quoted in the literature describe environmental dynamism and environmental complexities as the two most cited constituents of environmental uncertainty (Martin, Gözübüyük, & Becerra, 2015).

Environmental dynamism entails the rate of change of technological advancements and innovations, the absence of pattern, and the competitive environment's unpredictability. It has also been operationalized regarding the firm's perception of the unpredictability of customer tastes and competitors' capabilities (Hong & Lee, 2015). Environmental complexities tend to encompass those phenomena of the firm's macro-environment that impact the entire industry's profitability (Tang & Tang, 2012). Further, environmental complexities are generally being measured by looking at the hostility of macroeconomic factors like the pace of product/ process innovation, availability/ shortage of labour and raw materials, the speed of demographic trends change, political stability, corporate legislations etc. (Wales, 2016).

In business studies, environmental Uncertainty has emerged as one of the significant factors affecting the performance of an organization (Eruemegbe, 2015; Vij & Bedi, 2016). Environmental uncertainties often conceptualized

through the unpredictability of competitor's actions, frequent technological advancements, irregular customer behaviour, and complex regulatory environment are hard to predict and play a fundamental role in describing business success. The advent of new technology improves the level of existing knowledge, generates new options, and introduces new and improvised products. Technological evolution and innovation facilitate quicker translation of conceived ideas into successful products and methods of operation.

But at the same time, these environmental factors increase the rate of product obsolescence, enhance the customers' expectations and make business operations difficult for an enterprise (Tang, Kreiser, Marino, Dickson, & Weaver, 2009; Vij, & Bedi, 2016). Moreover, environmental Uncertainty is a measure of the complexity of changing external forces faced by an organization, and it crucially impacts organizations' responses to stay competitive. The relationship between environmental Uncertainty and firm performance represents a perplexing issue in the literature (López-Gamero *et al.*, 2009).

The reason is that, while some studies have documented a positive relationship (e.g., Aragón-Correa and Rubio-López, 2007; Galdeano-Gómez *et al.*, 2008; Nakao *et al.*, 2007), others do not identify a positive impact of environment on firm performance (Link & Naveh, 2006; Wagner, 2005; Watson et al., 2004). The debate also focuses on the concept of 'firm performance'. Some authors believe that this concept involves firm performance measures, and they then focus on the impact of the environment on firm performance (Al-Tuwaijri *et al.*, 2004; Link & Naveh, 2006; Nakao *et al.*, 2007; Wahba, 2008). Other authors use competitive advantage measures to represent firm performance.

Behavioural Uncertainty

Behavioural uncertainty exists within the context of an exchange relationship. It is the extent to which compliance with agreements of exchange partners cannot be verified ex-post: the buyer has no assurance that the supplier performs as specified (Williamson, 1985). This attitude leads to evaluation problems such as the inability to assess supplier quality standards (Grover & Malhotra, 2003). Morgan *et al.* (2007) found that a buyer's ability to monitor focal supplier behaviour can limit opportunistic behaviour, and Kaufmann and Carter (2006) show that behavioural transparency leads to an increase in non-firm performance of the supplier relationship.

Consequently, the ability to assess a supplier's performance is likely to lead to opportunism and performance risks (Heide & John, 1990). Poppo and Zenger (2002) state, when performance is difficult to measure, parties have incentives to limit their efforts toward fulfilling the agreement. So, institutions with high behavioural uncertainty buyers incur more risks, placing a heavy burden on risk management efforts.

Supply Risk Management

As with risk, there may be no universally conventional definition of supply risk management (SRM). However, in evaluating risk, there seems to be greater agreement than debate. Nearly all proposals define SRM as a set of movements that cause a result while stressing the prerequisite of coordination and collaboration amongst supply chain partners. SRM-associated movements are either collectively termed as management (Jüttner, 2005; Tang, 2006) or are, in my view, special. In the latter case, SRM is described to encompass identification (Jüttner 2005; Manuj & Mentzer 2008b), evaluation (Ho *et al.*,

2015), mitigation and monitoring of risks. In phrases of intended effects of SRM, researchers either pressure the mitigation of negative results of risk or the strengthening of positive characteristics of the deliver chain. Examples of the former case include decreasing vulnerability (Jüttner 2005; Martin & %, 2004), losses, chance or publicity to risk (Manuj & Mentzer 2008b).

Alternatively, the positive effects of SRM that are included in definitions involve ensuring profitability and continuity (Tang 2006). Supply risk management studies divide risks into operational and interruption risks, known as supply-demand coordination and interruption risks (Kleindorfer & Saad, 2005). Operational risk includes the simple control of the supply chain, even as interruption risk is related to emergencies, including natural disasters (Kouvelis *et al.*, 2006). As the second dimension, Tang (2006) proposed establishing a supply chain risk management literature based on mitigation methods.

Supply, demand, product, and information management all contribute to successful risk reduction. Recent studies have emphasized the importance of an integrated and holistic approach to supply chain management because the narrow view of a single-centre company cannot consider the many interrelationships of the global supply chain (Ponis & Ntalla, 2016; Wagner & Bode, 2006). The supply chain risk literature has matured substantially over the past two decades. A simple keyword search of supply chain risk on Scopus reveals more than 900 journal papers.

The scholarly review literature on this topic can be categorized into two main areas: either (i) focusing on providing holistic reviews and frameworks for identifying, categorizing, assessing, and managing supply chain risk (see Table

1 for a summary of the most effective supply chain risk management [SRM] review papers), or (ii) providing a narrower focus on a certain type of risk, such as climate change (Ghadge, Wurtmann, & Seuring, 2020), sustainability-related supplier risk (da Silva, Ramos, Alexander, & Jabbour, 2020), or information sharing risk (Colicchia, 2019), to name a few. In a recent study by Manhart, Summers, and Blackhurst (In press), they specifically focus on a meta-analytic review to test how buffering and bridging strategies affect SRM, investigating whether cultural differences play a role in this relationship.

As Ho *et al.* (2015) found that most SRM research is theoretical, they advise scholars to use primary data to investigate the practical applicability of SRM models. They found the original article about the Ericsson case (Norrman & Jansson, 2004) to be one of very few articles investigating SRM with the aid of a real-life case. In addition, in their literature review, Fan and Stevenson (2018) identify a crucial research gap in the holistic approach that considers all four stages (identification, assessment, treatment and monitoring) of the SRM process being almost absent in the academic literature. They identified only six articles, including Norrman & Jansson (2004), that have taken a holistic approach covering all stages, with only two of them (Tummala & Schoenherr, 2011; Lavastre *et al.*, 2012) having been published less than ten years ago.

Concentrating on only a few process stages comes with the downside of missing out on what practitioners have repeatedly highlighted as being the key to SRM effectively: understanding the interwoven connections between the identification, assessment, treatment and monitoring stages. Therefore, an updated real-life approach with a holistic perspective is missing in the literature. A distinction can be made between proactive and reactive SRM. The proactive

approach requires decision-makers to be able to forecast possible future changes and resist these forecasted changes (Wieland & Wallenburg, 2013). Although ongoing technological developments might increasingly enable decision-makers to get closer to total control of the end-to-end supply chain, the expectation that this can be possible is certainly too optimistic (Hoberg *et al.*, 2020). Therefore, while necessary, proactivity alone is not sufficient for SRM.

Reactivity is also needed, i.e., the actions required after a risk has already been detected. Again, organizations need to be able to (1) recognize risk and initiate a response; (2) put in place a disruption management team; (3) develop an initial plan; (4) review and revise the plan in light of new information; and (5) evaluate the reactive work, learning to improve for future risks (Hopp *et al.*, 2012). An essential part of reactive practices is the protection of the reputation of the company, highlighting the importance of communication after a risk occurrence (Bland, 2013; Ponis & Ntalla, 2016). The resilience literature assumes that systems, like supply chains, constantly evolve, suggesting that systems should be able to adapt by coping with changes (Holling, 1996). Within SRM, there needs to be a proper balance between proactive and reactive approaches.

However, in contrast to risk, there seems to be more agreement than debate. Nearly all proposals define SRM in terms of a set of actions that lead to an intended result while stressing the prerequisite of coordination and collaboration among supply chain partners. SRM-related actions are either collectively termed management (Charpin, 2021; Shepardson *et al.*, 2020) or individually specified. In the latter case, SRM is defined to include identification (Rodrik, 2018; Dong & Kouvelis, 2020), evaluation (Hendry *et*

al., 2019; Ho *et al.*, 2015), mitigation and monitoring (Ho *et al.*, 2015) of risks. In terms of intended results of SRM, researchers either stress the mitigation of negative effects of risks or the strengthening of positive characteristics of the supply chain. Examples of the former case include reducing vulnerability (Baryannis, Validi, Dani & Antoniou, 2019; Snyder *et al.*, 2016), losses, probability or risk exposure (Bak, 2018).

On the other hand, the positive effects of SRM that are included in definitions involve ensuring profitability and continuity (Charpin, 2021). In managing supply chain risks, the aforementioned debates can be resolved to obtain a more specific risk definition. First, SRM can benefit from an objective rather than a subjective view, provided the focus is on wider applicability instead of individualised approaches. Second, managing risks carries the connotation of adverse effects, in the sense of containing or avoiding altogether the negative consequences accompanying risk. Finally, SRM is only effective when at least the supply chain structure is fully known.

Risk Mitigation

Supply risk mitigation consists of measures to eliminate, lessen or offset supply risk (Hallikas *et al.*, 2004; Norrman & Jansson, 2004; Schoenherr *et al.*, 2008). For example, mitigation techniques encompass more than one procurement, multiplied flexibility, centralized demand, supplier development, early supplier involvement in product design, supplier audits or inventory increases (Braunscheidel & Suresh, 2009; Sreedevi & Saranga, 2017). Those mitigation strategies may be lively or passive (Dani, 2009; Rajagopal, Venkatesan, & Goh, 2017). In the event of unexpected activities, passive mitigation strategies will offset the impact of dangers. Buffer and insurance are

reactive threat mitigation techniques that cannot save you from dangers. However, they can take in potential negative risks.

Energetic risk mitigation strategies are techniques to lessen or remove risk sources, including buying extra or not buying in key countries (Ge, Nolan, grey, Goetz, & Han, 2016). Risk mitigation uses the facts accrued within the preceding step to solve potential risks through proper countermeasures. This process consists of traditional mitigation strategies (after risk activities) and contingency plans (after risk occasions). Suitable mitigation techniques need to be developed and implemented for all associated risks. Risk mitigation entails growing and comparing diverse mitigation strategies based on capacity cost and required funding (Chopra *et al.*, 2007; DuHadway, Carnovale, & Hazen, 2019). Kleindorfer and Saad (2005) consider prevention better than remedy, and risk managers want to behave quickly and remedy pressing risks.

However, only when managers prioritize risk management activities and understand risk management as their core management tasks can they achieve rapid action. Therefore, risk management activities should be regarded as an important task within the company (Zsidisin *et al.*, 2004; Kleindorfer & Saad, 2005; Berg *et al.*, 2008; Chen & Paulraj, 2004). The literature emphasizes that only through close cooperation between supply chain partners can early management and effective mitigation of supply risks be achieved. Reducing risks also requires support for different functional departments of an organisation. This activity requires the support of senior management to implement holistic thinking, joint decision-making and rapid implementation of activities (Berg *et al.*, 2008; Chen & Paulraj, 2004; Kleindorfer & Saad, 2005; Zsidisin *et al.*, 2004).

In short, risk reduction activities aim to reduce potential risks and the negative impact of risks (Tomlin, 2006). Risk identification and risk assessment indirectly promote risk performance by supporting the development of optimal risk mitigation strategies. However, only the implemented risk mitigation activities can directly impact the organization's performance. Although the previous steps in the risk management process help to better mitigate risks, only appropriate and well-implemented risk mitigation activities can directly promote risks in the form of specific risks with a lower probability or reduce the impact of existing risks. These mitigation strategies are useful tools to improve the performance of supply risk management. In addition, using risk mitigation strategies can offset a high degree of Uncertainty because active strategies can avoid unexpected events in the future (which are more likely to occur in uncertain environments).

In contrast, passive strategies can reduce the impact of such events on the organization. Therefore, in the case of Uncertainty, if firms apply mitigation strategies, they will be able to better deal with the impact of this Uncertainty. In this case, a high degree of Uncertainty has less impact on the performance of supply risk management. Measuring risk incidence through indicators leads to the next element of a supply risk management system: taking action to mitigate risks. Supply risk mitigation comprises actions to eliminate, diminish or counteract supply risks (Bode & Macdonald, 2017). Mitigation strategies are multiple sourcing, increased flexibility, pooled demand, supplier development, early supplier involvement in product design, supplier audits or inventory increases (Mohammaddust, Rezapour, Farahani, Mofidfar, & Hill, 2017).

These mitigation strategies can be either pro-active or reactive (Dani, 2009; Knemeyer *et al.*, 2009; Paul, Sarker, & Essam, 2018). Re-active mitigation strategies counteract risk effects when an undesired event occurs. Buffering and insurances are such reactive risk mitigation strategies, they do not prevent any risk from happening, but they can absorb possible negative risk effects. Pro-active risk mitigation strategies diminish or eliminate risk sources, such as multiple sourcing or not buying in critical countries.

Monitoring Supply Risks

An often-overlooked stage in supply risk management in academia is risk monitoring. Risk management is a dynamic process (Wagner and Bode, 2008), and the probability of unexpected events changes over time, even if these events may have an impact (Huang, Qiu, & Li, 2021). Monitoring supply risk is necessary because it can provide early warning when the level of risk increases, so you can make time for the company to respond to changing conditions by changing mitigation strategies. Few authors emphasize the importance of proactive and regular monitoring of risks (Dani, 2009; Kuroda & Kameda, 2019), and monitoring is implicitly regarded as risk identification and regular assessment. This process is very time-consuming, so the company can't understand the different supply risks.

The scarcity of resources forces companies to choose a limited number of risks for continuous monitoring which is the need to be measured to monitor these sources of risk. Monitoring can (not only) be a continuous assessment of the likelihood and impact of certain risks; the company should be able to use numbers to show whether the likelihood of an accident has increased. Therefore, risk monitoring is defined as an indicator that regularly assesses the possibility

of risk (Wang, Swartz, Corbett, & Huang, 2020). These indicators must work like signal lights and have signal functions. A first attempt to start with the development of indicators for regular risk measurement has been proposed by Blackhurst et al. (2008). They state that risk monitoring has received the least attention by supply chain risk researchers, and the literature has shown little focus on the tools necessary for temporal risk monitoring.

They developed a risk assessment and monitoring system for an automotive manufacturer to track risk indices over time. A heat graph is designed in which risk scores are calculated for certain parts or suppliers, using indicators like defects, product complexity, and supplier bankruptcy. These risk indices are monitored over time by constructing trend graphs, showing if a risk is still within acceptable levels but rising. Risk monitoring is often neglected in supply risk management processes by academics. Risk management is a dynamic process (Wagner & Bode, 2008); the probability of unwanted events occurring can change over time, and even the impact these events can have (Hallikas *et al.*, 2004). Monitoring supply risk is necessary as it can provide a near warning when risk levels rise, giving companies time to react to these changing circumstances by altering their mitigation strategies.

Few authors stress the importance of monitoring risks pro-actively and regularly (Dani, 2009; Hallikas *et al.*, 2004; Norrman & Jansson, 2004), but, at the same time, monitoring is implicitly treated as risk identification and assessment regularly. This process is very time-consuming, and it is therefore impossible for companies to realize all their different supply risks. The scarcity of resources forces companies to select a limited set of risks to monitor on an ongoing basis. We emphasize that measures are needed to monitor these risk

sources (Tian, 2018). Monitoring may not (only) be an ongoing assessment of the probability and impact of certain risks; companies should be able to use figures that indicate if the chances of an unwanted event occurring are rising.

Supply Risk Management Process Maturity

In supply risk management literature, most of the attention is given to developing different stages of a supply risk management system (Hallikas *et al.*, 2004; Kleindorfer & Saad, 2005). Risk identification and assessment are frequently discussed as the first two steps of a risk management process. Risk identification is about the recognition and understanding of possible risk sources. Risk assessment is generally described as evaluating or calculating the probability of occurrence of an unwanted event and its impact (Hallikas *et al.*, 2004). The next supply risk management activity is regular risk monitoring; indicators can identify risk levels that are still within limits but rising, Indicating possible future problems (Blackhurst *et al.*, 2008). The last step in the process is using mitigation strategies to diminish, eliminate, or counteract risks (Schoenherr *et al.*, 2008).

Despite these efforts to address the different stages of supply risk management, little attention has been given to the influence of the supply risk management process on performance (for instance, Wagner & Bode, 2008). Without clearly defined processes, spontaneous and non-systematic action is dangerous. For instance, in their study on risk management capability maturity in the water utility sector, MacGillivray *et al.* (2007) explain that organizations fail in risk management because they lack the organizational capacity to use risk management tools and techniques for optimal decision-making. However, these tools and techniques themselves are sufficiently developed. As they state: the

dominant cause of this capacity deficiency is the difficulty inherent in establishing, defining and controlling risk management processes (MacGillivray *et al.*, 2007).

In supply chain management, clearly defined processes reflect the high maturity of the purchasing function, subsequently leading to better performance (Schiele, 2007). Schiele (2007) found a positive relationship between purchasing maturity and firm performance in his research. Still, he subsequently states that links between maturity and other performance indicators – such as supply risk management performance – may exist. Berg *et al.* (2008) argue that certain capabilities must be possessed for successful supply risk management in developing a tentative model for assessing supply chain risk management programs.

The benefits of supply risk management will increase when firms improve their risk management capabilities, i.e., mature in their risk management process. In risk management literature and supply chain management literature, scholars have developed several maturity models (Barry et al., 1996; Hillson, 1997; MacGillivray et al., 2007; Schiele, 2007). These models describe different stages of maturity (mostly) for several management dimensions such as planning or organizational structure. One of these dimensions is process maturity, which in our case is about the capability of a company to manage supply chain risks.

Hillson (1997), for instance, describes a 4-stage risk maturity model in which process capabilities mature from no formal processes at level 1 to level 4, in which a company executes total risk management across the entire business, regularly updates their processes, and uses standard risk metrics with

constant feedback for improvement. In developing his supply chain management maturity model, Schiele (2007) describes the existence of a clear sourcing strategy and cross-functional involvement between purchasing and other departments of a company as necessary conditions for purchasing process maturity.

Performance

Firm performance refers to the extent to which firms achieve their production, human resource, marketing and financial goals. Researchers who have addressed firm performance in the SC context have proposed various measurement scales. Most studies have focused on firm performance, like profitability ratio, market value, etc. (Yang, 2012). Jun and Rowley (2014), however, stated that using firm performance has some limitations and difficulties in evaluating the actual performance of firms. According to Obeidat, Mitchell and Bray (2016), there are several definitions of firm performance. For example, Selvam *et al.* (2016) hold that the organisational effectiveness that covers financial and operational outcomes constitutes firm performance. Nikpour (2017) also asserted that firm performance is the sum of accomplishments achieved by all businesses or departments of an organisation.

These definitions appear to suggest that several constructs can be used to measure firm performance. These several constructs are employed based on the sectors, industries and countries these firms belong to, thus confirming the multidimensional nature of firm performance (Soto-Acosta, Del Giudice, & Scuotto, 2018). For this study, firm performance is operationalized as 'an organisation's effectiveness that covers good non-financial and financial outcomes. Research has indicated that firms can employ non-financial and

financial indicators to measure performance (Anning-Dorson, 2017; Singh, 2018). Cochran and Wood (1984) hinted that the measurement indicators used by researchers to evaluate and measure firm performance fall into three categories.

The profitability and accounting-based or their combination are used to measure Return on Equity [ROE], Return on Assets [ROA], etc. (Tang, Hull, & Rothenberg, 2012; Saeidi *et al.*, 2015); market-based indicators also measure the market value of stock market performance (Martinez-Ferrero & Valeriano, 2015), and a blend of profitability and accounting-based and market-based indicators (Akisik & Gal, 2014; Singh, & El-Kassa, 2019). However, according to Kuada and Hinson (2012), research has also indicated that firms derive financial and social benefits when they embark on CSR. The use of non-financial indicators, such as productivity, customer satisfaction, employee development, employee satisfaction, turnover rate, quality of products/services, and some other variables are important measurements of performance (Nzioka & Njuguna, 2017).

Researchers have argued that employing non-financial indicators is the new trend for performance appraisal (Alshammari, 2015). Some scholars hold that employing variables such as employee satisfaction, customer satisfaction, and service quality is appropriate (Anning-Dorson, 2017; Xiaoming & Junchen, 2012; Mahmoud & Hinson, 2012). However, it has been suggested that non-financial and financial measurements should be incorporated in the same study so managers can view performance in several areas simultaneously to facilitate efficient decision-making (Jassmy & Bhaya, 2016; Anning-Dorson, 2017).

Therefore, this current study employs non-financial and financial indicators (El-Kassar, & Singh, 2018).

Poultry Production in Ghana

Forward supply chains, reverse supply chains, and combined supply chains are major features of the commercial poultry industry (Shamsuddoha, Quaddus & Klass, 2013) in Ghana. However, much emphasis is placed on the forward supply chain (Nti, 2018). The forward supply chain is a system whose constituent parts include material suppliers, production facilities, distribution services and customers linked together by the feed-forward flow of materials and feedback flow of information. The Reserve supply chain is the direct opposite of the forward supply chain. It deals with effectively implementing a series of activities involved in collecting products from any stage of the forward supply chain to either dispose of or recover value. The interdependency among these actors in the commercial poultry industry in Ghana is partly responsible for many integrative interrelations among the actors.

Most poultry producers also sell off spent layer chickens at these times. Even though there are local hatcheries that produce day-old chicks, the quality is generally low. Hence, most poultry farmers prefer to buy imported day-old chicks, especially layer day-old chicks. In 2018, Ghana imported 511,960 broiler chicks and 7,130,999-layer day-old chicks (Ghana Poultry Production, 2018). The average cost per kg of producing broilers in Ghana is estimated at GH15 (USD 2.7) for large-scale producers and higher for small-scale producers. In the face of these challenges, the poultry industry was hit with huge Uncertainty from the COVID-19 pandemic, which impacted the industry's risk management performance. Meanwhile, large-scale producers felt less of an

impact because many have varied supply chains or the ability to diversify their marketing strategies quickly.

Again, in a desperate attempt to sell, farmers slashed egg prices up to 30 per cent, yet most of them still struggled to sell (Ghana Poultry Project, 2020). According to the Ghana Poultry Farmers Association, supply exceeded demand, and this glut in chicken and eggs has been a major loss to the poultry industry. Overall, there have been serious income disruptions for women livestock farmers with serious consequences on household essentials and nutrition. In the Bono Region of Ghana, a hub for egg production, egg prices have risen by about 50% in recent months, causing concern for the poultry industry. The price increased sharply because of the high cost of maize, soybeans, and other ingredients used in poultry feed production, as floods in 2020 destroyed maize farmlands. A crate of eggs costs 13-18 GH₵ (Ghanaian cedi) (US$ 2.22 – US$ 3.08) in November 2020 but now costs between GH₵20-25 (US$ 3.42 – US$ 4.27), reports Ghana's Graphic Online.

Wholesalers and street vendors are complaining about subdued orders and low patronage. Currently, there is limited regulation on local hatcheries. The Government of Ghana has yet to pass a hatchery bill to ensure that quality day-old chicks are produced from domestic hatcheries. Currently, 15 local hatcheries and eight importers primarily produce day-old chicks for commercial production, according to the Ghana Poultry Project survey carried out in 2017. The importers mostly import the day-old chicks from the Netherlands and Belgium. Demand for day-old chicks exceeds supply by both local hatcheries and imports. Broiler and layer birds are kept exclusively indoors on deep litter and battery cages and fed on well-formulated diets. The broiler birds attain 2.0-

2.25 kg live weight at six to seven weeks and are ready for the market. Layer birds reach 16 weeks before pullets start laying eggs.

Average industry egg production is 230 to 250 eggs per layer per year. The average cost per kg of producing broilers in Ghana is estimated at GH15 (USD 2.7) for large-scale producers and higher for small-scale producers. In the face of these challenges, the poultry industry was hit with huge Uncertainty from the COVID-19 pandemic, which impacted the industry's risk management performance.

Empirical Review

The empirical review focuses on the many studies done by other researchers on the issue or the research efforts of others related to one's study (Nakano & Muniz Jr, 2018). In this part, I present some of the more recent empirical investigations. The review was based on the study's targets.

Supply Chain Uncertainty and Performance

Wang (2017) conducted a study to assess the impact of supply chain uncertainty and risk on logistics performance in the Australian Courier industry. The study targeted 98 Australian courier companies that adopted an online survey for data collection. A total of 229 responses were recorded on the website. In total, 162 surveys are fully completed. In total, 67 incomplete surveys were deleted from the data set. To ensure the reliability and validity of the instruments, the instrument development an extensive literature review is conducted to identify supply chain uncertainty and risk variables. In addition, a pilot study was undertaken to refine the variables and questionnaire by supply chain and logistics academics and managers with extensive experience working

in the transport and logistics industry. Confirmatory factor analysis (CFA) is conducted to validate measurement models.

The results of the study revealed the top five supply chain uncertainties and risks in the different categories, including company-side, customer-side, and environmental uncertainty and risk. The study further revealed that supply chain uncertainty and risk harm logistics performance in the Australian courier industry. The results confirmed that the supply chain uncertainty and risk consisted of three main dimensions – company-side uncertainty and risk, customer-side uncertainty and risk and environment uncertainty and risk in the Australian courier industry. Additionally, external supply chain uncertainty and risk, including customer-side uncertainty and environment uncertainty and risk, are more severe than company-side uncertainty and risk in the Australian courier company.

Also, Wang, Jie and Abareshi (2015) conducted a study to measure the model of supply chain uncertainty and risk in the Australian courier industry. Logistics capability is important for transport and logistics firms to deliver value and services to the customers. In contrast, supply chain uncertainty and risk is an issues in supply chain and logistics to obstruct the delivery. This paper aims to evaluate and understand the logistics capability and provide empirical evidence for logistics capability mitigating supply chain uncertainty and risk in the Australian courier firms. This study examines the relationship between logistics capability, supply chain uncertainty, and risk. The partial least squares approach for structural equation modelling is applied for data analysis involving the interplay of theoretical thinking and empirical data.

Empirical data are collected through a web-based survey. 98 Australian courier firms were identified and invited to the study. Based on the factor analysis, the authors identify the key factors of logistics capability for the Australian courier firms. This study would help both academics and practitioners to have a better understanding of logistics capability in the transport and logistics firms. In addition, results indicated a negative relationship between logistics capability and supply chain uncertainty and risk in the Australian courier firms. The result supported logistics capability mitigating supply chain uncertainty and risk and contributes to logistics risk management literature. The paper focused on the Australian courier industry. Therefore, any generalisation to other countries or sectors must be made with caution. Hence the hypotheses:

H_1: Environmental uncertainty is negatively associated with firm performance

H_2: Behavioural uncertainty is negatively associated with firm performance

Supply Risk Management and Performance

A study was conducted by Munir, Jajja, Ghatha and Farooq (2020) on supply chain risk management and firm performance: the enabling role of supply chain integration. The research hypotheses were tested with data from the sixth version of the International Manufacturing Strategy Survey (IMSS VI). Researchers translated in different languages (Spanish, Chinese and French) in a coordinated manner, using double and reverse translation procedures for countries with language constraints (Vanpoucke *et al.*, 2014). The selection criterion for target respondents was the awareness and knowledge required for responding to the operational and strategic information sought in the IMSS IV

questionnaire. Local research teams sent the questionnaires by ordinary mail, email or fax regarding the plant's performance, practice, and strategy.

The survey was designed to collect data from the population of assembly manufacturing plants (ISIC 25–30 classifications) having more than 50 employees. Across different countries, 2586 IMSS questionnaires were distributed. The final useable sample of the sixth edition of IMSS, as shown in Table 2, consisted of 931 firms from 22 countries in the Americas, Europe, and Asia, giving an overall effective response rate of 36%. Local teams tested non-respondent and late respondent biases by comparing the publicly available secondary information in terms of sales, size, industry or proprietorship of target companies with received responses. In case of such secondary information unavailability, survey responses were used to test the differences between early and late responses. However, evidence of non-response and late response bias was not found in the data.

Following the techniques of Podsakoff et al. (2003), common method bias (CMB) was minimized from the survey proactively. Firstly, items prone to CMB, such as criterion and predictor variables, were separated from each other in the questionnaire. Secondly, different scale anchors/formats were employed in the survey to measure independent and dependent variables. Thirdly, the anonymity of the respondent and the firm was maintained throughout the data collection process to reduce the social desirability bias. Finally, the survey employed objective concepts and explained items were needed to reduce ambiguity. Additionally, we conducted two tests to examine potential CMB. Firstly, Harman's one-factor test was performed using principal component

analysis with an unrotated factor solution on the five scales with 24 items. The results indicated five factors with eigenvalues greater than 1.

The first factor explained only 34.944% of the variance, suggesting that it did not explain the majority of the variance, hence providing additional support that CMB is not an issue in this study. The study adopted a structural equation modelling (SEM) approach for empirical examination. The study's results revealed that supply chain risk management positively affects performance. Munyuko conducted another study (2015). The research aimed to determine the effects of Supply chain risk management on organization performance. Previous studies have focused on risk management within the general context of an organization. Still, little attention has been focused on how supply chain risk affects organization performance regarding its bottom-line profits and overall organization objectives. Particular attention was paid to the effects of supply chain risk management variables on the organisation's performance.

Three main supply chain risk management variables were identified: supply chain risk identification, supply chain risk sources and supply chain risk mitigation. The population for the research included staff at Andy forwarders and logistics services. The research methodology included both primary and secondary data; both interviews and questionnaires were used, questionnaires being the main data collection instrument. The advantage of a questionnaire over other instruments includes the fact that questionnaires are: Practical and large amounts of information can be collected from a large number of people in a short time and in a relatively cost-effective way, they can be carried out by the researcher or by any number of people with limited effect to its validity and

reliability, and the results of the questionnaires can be quickly and easily quantified by either a researcher or through the use of a software package.

The researcher used questionnaire Tables, bar graphs and pie charts were used during the analysis using the statistical of science package software to come up with accurate analysis and presented in tabular and graphical methods. The results showed a direct link between supply in the event y chain risk management and organization performance. It was concluded that supply chain risks affect organization performance as they materialize. Therefore, there was a need for the organization to identify risk exposure, analyse the risk exposure and have mitigation plans for the risk identified within their supply chain.

Hoffmannn, Schiele and Krabbendam (2013) conducted a study to assess uncertainty, supply risk management and their impact on performance. This research aims to identify the antecedents of supply risk management performance. Speed consortium benchmarking is used to explore the concepts of supply risk monitoring and mitigation. In addition, a survey yielding 207 responses is used to test our hypothesized antecedents of supply risk management performance. Findings indicate that the environmental and behavioural uncertainty of the transaction cost constructs negatively affect supply risk management performance. In addition, supply risk mitigation and supply risk management process maturity positively influence supply risk management performance, the latter having the strongest influence.

Furthermore, supply risk monitoring, supply risk mitigation and supply risk management process maturity moderate the effect of environmental uncertainty, whereas only risk monitoring influences the relationship between

behavioural uncertainty and supply risk management performance. This research identified the antecedents of supply risk management performance and the moderating effect of different principles on the relationship between uncertainty and supply risk management performance. Most importantly, the study showed the relevance of developing general supply risk management structures and capabilities (i.e. supply risk management process maturity) to manage supply risks successfully. The findings indicated that the implementation of a risk management process is even more important than the proper selection of individual risk monitoring and mitigation strategies. Hence the hypotheses:

H_3: Risk monitoring weakens the effect of behavioural uncertainty on firm performance

H_4: Risk monitoring weakens the effect of environmental uncertainty on firm performance

H_5: Risk mitigation weakens the effect of behavioural uncertainty on firm performance

H_6: Risk mitigation weakens the effect of environmental uncertainty on firm performance

H_7: Supply risk management process maturity weakens the effect of behavioural uncertainty on firm performance

H_8: Supply risk management process maturity weakens the effect of environmental uncertainty on firm performance

Conceptual Framework

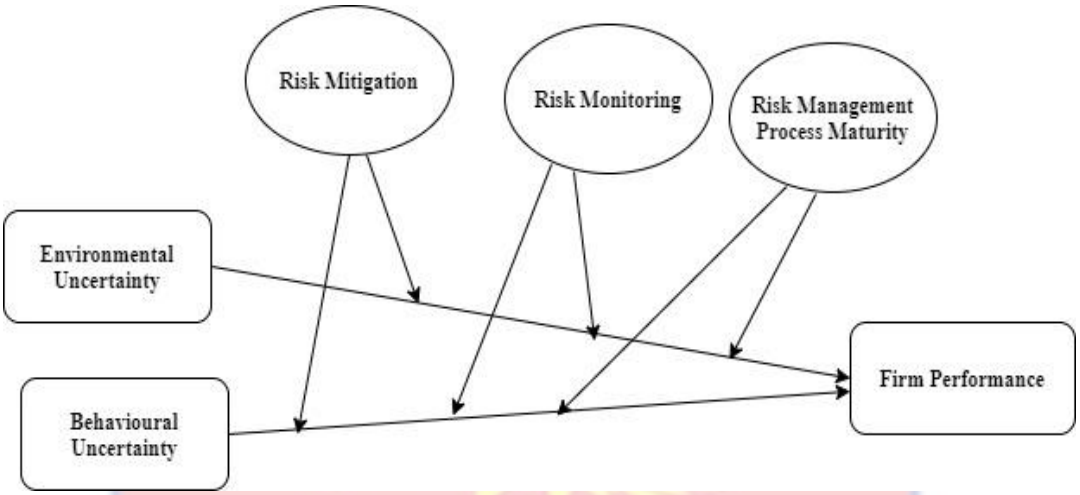
Based on the overall impulse of the study, theoretical expositions, objectives formulated and interrelationships established among the construct,

the conceptual framework has been developed to guide the research focus of the study. The investigation offers those changes in supply chain uncertainty (environmental and behavioural uncertainty) which is conceptualized as underlying constructs, can positively and significant influence variance in the performance of commercial poultry farmers in Ghana, particularly those in Dormaa Ahenkro Municipality. Also, performance in this study was conceptualized as financial and firm performance. It is also proposed that supply risk management will positively moderate the relationship between supply chain uncertainty and performance in the study.

Furthermore, it is proposed that supply risk management among performers in each integrative relationship plays a moderating role in explaining the effect of the predictors (supply chain uncertainty) on the performance of poultry firms. The choice of environmental and behavioural uncertainty as the measuring variables was necessitated by the fact that environmental and behavioural uncertainty significantly negatively affect performance. The reason is that the interpretations would be articulated at the individual and general predictor levels. Supply risk management, as a moderating variable, weighs the power and direction of the effect of supply chain uncertainty on performance. Hence, supply risk management was employed to moderate the relationship between the independent variable (supply chain uncertainty) and the dependent variable (performance).

Again, the study's arrows depict the interrelationships between the various constructs. For instance, the arrows combined and directed towards the performance construct from the uncertainty variables show the relationship and effect that uncertainty might have on performance. While the arrow pointing to

the performance construct from the supply risk management shows and depicts the moderating role on performance.



Source: Author's Construct (2021)

Figure 1: Conceptual Framework

Chapter Summary

In this chapter, evidence has been delivered concerning the concepts that underpinned the study, the key theory that made up the thematic areas has been well well-defined, operationalized and explained, an empirical review of some associated investigations has been carried out as well as a theoretical framework reflecting the interrelationships among the constructs was constructed founded on the detailed purposes of the research, inclinations recognized through empirical review as well as the theoretical assertions.

CHAPTER THREE

RESEARCH METHODS

Introduction

The study sought to evaluate supply chain uncertainty, supply chain risk management and performance in the poultry production in Dormaa Ahenkroh Municipality in the Bono Region. It also sought to establish that supply risk management moderates the effect of supply risk management on the relationship between supply chain uncertainty and performance. This chapter offers evidence linking to the methodological approach engaged in respect of how primary data were together, processed, analysed and summarized in the framework of this research, given awareness of the nature of the precise research objectives.

Rassel, Leland, Mohr, & O'Sullivan (2020) posited that research methodology generally provides the approaches and procedures through which researchers need to conduct their investigation. It precisely delivers information regarding the research approach, research design, study area, population, sampling procedure, data collection procedure, validity and reliability, data collection procedure, data processing and analysis and ethical consideration.

Research Paradigm

The paradigm of research has been referred to as a general philosophical approach to the environment and the essence of research that a study brings to a study (Louis, Smarr & Patel, 2017; Brown & Dueñas, 2020). The study used the positivist research paradigm. The positivist research paradigm, associated with the French philosopher Comte (1789- 1857), reflects the assumptions that logic, measurement, and the utilization of deductive reasoning to prove absolute

truths can be applied to the study of phenomena (Walsh, 2019; Denscombe, 2008; Johnson & Onwuegbuzie, 2004). Thus, through the scientific method, it is proposed that objective trust can be obtained empirically by assessing the influence of target setting on the stress management and performance of employees at the National Health Insurance Scheme office in the Juaben District of the Eastern Region.

Empiricism, being the main characteristic of positivism, argues that what is observable by the human senses is factually suggesting the existence of an objective universal reality that is the subject of universal laws and mechanisms (Nückles, 2021; Stingone, Buck-Louis, Nakayama, Vermeulen, Kwok, Cui & Teitelbaum, 2017). The study focuses on target setting, employee performance and stress management, which are also observable by human senses and factually suggest the existence of an objective universal reality that is the subject of universal laws and mechanisms. The positivist philosophy focuses on objectivity and distance involving research question or theory testing, highlighting the researcher and the research subject as independent structures (Kaushik & Walsh, 2019; da Silva & Moreira, 2019).

The Positivist paradigm was chosen because the study involves research questions and hypothesis testing. Also, subsequently, being driven by the rationale of the cause-effect relationship among the constructs of interest – target settings and employee performance (Independent variables) and stress management (Dependent variable). However, criticisms have also been raised regarding measuring observable phenomena to exclude unobservable phenomena (Vashishth & Chakraborty, 2019; Brown & Dueñas, 2020). The positivist model is based on the premise that social reality has an objective

ontological framework and that individuals respond to this factual context (Morgan & Smircich, 1980).

The premise behind the positivist theory is that there is an actual empirical reality in the universe that can be objectively evaluated and clarified. Positivism philosophy goes with deductive reasoning (Spano, Giannico, Elia, Bosco, Lafortezza & Sanesi, 2020), which is much more tuned to testing research hypotheses for confirmation or otherwise of theoretical claims (Chikari, 2021; Kaushik & Walsh, 2019).

Research Approach

The study employed the quantitative research approach in light of the study's purpose under thought, specific objectives/hypotheses, and the nature of the primary data to be collected and analyzed. This is because the constructs such as supply chain uncertainty, firm performance and supply risk management were numerically measured through recognized measurement scales such as nominal. The quantitative approach explains phenomena by collecting numerical data and analysing using mathematically based methods, particularly statistics (Miah, Solomonides & Gammack, 2020; Lak, Aghamolaei, Baradaran & Myint, 2020; Schimanski, Pasetti-Monizza, Marcher & Matt, 2019). This helped the researcher collect numerical data on supply chain uncertainty, firm performance and supply risk management, which were analyzed using mathematically based methods, particularly statistics.

The constructs (supply chain uncertainty, firm performance and supply risk management) were ordinarily quantifiable and subject to statistical manipulation. According to Creswell (2014), the quantitative approach describes phenomena by gathering numerical data, which are interpreted using

statistics, and mathematically based methods. Quantitative approaches usually use deductive reasoning and pursue regularities in human lives by splitting the social world into empirical components called variables that can be numerically interpreted as frequencies or values (Rahman & Hakim, 2016). The quantitative approaches can be examined using statistical techniques, accessed via stimuli implemented by the researcher and systematic measurement (Ben-Shlomo, Brookes & Hickman, 2013).

Therefore, because of the numerical nature of the study, quantitative approach was adopted. It was also adopted to determine how supply risk management influences the relationship between supply chain uncertainty and firm performance. The quantitative approach to analysis typically begins with the hypothesis or theory-dependent data collection and is accompanied by descriptive or inferential statistics (Tashakkori & Teddlie, 2003). Quantitative methods are often deductive in that inferences from statistical hypothesis tests on the study's objectives lead to general inferences about population characteristics. Quantitative approaches are also frequently defined as believing that a single reality exists, independent of human experience (Lincoln & Guba, 1985).

The key issues of quantitative analysis are that measurement in its straightforward prediction of cause and effect is accurate, true, and generalizable (Cassell & Symon, 1994; King, Cassell, & Symon, 1994). A quantitative approach depends on data of the variables that can be estimated numerically. It centres around questions, for example, what number of? Or potentially how regularly? which are effectively prepared as numbers. It is normally the reason or target of the review that guides the methodology that

ought to be utilized. Such investigations are implemented as numbers are converted into data. Techniques used in the quantitative method are usually questionnaires, surveys, personality assessments, and structured analysis methods (Burrell & Morgan, 2017).

The quantitative approach presents straightforwardness and speed in conducting research and can cover many circumstances (Amaratunga, Baldry, Sarshar & Newton, 2002). The quantitative results are likely to be generalized to an entire population or sub-population as they include the broader sample chosen randomly (Carr, 1994). It is additionally conceivable to utilize the quantitative method in examining data on supply chain uncertainty, firm performance and supply risk management with statistical methods since it is simpler to generalize the findings. Also, the conclusive outcomes depend on quantities instead of interpretations, which may improve potential future events and correlations with the work. Be that as it may, this approach will generally be rigid, fake, and ineffective in measuring the significance people assign to activities and don't help produce theories (Crotty, 1998).

Further, Matveev (2002) also posited that the quantitative approach neglects to furnish the researcher with information on the context of the studied phenomenon. Again, the researcher in a quantitative study has no control over the environment where the respondents provide answers to the questions in the survey (Matveev, 2002). According to Edwards and Talbot (2014), the quantitative approach requires constant monitoring of model performance to ensure continued compliance with the original hypothesis, which is time-consuming. Also, these approaches limit research outcomes to only those outlined in the original research proposal due to the usage of closed questions

and a structured format (Matveev, 2002). Finally, quantitative research approaches take snapshots of a phenomenon: not in-depth and overlook test-takers and testers' experiences and what they mean by something (Rahman & Hakim, 2016).

Study Design

The study employed the explanatory research design due to the scientific inquiry underpinning this study (Andrade, 2022; Bloomfield & Fisher, 2019; Ishtiaq, 2019; Osuagwu, 2020; Windsong, 2018). Rahi (2018), arguing for causal studies, provided that things and events have causal capacities. Due to their properties, they have the power to bring about other events or situations. Thus, assessing how supply risk management influences the relationship between supply chain uncertainty and firm performance. The primary purpose of explanatory research is to explain phenomena and predict future occurrences (D'Alimonte, De Sio & Franklin, 2020; Doyle, McCabe, Keogh, Brady & McCann, 2020; Reay, van Schaik & Wilson, 2019).

According to Zikmund, Babin, Carr, and Griffin (2012), explanatory design research is conducted to identify the extent and nature of relationships. Subsequently, being driven by the rationale of the cause-effect relationship among the constructs of interest – supply chain uncertainty (Independent variables) and firm performance (Dependent variable) and supply risk management (Moderating variable). Also, informing the decision to approach the study quantitatively is the assertion that the data are quantitative and almost always require the use of a statistical test to establish the validity of the relationships. This includes determining how supply risk management

influences the relationship between supply chain uncertainty and firm performance.

The choice of the explanatory research design used in quantitative studies is deeply rooted in epistemological philosophy. Explanatory studies focus on analysing a situation or a specific problem to explain the patterns of relationships between variables (Creswell, 2014). The choice of the explanatory research design used in quantitative studies is deeply rooted in epistemological philosophy. Explanatory studies focus on analysing a situation or a specific problem to explain the patterns of relationships between variables (Creswell, 2014). The primary purpose of explanatory research is to explain phenomena and predict future occurrences (Maxwell & Mittapalli, 2010).

This study is considered a valid method to examine how supply risk management influences the relationship between supply chain uncertainty and firm performance, given that neither the dependent variable nor the independent variables could be manipulated. Also informing the decision to approach the study quantitatively is the assertion that the data are quantitative and almost always require a statistical test to establish the validity of the relationships (Cardano, 2020; Dannels, 2018; Sileyew, 2019; Cresswell, 2014). Also, data collected for analysis was based on a self-reported questionnaire and was subjected to definite cause-effects analysis as in the case of explanatory design. Therefore, the study design informed the choice of the questionnaire used for the data collection and the data analysis tool used.

Study Area

Ghana is situated on the Gulf of Guinea, just a few degrees north of the Equator, thereby providing a warm climate for it. Ghana occupies an area of

238,535 km2 (92,099 sq mi) and has an Atlantic coastline extending 560 km (350 miles) south of the Gulf of Guinea in the Atlantic Ocean. It falls between 4 ° 45'N and 11 ° N latitudes and 1 ° 15'E and 3 ° 15'W longitudes. The Prime Meridian crosses Ghana, particularly through Tema 's industrial port city. Ghana is geographically closer to the Earth's "center" of geographical coordinates than any other country; although the notional center (0 °, 0 °) is located in the Atlantic Ocean about 614 km (382 mi) off the south-east coast of Ghana on the Gulf of Guinea. Ghana contains plains, waterfalls, low hills, rivers, Volta Lake, the world's largest artificial lake, Dodi Island, and Bobowasi Island on Ghana 's south Atlantic coast.

Population

The population of a study consists of the entire group of persons who are of interest to the researcher and who meet the criteria that the researcher is interested in studying, or a set of individuals having some common characteristics, as indicated by Babbie and Mouton (2012), Van der Walt and Rensburg (2012) and, Polit and Beck (2012). According to Saunders, Thornhill, and Lewis (2012), the population is the full set of cases from which a sample is drawn. The population of the study was all poultry farms in Ghana. However, the target population for the investigation was 182 registered members (Agyemang, Ratinger & Ahado, 2019) of the Poultry Farmers Association (PFA) with microcredit access (⩾2 farming years) and without microcredit access during the survey.

The population excluded domestic poultry farms in Ghana and familiar ground employees in commercial farms in Ghana. The farms were further categorised into small (50 – 5,000 birds), medium (5,000 – 10,000 birds) and

large (above 10,000 birds) based on the common classification of commercial farms in Ghana (Kusi, Agbeblewu, Anim, & Nyarku, 2015).

Table 1: Target Population

Classification of Commercial Poultry Farms	Population
Large-scale commercial farms	39
Medium-scale commercial farms	78
Small-scale commercial farms	65
Total	182

Source: Agyemang, Ratinger and Ahado (2019)

Sampling Technique

The issue of representativeness in social science study is underpinned by the need to authentically promote the generalizability of the research outcomes to the entire target population from which the sample was drawn (Noushini, Park, Jamie, Jamie, & Taylor, 2020; Zehnalová & Kubátová, 2019). Thus, the sample must first be selected from the population characteristically signified in the sampling frame (Moore, Phillips, Cook, & Darrah, 2020; Lohr, 2019). Therefore, the sample size was committed first and then selected from the sampling frame, which defined the study's target population. All poultry farms in Ghana were included in the study because of the small sample size, indicating that the research encompassed the complete intended audience. As a result of meeting the sample criteria [n> 50 + 8 (Number of independent variables)] for regression analysis in social science research, this sampling formula was selected (Carr, 1994).

A census sampling technique was employed to gather data for this study. To ensure the study's conclusions were as accurate and reliable as possible, the researchers used the census method (Cresswell, 2014). As a result, the research

included all members of the intended demographic. Census sampling refers to the practice of sampling from the total population of interest. Instead of selecting a sample, Harding (2006) describes a census as a procedure that collects data from every unit of a population being studied. The use of the entire population enumeration for research is referred to as a census study. In order to have a realistic representation of a tiny population, it is necessary to pick the complete population for the study, since the population is so small.

Data Collection Instruments

Primary data collection was made possible by employing a structured questionnaire designed for such a purpose. Rendering to Roopa and Rani (2012), a questionnaire is a series of questions asked to individuals to obtain statistically useful information about a given topic. Specifically, the questionnaire design was inherently structured. Thus, this produced the chance for posing a standardized set of reliable prearranged questions in a given order to respondents for self-completion (Rodrigues, Rodrigues, Gurgel, Abreu, & Souza, 2021; Bolarinwa, 2015). A structured questionnaire delivers a stress-free right to use well-ordered data, making data coding, processing and analysis easier when suitable statistical procedures are engaged (Lionello, Aletta, Mitchell, & Kang, 2021). Checklist and Likert scale types of questioning were employed to assess the respondents' opinions on the variables and constructs that were measured under the research.

The variables and the constructs were statistically measured. The constructs were attained through authorized instruments thorough review of the literature. A 5-point Likert Scale was used to measure the respondents' opinions regarding supply chain uncertainty, supply risk management and firm

performance. The Likert Scale was treated as a continuous interval scale because items measuring each construct were treated as a composite measure to form a composite score for each construct in an individual summative score (Murali, Cuthbertson, Slater, Nguyen, Turner, Harris, & Nagamani, 2020; Nasser, & Chung, 2020). The scales used to measure supply chain uncertainty, supply risk management and firm performance were *1- Strongly Disagree, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree and 5- Strongly Agree*.

The questionnaire was structured as follows: Section "A" measured the respondents' demographic information (with five items; Sex, the position of respondent, firm size, production capacity, principal breed and form of business). Section "B" concentrated on the uncertainty which comprised of environmental uncertainty and behavioural uncertainty. Seven (7) items were used to determine the environmental uncertainty of poultry farms involved in the study. Also, five (5) items were used to determine the behavioural uncertainty of poultry farms involved in the study.

In addition, Section "C" also provided information about the supply risk management which comprised of risk monitoring, risk mitigation and supply risk management process maturity. Four (4) items were used to determine the risk monitoring practices of poultry farms involved in the study. Also, four (4) items were used to determine the risk mitigation of poultry farms involved in the study. In addition to that, four (4) items were used to determine the supply risk management process maturity of poultry farms involved in the study. Section "D" provided information about the firm performance of the poultry farms.

Pre-Testing

A pre-testing was undertaken to check glitches in wording of questions, clarify instructions, and refine the questionnaire so that respondents would have no problem answering the questions. According to Reynolds, Diamantopoulos and Schlegelmilch (1993), questionnaires do not emerge complete. They have to be developed, modified or shaped after several tests. It should be informed by literature. According to Saunders, Lewis and Thornhill (2009) and de Vaus (2001), pre-testing offers many contributions to the study. These include the provision of an indication of the response rate to be expected of the final study, testing questions with a very low response rate, testing the efficiency of instructions within the questionnaire and providing an indication of the probable cost and duration of the primary survey.

Pretesting also evaluates how respondents understood the questions and checks whether the range of responses to each question is adequate. Also, it allows testing to know if respondents correctly understand filter questions, test the coding of questions, especially open-ended questions and other responses to closed questions and test for duplicate questions. A pre-test of the instrument was undertaken in the first week of June 2021. Although Saunders, Lewis and Thornhill (2009) justify a minimum of 10 respondents as sufficient for a pre-testing, a sample of 30 owners of poultry farms in Cape Coast was used. Each respondent was informed that this was a pre-test and was encouraged to provide feedback on any problems they encountered while completing the questionnaire, as recommended by Baxter and Babbie (2003).

In total, 25 of the pre-test questionnaires were retrieved. Questions relating to supply chain uncertainty were not well answered. Respondents

complained about the allocation of weights to the questions asked under it. The Cronbach alpha test used to test the instrument's reliability was -0.995. This meant that the internal consistency among the items was weak. This was attributed to respondents' lack of understanding of the questions and the scale employed. Items under supply chain uncertainty were converted to Likert-scale items. As a result, the number of questions under the supply chain uncertainty increased from an initial 8 items to 12 items.

Reliability

Reliability is one of the two key components to be considered when evaluating a particular instrument. Bless and Higson-Smith (2000) state that reliability is concerned with the instrument's consistency. An instrument is highly reliable if it can be trusted to give an accurate and consistent measurement of a constant value. An extant empirical review was carried out to ensure the constructs' validity, which informed the choice of the items included in the scale. Again, to determine the scales' reliability and validity, the initial questionnaires that were developed were pretested on 5% of the similar sample size of poultry farms in Ghana.

Detailed discussion was done with these respondents, who then informed the scale alteration. This procedure was based on the recommendation presented by Roopa and Rani (2012). Again, to ensure the scale's reliability, Principal Component Factor on the poultry farms in Ghana. The factors created were then evaluated in terms of their reliability through the internal consistency approach as measured by the Cronbach's Alpha. The findings are presented as follows in Table 2:

Table 2: Reliability Results

No	Constructs	Cronbach's Alpha	No. of items
1	Supply Chain Uncertainty	.954	12
3	Risk monitoring	.867	4
4	Risk Mitigation	.819	4
5	Supply risk management process maturity	.906	4
4	Performance	.761	9

Source: Field survey, (2021)

The findings were presented in Table 2; Cronbach's Alpha values obtained for the constructs greater than the minimum 0.7 cut-off point proposed were deemed very reliable. From the Table, the constructs were all deemed reliable since the values for the various constructs were above the cut-off point of 0.7.

Validity

Validity of an instrument refers to how well an instrument measures the particular concept is supposed to measure (Saunders et al., 2009). They further argue that an instrument must be reliable before being valid, implying that it must be consistently reproducible. Once this has been achieved, the instrument can be scrutinized to assess whether it is what it purports to be. To ensure the validity of the questionnaires, the researcher reviewed other relevant literature and supported the instrument's construct. Some of the items in the scales were scientifically validated items. Further, the designed questionnaire was submitted to the project supervisor for vetting, correction, and approval before distributing it to the respondents.

The validity of the subscales measuring the constructs was analyzed with the principal component factor analysis after a pre-test was conducted on

a similar sample size of poultry farms in Ghana. This approach is recommended by some previous empirical studies (Amilani et al., 2020). Before the results of the principal component factor analysis, which was conducted to measure the confirmatory factor analysis of uncertainty and supply risk management, can be deemed acceptable, Kaiser-Meyer-Olkin of sampling adequacy and Bartlett's test of sphericity must be confirmed and validated. At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.50 or above 0.50, and Bartlett's test of sphericity should be significant ($p=0.000$; $p<0.05$). According to Harris (1962), KMO results are classified as follows:

In the 0.90s=Marvelous

In the 0.80s=Meritorious

In the 0.70s=Middling

In the 0.60s=Mediocre

In the 0.50s=Miserable

Below 0.50=Unacceptable

At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.5 and Bartlett's test of sphericity should be significant ($p=0.000$; $p<0.05$). These criteria are met per the findings of this study (See Tables below) hence the need to proceed with the interpretation of the factor analysis results.

Validity: Environmental Uncertainty

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.837
Bartlett's Test of Sphericity	Approx. Chi-Square	692.211
	Df	21
	Sig.	.000

Source: Field survey, (2021)

At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.5 and Bartlett's test of sphericity should be significant (p=0.000; p<0.05). These criteria are met per the findings of this study (See Table 2) regarding environmental uncertainty.

Table 4: Component Matrix

	Component
Environmental Uncertainty	1
Weather/natural disasters/industrial action (e.g. bushfire, strike).	.864
Uncertainty due to government laws/regulations.	.862
Road congestion/closures.	.830
Unstable fuel prices.	.842
Labor / driver shortage.	.865
A scarce supply of materials currently threatens the survival of this organisation.	.868
The survival of this organisation is currently threatened by a scarce supply of tough competition in product/service quality.	.734
Extraction Method: Principal Component Analysis. a. one component extracted.	

Source: Field survey, (2021)

The results of the principal component factor analysis (Confirmatory factor analysis), as shown in Table 4, proved that all the seven items were validated for measuring environmental uncertainty because they met the component score of 0.3 and above (Pallant, 2005).

Validity: Behavioural Uncertainty

Table 5: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.875
Bartlett's Test of Sphericity	Approx. Chi-Square	429.868
	Df	15
	Sig.	.000

Source: Field survey, (2021)

At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.5 and Bartlett's test of sphericity should be significant ($p=0.000$; $p<0.05$). These criteria are met per the findings of this study (See Table 5) for behavioural uncertainty.

Table 6: Component Matrix

Behavioural Uncertainty	Component 1
Inaccurate forecast of customers' freight volume.	.822
Poor communication between company and customer.	.875
The constant change in customers' preferences distorts business.	.873
Inaccurate forecast of customers' freight volume.	.839
Damages are due to customers' faults.	.839
Customers were refusing the freight charge.	.668

Extraction Method: Principal Component Analysis.
a. one component extracted.

Source: Field survey, (2021)

The results of the principal component factor analysis (Confirmatory factor analysis), as shown in Table 6, proved that all the six items were validated for measuring behavioural uncertainty because they met the component score of 0.3 and above (Pallant, 2005).

Validity: Risk Monitoring

Table 7: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.770
Bartlett's Test of Sphericity	Approx. Chi-Square	238.904
	Df	6
	Sig.	.000

Source: Field survey, (2021)

At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.5 and Bartlett's test of sphericity should be significant ($p=0.000$; $p<0.05$). These criteria are met per the findings of this study (See Table 7) for risk monitoring.

Table 8: Component Matrix

	Component
Risk Monitoring	1
I fully know the tools and techniques for effective supply chain risk management.	.855
Overall, I find supply chain risk management useful and helpful in my job.	.795
Supply chain risk management allows me to undertake complex supply chain decisions more quickly and efficiently.	.856
I am very positive and supportive of applying chain risk monitoring practices in my company.	.881

Extraction Method: Principal Component Analysis.
a. one component extracted.

Source: Field survey, (2021)

The results of the principal component factor analysis (Confirmatory factor analysis), as shown in Table 8, proved that all the four items were validated for measuring monitoring risk because they met the component score of 0.3 and above (Pallant, 2005).

Validity: Risk Mitigation

Table 9: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.682
Bartlett's Test of Sphericity	Approx. Chi-Square	199.122
	Df	6
	Sig.	.000

Source: Field survey, (2021)

At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.5 and Bartlett's test of sphericity should be significant ($p=0.000$; $p<0.05$). These criteria are met per the findings of this study (See Table 9) for risk mitigation.

Table 10: Component Matrix

	Component
Risk Mitigation	1
Information on critical events is communicated only to selected managers and only for the management board's explicit indication.	.831
I know how to relate supply chain risk management and techniques to my company's decision-making process.	.822
The top management (Managing Director or equivalent) acknowledges the contributions and encourages individuals or teams which establish or enhance supply chain risk mitigation practices in our organisation.	.672
My organisation's supply chain is robust against artificial or natural catastrophic events.	.886

Extraction Method: Principal Component Analysis.

a. one component extracted.

Source: Field survey, (2021)

The results of the principal component factor analysis (Confirmatory factor analysis), as shown in Table 10, proved that all the four items were

validated for measuring risk mitigation because they met the component score of 0.3 and above (Pallant, 2005).

Validity: Supply Risk Management Process Maturity

Table 11: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.833
Bartlett's Test of Sphericity	Approx. Chi-Square	312.011
	Df	6
	Sig.	.000

Source: Field survey, (2021)

At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.5 and Bartlett's test of sphericity should be significant ($p=0.000$; $p<0.05$). These criteria are met per the findings of this study (See Table 11) for supply risk management process maturity.

Table 12: Component Matrix

Supply Risk Management Process Maturity	Component 1
In the case of an adverse event that occurs in supply processes, managers collect information	.851
For critical events, particularly for which the consequences determine an enterprise's performance, supply chain managers must develop emergency procedures.	.878
For critical events, managers must periodically prepare a risk analysis based on their observations and knowledge.	.932
Information on the identified risks is communicated to the management board and selected managers.	.876

Extraction Method: Principal Component Analysis.

a. one component extracted.

Source: Field survey, (2021)

The results of the principal component factor analysis (Confirmatory factor analysis), as shown in Table 12, proved that all the four items were validated for measuring supply risk management process maturity because they met the component score of 0.3 and above (Pallant, 2005).

Validity: Performance

Table 13: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.713
Bartlett's Test of Sphericity	Approx. Chi-Square	435.946
	Df	36
	Sig.	.000

Source: Field survey, (2021)

At least, the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.5 and Bartlett's test of sphericity should be significant ($p=0.000$; $p<0.05$). These criteria are met per the findings of this study (See Table 13) for performance.

Table 14: Component Matrix

	Component
Firm Performance	1
There has been a great reduction in the bird's mortality rate due to the breed purchased and strict bio-security.	.743
Using dual-purpose exotic breeds has increased egg production and the sizes of spent layers.	.679
Egg sizes are devoid of peewee eggs, mostly from large to extra-large eggs.	.724
The delivery frequency of the poultry firm has improved drastically.	.692
There is a high percentage of perfect order delivery in my poultry firm.	.724

Workforce cost has been reduced drastically by using the battery cage system.	.749
The battery cage system ensures clean eggs, reduced egg destruction and increased number of birds per room.	.855
Reduction in procurement costs can increase the production of poultry products.	.678
There is the preparation of own feed to increase quality, cost, and egg production.	.705
There is the internalization of cost to ensure access to quality and preferred input, reduce cost and increase savings.	.713

Extraction Method: Principal Component Analysis.

a. one component extracted.

Source: Field survey, (2021)

The results of the principal component factor analysis (Confirmatory factor analysis), as shown in Table 14, proved that all the four items were validated for measuring performance because they met the component score of 0.3 and above (Pallant, 2005).

Data Collection Procedure

Ever since the research depends on primary data for the achievement of the explicit research objectives, it has become vital to depend on a trustworthy approach that could assure entrance to the respondents and the right kind of data desired. The collection of the respondents was grounded on the random numbers generated through a computer programme. These would-be respondents were individually contacted through mobile phone before the date for the primary data collection was agreed on with each would-be respondent. This arrangement was made after formal permission for the collection of the primary data from the university had been granted by these poultry farms in Ghana. The

questionnaires were personally administered through the drop-and-pick method. All 182 owners and managers of poultry farms were included in the study.

However, 182 questionnaires were distributed to the respondents. Out of the 182 questionnaires, 118 responded and returned the questionnaire. This large sample size was used because the statistical insight is that imperfect measures can be satisfactory. After all, in large samples, random measurement errors will usually cancel out. The respondents were contacted at their farms to distribute and retrieve the questionnaires. The respondents accurately provided the information needed and returned the questionnaires, which led to a 65% response rate. The duration of the administration and retrieval of the questionnaires was from October 19th to November 24th, 2021.

Data Processing and Analysis

Data analysis is a process of editing, cleaning, transforming, and modelling data to highlight useful information, suggestion, conclusions, and supporting decision-making (Béthermin, Fudamoto, Ginolfi, Loiacono, Khusanova, Capak, & Zucca, 2020). The questionnaire responses were edited, coded and entered into Statistical Package for Social Science (SPSS version 25.0) for the analysis. This statistical software is recommended for use in studies in social sciences (De, Hankins, Kasliwal, M. Moore, Ofek, Adams, & Travouillon, 2020). Both descriptive statistical techniques and inferential statistics were applied to analyze the data. The use of any of these tools was influenced by the nature of the findings (Cuthbertson, Tarr, & González, 2019; Ma & Pang, 2019).

Based on the nature of the specific research objectives, descriptive statistics such as mean, standard deviation, percentage and frequency were employed to analyse research objective one and the demographic characteristics of the respondents. Inferential statistics such as Pearson product-moment correlation (see similar approaches in Derrick, Bates, & Dufek, 2019; Humphreys, Puth, Neuhäuser, & Ruxton, 2019) and multiple regression (see similar approaches in Keith, 2019; Farhadi, Salehi, Moieni, Safaie, & Sabet, 2020; Maheswari, Priyanka, Thangavel, Vignesh, & Poongodi, 2020) were employed to analysed research objectives 2 and 3. Moderation analysis was conducted through the SPSS software (See Liu & Yuan, 2020). The research findings were briefed and offered in Tables and Figures for easy understanding, examination and discussion.

Ethical Consideration

Ethics is the norms or standards of behaviour that guide moral choices about our behaviour and relationships with others (Facca, Smith, Shelley, Lizotte, & Donelle, 2020). Issues relating to the ethical conduct of research such as privacy, confidentiality, informed consent and anonymity were sustained (Sipes, Mullan, & Roberts, 2020; Husband, 2020). To this effect, an introductory letter introducing the researcher to the respondents was taken from the Department of Marketing and Supply Chain Management and the Institutional Review Board of the University of Cape Coast to seek permission from the management of these poultry farmers in the Dormaa Ahenkro municipality.

In addition, all evidence collected was solely used to resolve this investigation. To gain the confidence and trust of the respondents, they were

given full information about the research's objective and purpose to make conclusions about whether to participate or not in the exercise. This idea helped reduce the number of unwilling participants to engage in the study. The research assured that all ethical issues bordering confidentiality and anonymity of participants are followed. The benefits, as well as the purpose of the study, were fully explained to all stakeholders, particularly the respondents. Again, informed verbal consent of respondents was sought, and no respondents were coerced into participating in the study. This activity was done to allow respondents to participate in the study willingly.

Where respondents had, issues concerning responding to some of the items, active steps like explaining each item to the respondents were done to ensure clarity to resolve such misunderstandings. Issues such as confidentially, privacy and unanimity were carefully preserved through a vigorous organized questionnaire design. No data manipulation was carried out during the study's data processing and analysis stage.

Chapter Summary

The section has given information concerning the methodological methods the researcher tailed in gathering the primary data, processes followed to ensure primary data processing and analysis, particularly in the light of the specific research objectives, and data analysis tools as measurement criteria. Again, the data presentation and interpretation mode were also highlighted in the research context.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The current chapter presents the results and discussion of this study. The main purpose of this study is to contribute to the larger body of knowledge on uncertainty, supply risk management and performance in the poultry industry. The study specifically targeted commercial poultry farmers in Dormaa Municipality in the Bono region of Ghana. Chapter Three provided information relating to the methodological approaches employed for the gathering, processing and analysing of the primary data to provide results as outlined by the principles of the specific research objectives considered in the investigation. The chapter begins with the respondents' demographic information, followed by sections that answer the research questions of the investigation.

Demographic Information

This segment provides information concerning the demographic information of the respondents. The demographic characteristics were measured with descriptive statistics such as frequency and percentage, which were deemed suitable for analysing the variables under consideration. The demographic characteristics of the respondents are presented in Table 15.

Table 15: Demographic Information

Variable	Variable categories	Frequency	Percentage (%)
Gender	Male	75	63.6%
	Female	43	36.4%
Position	Farm manager	59	50.0%
	Farm owner	34	28.8%
	Supply Chain Manager	25	21.2%

Farm size	Small-sized	34	28.8%
	Medium-sized	71	60.2%
	Large-sized	13	11.0%
Production capacity	50-5000 birds	30	25.4%
	5001-10000 birds	64	54.2%
	Above 10,000 birds	24	20.4%
Principal breed	Layers	58	49.2%
	Broiler	44	37.3%
	Layers and broiler	16	13.5%
Form of Business	Company	16	13.6%
	Partnership	33	28.0%
	Sole proprietorship	69	58.4%
Total Respondents		118	100%

Source: Field survey, (2021)

The analysis of the respondents' demographic information revealed that most were male (63.6%), while the remaining 36.4% were female. Again, most of the participants were farm managers representing 50.0%, whilst 28.8%, according to the results, were farm owners. The remaining 21.2% were supply chain managers in the poultry farms. These respondents had enough working experience and expertise in the commercial poultry industry of Ghana to provide the needed data. This idea makes the data more reliable to be subjected to scientific manipulation. Per the farm size classification, it was exposed that most commercial poultry farms were medium-sized farms representing 60.2%, while the 28.8% were small-sized farms. The remaining 11.0% were those with large-size farms.

However, the production capacity of 5001-10,000 birds represented 54.2%, whilst 25.4% produced 50-5000 birds. The remaining 20.3% of the poultry farmers produced above 10,000 birds. Regarding the top breed of commercial poultry farms, it was discovered that most farms had layers (49.2%). This observation was followed by those with only broilers (37.3%) and those with both layers and broilers (13.6%). On the issue of the nature of the legal form of business, it was discovered that most of the commercial poultry farms were sole proprietorships (58.5%), then partnerships (28.0%) and private companies (13.6%).

The demographic characteristics show that the managerial workforce structure in Ghana's commercial poultry industry is male-dominated. This situation could be linked to the somewhat difficult intensive nature of operations of commercial poultry farms. The industry seemed to be dominated by medium-sized enterprises. Continuous efforts need to be carried out to expand production capacity to these small-scale and medium-sized enterprises to reach large-scale operational status to fill the domestic demand gap in poultry products in Ghana. Also, the principal breed shows the dominance of layers and broilers, respectively, with comparatively few poultry farms focusing only on layers and broiler production. This justifies the claim that commercial poultry farms in Ghana are pushed into the production of egg at the expense of chicken meat production (Djang-Fordjour, 2017).

Data Screening (Assumptions of Multiple Regression for Research Objective 1)

Proceeding to key analyses, data were examined using SPSS 25.0 for data entry accuracy, missing values and violation of multiple regression

assumptions of normality; linearity, multicollinearity and outliers. Residuals were marked off for normality through expected normal probability plots, skewness and kurtosis. Pallant (2005) postulates that when the remaining plots appear normal in regression, it is not essential to screen individual variables for normality. An examination of normal probability plots recommended no noteworthy abnormality from normality for the present data. The skewness values (z-score= -1.057) and kurtosis values (z-score= 1.177) were all within the -1.69 and 1.69 range confirming the normality of the data.

Table 16: Test of Normality

			Statistic	Std. Error
Performance	Mean		4.0141	.05712
	95% Confidence Interval for Mean	Lower Bound	3.9010	
		Upper Bound	4.1273	
	5% Trimmed Mean		4.0550	
	Median		4.1111	
	Variance		.385	
	Std. Deviation		.62052	
	Minimum		1.89	
	Maximum		4.89	
	Range		3.00	
	Interquartile Range		.67	
	Skewness		-1.057	.223
	Kurtosis		1.177	.442

Source: Field survey, (2021)

Again, assumption of multicollinearity was tested using correlation matrix and collinearity diagnostics. Hair et al (2006) advice that inter-correlation of more than 0.9 is considered to be a demonstration of high multicollinearity. For this observe, correlation values for the independent predictor were under 0.9 indicating that the policies underlying multicollinearity

was not debased. Collinearrity diagnostics were determined by way of noting tolerance values and variance inflation factor (VIF). Low tolerance values (those drawing near zero) indicate that multiple correlations with other variables are high, suggesting the possibility of multicollinearity. The findings suggest that the tolerance values for the independent variables are pretty decent, and the VIF values for all the independent variables are nicely under the threshold of 10.

Table 17: Test of Multicollinearity

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Supply Chain Uncertainty	1.000	1.000

Source: Field survey, (2021)

Further, the linearity assumption was studied utilizing scatter plots of the variable to discover any non-linear patterns in the data. In step with Hair et al. (2006), the linearity of the relationship among dependent and independent variables represents the degree to which the change in the dependent variable is related to the independent variable. In multiple regression with multiple independent variables, partial regression plots are used to expose the relationship of a single independent variable to a dependent variable. An examination of the residual probability plots showed no non-linearity in any of the connections (see appendix B). Also, cases with ratings that can be very special from the rest are considered outliers (Kline, 2005). Outliers can be detected by inspecting the scatter plots of standardised residuals.

The residuals must be rectangularly dispensed, with most scores concentrated within the centre (alongside the zero point) (Tabachnick & Fidell, 2007). Tabachnick Deviation from the centralised rectangle violates this

assumption (Tabachnick *et al.*, 2007). This observation was not noticed in the present thesis from examining the residual plot (see appendix B). The Mahalanobis distance was additionally examined to check for possible outliers. The result confirmed a maximum value of 6.015, below the critical value of 13. Although it shows no presence of some outliers, an investigation of the prepared Cook's distance with a maximum value of .129 below 1 (Tabachnick *et al.*, 2007) suggests no actual problem (see appendix C).

Supply Chain Uncertainty and Firm Performance

The first objective of the study analysed the effect of supply chain uncertainty on firm performance in the poultry farms in Ghana. This was achieved by formulating two hypotheses which were environmental uncertainty is negatively associated with firm performance (H_1) and behavioural uncertainty is negatively associated with firm performance (H_2). A composite variable was formed for the independence variables (behavioural uncertainty and environmental uncertainty) which represents supply chain uncertainty and firm performance (dependent variable) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective.

Environmental Uncertainty is Negatively Associated with Firm Performance

This hypothesis sought to investigate the effect of environmental uncertainty on the performance of the poultry farmers in the Dormaa Ahenkro Municipality. A composite variable was computed for the two independent (environmental uncertainty) and dependent variable (firm performance) through the data transformation. There was no autocorrelation as attested by the Durbin-

Watson indicator (1.814). Campbell and Campbell (2008) asserted that for regression to avoid autocorrelation, the Durbin-Watson indicator should fall between 1.5-2.5. The findings are presented in Tables 18, 19 and 20.

Table 18: Model Summary

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate	Durbin-Watson
1	.375[a]	.144	.137	.57769	1.814

a. Predictors: (Constant), Environmental Uncertainty

b. Dependent Variable: Firm Performance

Source: Field survey, (2021)

A close examination of the results showed a statistically significantly weak positive correlation between the predictor (environmental uncertainty) and firm performance (r=0.375). Thus, a higher level of environmental uncertainty was associated with a weaker level of firm performance, and a lower level of environmental uncertainty was associated with a lower level of firm performance of poultry farms in the Dormaa Ahenkro Municipality. Regarding the model's predictive capacity, it was discovered that the predictors accounted for a 14.4% positive variance in firm performance (r-square=0.144). This positive variance in firm performance was statistically significant (p=0.000: p<0.05). On the other hand, it can be inferred from the model that 85.6% variance in environmental uncertainty is accounted for by factors not captured in this model.

This study shows that the more owners and managers become somehow dissatisfied with the environmental uncertainty at Dormaa Ahenkro Municipality, the more the level of performance becomes lower; hence, we accepted the hypothesis. The positive relationship between environmental uncertainty and firm performance supports some empirical studies (Hoffmannn,

Schiele and Krabbendam, 2013; Wang, 2017; Liu & Lee, 2019; Chen, Ming, Zhou, & Chang, 2020; Collier, & Sarkis, 2021). However, Mukherji and Mukherji (2017) believe that environmental uncertainty has a negative relationship with firm performance.

Table 19: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6.338	1	6.338	18.992	.000[b]
	Residual	38.712	116	.334		
	Total	45.051	117			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Environmental Uncertainty

Source: Field survey, (2021)

Close surveillance of the significance value indicated that this predictive model is statistically significant ($p=0.000$; $p<0.05$), which signifies that the 14.4% positive change in firm performance at Dormaa Ahenkro attributed to the changes in the predictors (independent variable) was not due to chance but the scientific interaction among the variables in the model. Management can therefore rely on this model to make predictive managerial decisions concerning environmental uncertainty and firm performance. It thus shows that environmental uncertainty can influence owners and managers to either stay in business or not stay in business. It became essential to weigh the contributions of the individual predictors to the weak positive variance in firm performance.

The positive relationship between environmental uncertainty and firm performance supports some empirical studies (Hoffmannn, Schiele and Krabbendam, 2013; Wang, 2017; Liu & Lee, 2019; Chen, Ming, Zhou, & Chang, 2020; Collier, & Sarkis, 2021). However, Mukherji and Mukherji

(2017) believe that environmental uncertainty has a negative relationship with firm performance.

Table 20: Co-efficient

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	3.123	.211		14.773	.000
	Environmental Uncertainty	.245	.056	.375	4.358	.000

a. Dependent Variable: Firm Performance

Source: Field survey, (2021)

Table 20 confirmed the results of Table 18 and Table 19 that there was a significant and positive effect of environmental uncertainty on firm performance of poultry farms in Ghana ($t = 4.358$, $P < 0.05$). As a consequence of this finding, we may infer that environmental uncertainty has a statistically significant positive effect on the firm performance of poultry farms in Ghana. By implication, environmental uncertainty serves as a positive predictor of firm performance across poultry farms in Ghana. Based on these results, the researcher reported the following regression equation, predicting firm performance based on the available environmental uncertainty. Y (Firm performance) = 3.123+ .245*(Environmental uncertainty).

Taking the values for the slope and the intercept in the resulting regression equation, the researcher can make the following assertion; that is from the intercept, when there is no environmental uncertainty in their supply chain operations, thus when firms are faced with environmental uncertainty, firm performance across poultry farms in Ghana will be .446. However, from the same slope, when any additional environmental uncertainty is faced by

poultry farmers lead to an improvement in the firm performance of poultry farm by 81.1%. The positive relationship between environmental uncertainty and firm performance supports some empirical studies (Hoffmannn, Schiele and Krabbendam, 2013; Wang, 2017; Liu & Lee, 2019; Chen, Ming, Zhou, & Chang, 2020; Collier, & Sarkis, 2021). However, Mukherji and Mukherji (2017) believe that environmental uncertainty has a negative relationship with firm performance.

Behavioural Uncertainty and Firm Performance

Simple regression was carried out to examine how changes in behavioural uncertainty if any changes in the firm performance of poultry farms in Ghana. Auto-correlation assumption was measured with the Durbin-Watson criterion. To avoid auto-correlation Durbin-Watson score must fall within the range 1.5-2.5. The results show there is no problem of auto-correlation hence warranting the interpretation in respect of the regression results.

Table 21: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.727[a]	.528	.526	.54700	1.910

a. Predictors: (Constant), Behavioural Uncertainty

b. Dependent Variable: Firm Performance

Source: Field survey, (2021)

The study shows there is a large and positive joint correlation between behavioural uncertainty and firm performance after controlling for the effect of other factors in the configured model (r=0.727). Observation of the co-efficient of determination results shows that changes in behavioural uncertainty accounts

for 52.8% positive change in firm performance after the effect of other factors having the capacity to influence firm performance had been statistically controlled for (r^2=0.528). Such factor could potentially account for 47.2% change in the state of firm performance. It is therefore prudent to examine the state of significance of such contribution to changes in firm performance as ascribed to changes in behavioural uncertainty of poultry farms in Ghana.

The positive relationship between behavioural uncertainty and firm performance supports some empirical studies (Hoffmannn, Schiele and Krabbendam, 2013; Wang, 2017; Liu & Lee, 2019; Chen, Ming, Zhou, & Chang, 2020; Collier, & Sarkis, 2021). However, Mukherji and Mukherji (2017) believe that behavioural uncertainty has a negative relationship with firm performance.

Table 22: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	68.612	1	68.612	229.313	.000[b]
	Residual	61.338	205	.299		
	Total	129.950	206			

b. Predictors: (Constant), Behavioural Uncertainty

Source: Field survey, (2021)

ANOVA results (Table 22) show therefore that behavioural uncertainty accounts for a statistically significant positive strong significant change in the firm performance of poultry farms in Ghana (p=0.0001; p<0.05). The study therefore shows that behavioural uncertainty causes strong significant improvement in the firm performance of poultry farms in Ghana. The finding is also in line with similar positions held by some previous empirical studies which

collectively found behavioural uncertainty as significant predictor of firm performance (Nasir, et al., 2020). The positive relationship between behavioural uncertainty and firm performance supports some empirical studies (Hoffmannn, Schiele and Krabbendam, 2013; Wang, 2017; Liu & Lee, 2019; Chen, Ming, Zhou, & Chang, 2020; Collier, & Sarkis, 2021). However, Mukherji and Mukherji (2017) believe that behavioural uncertainty has a negative relationship with firm performance.

Table 23: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	1.108	.163		6.788	.000		
	Behavioural Uncertainty	.705	.047	.727	15.143	.000	1.000	1.000

a. Dependent Variable: Firm Performance

Source: Field survey, (2021)

Observation of the contributions of behavioural uncertainty to causing the statistically significant positive strong increment in firm performance shows that behavioural uncertainty makes a statistically significant positive contribution to predicting the 52.8% significant positive change in firm performance when the effect of the other factors in the model are statistically controlled for (Beta=0.727; p=0.0001: p<0.05). Thus, a unit significant change in behavioural uncertainty causes 0.705 significant positive change in firm

performance because such change is attributed to the scientific interaction among the factors in the regression model.

The positive relationship between behavioural uncertainty and firm performance supports some empirical studies (Hoffmannn, Schiele and Krabbendam, 2013; Wang, 2017; Liu & Lee, 2019; Chen, Ming, Zhou, & Chang, 2020; Collier, & Sarkis, 2021). However, Mukherji and Mukherji (2017) believe that behavioural uncertainty has a negative relationship with firm performance.

How Supply Risk Management Practices Moderates the Relationship Between Supply Chain Uncertainty and Firm Performance

The second objective of the study analysed how supply risk management practices moderates the relationship between supply chain uncertainty and firm performance. This was achieved by formulating six hypotheses which include risk monitoring weakens the effect of behavioural uncertainty on firm performance (H_3), risk monitoring weakens the effect of environmental uncertainty on firm performance (H_4), risk mitigation weakens the effect of behavioural uncertainty on firm performance (H_5), risk mitigation weakens the effect of environmental uncertainty on firm performance (H_6), supply risk management process maturity weakens the effect of behavioural uncertainty on firm performance (H_7) and supply risk management process maturity weakens the effect of environmental uncertainty on firm performance (H_8).

A composite variable was formed for the moderating variables (risk monitoring, risk mitigation and supply risk management process maturity) which represents supply risk management practices, independence variables (behavioural uncertainty and environmental uncertainty) which represents

supply chain uncertainty and firm performance (dependent variable) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective. The study proceeded to test the moderation effect applying the process documented by Rose (2010) that involved regressing the dependent variable (Y) on the suspected moderator (Z) together with the independent variable (X) and the product of the two variables (Y = X + Z + XZ). It was expected that the presence of moderation was to be detected by the presence of a significant effect on the interaction term (XZ).

Risk Monitoring Weakens the Effect of Behavioural Uncertainty on Firm Performance

The third hypothesis proposes that risk monitoring weakens the effect of behavioural uncertainty on firm performance. A composite variable was formed for risk monitoring (moderator), behavioural uncertainty (independence) and firm performance (dependence) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective. In relation to the study, Y, X, Z and XZ represented firm performance, behavioural uncertainty, risk monitoring and the moderating interaction variable respectively. The key results interested in this instance included the Model Summary, the ANOVA and the Co-efficient. The findings are presented as follows.

Table 24: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.930[a]	.865	.863	.34501	.865	469.537	2	147	.000
2	.931[b]	.867	.864	.34362	.002	2.193	1	146	.141

a. Predictors: (Constant), Risk Monitoring, Behavioural Uncertainty
b. Predictors: (Constant), Risk Monitoring, Behavioural Uncertainty, Interaction
Source: Field Survey (2021)

The model summary as depicted in Table 24 reveals two models with model 1 having only behavioural uncertainty as the independent variable and correlate with firm performance to the tune of 93 percent. Model 2 incorporated risk monitoring as an additional independent variable together with the interaction effect variable whose correlation was 93.1 percent indicating a slight improvement. There was also a corresponding increase in the explanatory of model 2 from 86.5 percent to 86.7 percent signifying that behavioural uncertainty and risk monitoring as independent variables explained 86.7 percent of the variation in firm performance denoting 0.2 percent increase in explanatory power. However, the adjusted R Square increased from 86.3 percent to 86.4 percent, an indication that if the population instead of the sample was used to estimate firm performance, then there would be a strengthening of the explanatory power by 1.5 percent.

These findings support the claim that risk monitoring plays an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk monitoring plays an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Table 25: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	111.780	2	55.890	469.537	.000[b]
	Residual	17.498	147	.119		
	Total	129.278	149			
2	Regression	112.039	3	37.346	316.296	.000[c]
	Residual	17.239	146	.118		
	Total	129.278	149			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Risk Monitoring, Behavioural Uncertainty
c. Predictors: (Constant), Risk Monitoring, Behavioural Uncertainty, Interaction
Source: Field Survey (2021)

The combined influence of behavioural uncertainty and risk monitoring had a significant impact on firm performance as depicted by model's ANOVA p-value of 0.000 in Table 25. These findings support the claim that risk monitoring plays an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk monitoring plays an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Table 26: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	-1.071	.172		-6.226	.000
	Behavioural Uncertainty	.365	.068	.223	5.333	.000
	Risk Monitoring	.924	.051	.762	18.236	.000
2	(Constant)	.463	1.050		.441	.660
	Behavioural Uncertainty	-.089	.314	-.054	-.283	.778
	Risk Monitoring	.488	.299	.403	1.633	.105
	Interaction	.126	.085	.588	1.481	.141

a. Dependent Variable: Firm Performance
Source: Field Survey (2021)

Additionally, risk monitoring as the moderator variable had a positive influence on the relationship between behavioural uncertainty and firm performance as indicated by the beta co-efficient of the interaction term at .588. However, the moderation effect was not statistically significant as demonstrated by the computed p-value of the beta co-efficient which stood at .141 and was above .05. These findings contradict the claim that risk monitoring plays an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings contradict the claim that risk monitoring plays an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Risk Monitoring Weakens the Effect of Environmental Uncertainty on Firm Performance

The fourth hypothesis propose that risk monitoring weakens the effect of environmental uncertainty on firm performance. A composite variable was formed for risk monitoring (moderator), environmental uncertainty (independence) and firm performance (dependence) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective. In relation to the study, Y, X, Z and XZ represented firm performance, environmental uncertainty, risk monitoring and the moderating interaction variable respectively. The key results interested in this instance included the Model Summary, the ANOVA and the Co-efficient. The findings are presented as follows.

Table 27: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.924[a]	.854	.852	.35780	.854	431.414	2	147	.000
2	.936[b]	.876	.874	.33121	.022	25.551	1	146	.000

a. Predictors: (Constant), Environmental Uncertainty, Risk Monitoring

b. Predictors: (Constant), Environmental Uncertainty, Risk Monitoring, Interaction

Source: Field Survey (2021)

The model summary as depicted in Table 27 reveals two models with model 1 having only environmental uncertainty as the independent variable and correlate with firm performance to the tune of 92.4 percent. Model 2 incorporated risk monitoring as an additional independent variable together with the interaction effect variable whose correlation was 93.6 percent indicating a slight improvement. There was also a corresponding increase in the explanatory of model 2 from 85.4 percent to 87.6 percent signifying that environmental uncertainty and risk monitoring as independent variables explained 87.6 percent of the variation in firm performance denoting 2.2 percent increase in explanatory power. However, the adjusted R Square increased from 85.4 percent to 87.6 percent an indication that if the population instead of the sample was used to estimate firm performance, then there would be a strengthening of the explanatory power by 1.5 percent.

These findings support the claim that risk monitoring plays an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk

monitoring plays an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Table 28: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	110.459	2	55.229	431.414	.000[b]
	Residual	18.819	147	.128		
	Total	129.278	149			
2	Regression	113.262	3	37.754	344.162	.000[c]
	Residual	16.016	146	.110		
	Total	129.278	149			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Environmental Uncertainty, Risk Monitoring
c. Predictors: (Constant), Environmental Uncertainty, Risk Monitoring, Interaction

Source: Field Survey (2021)

The combined influence of environmental uncertainty and risk monitoring had a significant impact on firm performance as depicted by model's ANOVA p-value of 0.000 in Table 28. These findings support the claim that risk monitoring significantly played an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk monitoring significantly played an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Table 29: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	-.157	.156		-1.002	.318
	Risk Monitoring	.781	.090	.645	8.659	.000
	Environmental Uncertainty	.261	.065	.299	4.015	.000
2	(Constant)	2.857	.613		4.657	.000
	Risk Monitoring	-.259	.222	-.214	-1.166	.245

Environmental Uncertainty	-.542	.170	-.621	-3.191	.002
Interaction	.268	.053	1.743	5.055	.000

a. Dependent Variable: Firm Performance

Source: Field Survey (2021)

Risk monitoring as the moderator variable had a positive influence on the relationship between environmental uncertainty and firm performance as indicated by the beta co-efficient of the interaction term at 1.743. However, the moderation effect was statistically significant as demonstrated by the computed p-value of the beta co-efficient which stood at .000 and was less than .05. These findings support the claim that risk monitoring plays an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk monitoring plays an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Risk Mitigation Weakens the Effect of Behavioural Uncertainty on Firm Performance

The fifth hypothesis proposes that risk mitigation weakens the effect of behavioural uncertainty on firm performance. A composite variable was formed for risk monitoring (moderator), behavioural uncertainty (independence) and firm performance (dependence) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective. In relation to the study, Y, X, Z and XZ represented firm performance, behavioural uncertainty, risk mitigation and the moderating interaction variable respectively. The key results interested in this instance included the Model Summary, the ANOVA and the Co-efficient. The findings are presented as follows.

Table 30: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.495[a]	.245	.232	.53597	.245	18.708	2	115	.000
2	.496[b]	.246	.226	.53825	.000	.026	1	114	.872

a. Predictors: (Constant), Risk Mitigation, Behavioural Uncertainty
b. Predictors: (Constant), Risk Mitigation, behavioural Uncertainty, Interaction
Source: Field Survey (2021)

The model summary as depicted in Table 30 reveals two models with model 1 having only behavioural uncertainty as the independent variable and correlate with firm performance to the tune of 49.5 percent. Model 2 incorporated risk mitigation as an additional independent variable together with the interaction effect variable whose correlation was 49.6 percent indicating a slight improvement. There was also a corresponding increase in the explanatory of model 2 from 24.5 percent to 24.6 percent signifying that behavioural uncertainty and risk mitigation as independent variables explained 24.6 percent of the variation in firm performance denoting 0.1 percent increase in explanatory power. However, the adjusted R Square decreased from 23.2 percent to 22.6 percent an indication that if the population instead of the sample was used to estimate firm performance, then there would be a strengthening of the explanatory power by 1.5 percent.

These findings support the claim that risk mitigation plays an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk mitigation plays an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Table 31: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10.748	2	5.374	18.708	.000[b]
	Residual	33.035	115	.287		
	Total	43.783	117			
2	Regression	10.755	3	3.585	12.375	.000[c]
	Residual	33.027	114	.290		
	Total	43.783	117			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Risk Mitigation, Behavioural Uncertainty
c. Predictors: (Constant), Risk Mitigation, Behavioural Uncertainty, Interaction
Source: Field Survey (2021)

The combined influence of behavioural uncertainty and firm performance had a significant impact on firm performance as depicted by model's ANOVA p-value of 0.000 in Table 31. These findings support the claim that risk mitigation significantly played an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk mitigation significantly played an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Table 32: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	2.401	.341		7.050	.000
	Behavioural Uncertainty	-.076	.074	-.084	-1.032	.304
	Risk Mitigation	.402	.066	.497	6.104	.000
2	(Constant)	2.415	.352		6.851	.000
	Behavioural Uncertainty	-.079	.076	-.087	-1.038	.302
	Risk Mitigation	.401	.067	.496	6.024	.000
	Interaction	.007	.046	.014	.162	.872

a. Dependent Variable: Firm Performance
Source: Field Survey (2021)

Risk mitigation as the moderator variable had a positive influence on the relationship between behavioural uncertainty and firm performance as indicated by the beta co-efficient of the interaction term at .014. However, the moderation effect was not statistically significant as demonstrated by the computed p-value of the beta co-efficient which stood at .872 and was above .05. These findings contradict the claim that risk mitigation plays an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings contradict the claim that risk mitigation plays an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Risk Mitigation Weakens the Effect of Environmental Uncertainty on Firm Performance

The sixth hypothesis proposes that risk mitigation weakens the effect of environmental uncertainty on firm performance. A composite variable was formed for risk mitigation (moderator), environmental uncertainty (independence) and firm performance (dependence) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective. In relation to the study, Y, X, Z and XZ represented firm performance, environmental uncertainty, risk mitigation and the moderating interaction variable respectively. The key results interested in this instance included the Model Summary, the ANOVA and the Co-efficient. The findings are presented as follows.

Table 33: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.516[a]	.266	.253	.52857	.266	20.855	2	115	.000
2	.554[b]	.307	.289	.51586	.041	6.736	1	114	.011

a. Predictors: (Constant), Risk Mitigation, Environmental Uncertainty
b. Predictors: (Constant), Risk Mitigation, Environmental Uncertainty, Interaction

Source: Field Survey (2021)

The model summary as depicted in Table 33 reveals two models with model 1 having only environmental uncertainty as the independent variable and correlate with firm performance to the tune of 51.6 percent. Model 2 incorporated risk mitigation as an additional independent variable together with the interaction effect variable whose correlation was 55.4 percent indicating a moderate improvement. There was also a corresponding increase in the explanatory of model 2 from 26.6 percent to 30.7 percent signifying that environmental uncertainty and risk mitigation as independent variables explained 30.7 percent of the variation in firm performance denoting 4.1 percent increase in explanatory power. However, the adjusted R Square increased from 25.3 percent to 28.9 percent an indication that, if the population instead of the sample was used to estimate firm performance, then there would be a strengthening of the explanatory power by 1.5 percent.

These findings support the claim that risk mitigation plays an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk

mitigation plays an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Table 34: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.653	2	5.827	20.855	.000[b]
	Residual	32.130	115	.279		
	Total	43.783	117			
2	Regression	13.446	3	4.482	16.842	.000[c]
	Residual	30.337	114	.266		
	Total	43.783	117			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Risk Mitigation, Environmental Uncertainty
c. Predictors: (Constant), Risk Mitigation, Environmental Uncertainty, Interaction
Source: Field Survey (2021)

The combined influence of environmental uncertainty and risk mitigation had a significant impact on firm performance as depicted by model's ANOVA p-value of 0.000 in Table 34. These findings support the claim that risk mitigation plays an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk mitigation plays an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Table 35: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.673	.317		5.282	.000
	Environmental Uncertainty	.224	.107	.205	2.082	.040
	Risk Mitigation	.298	.080	.368	3.731	.000
2	(Constant)	1.570	.312		5.035	.000
	Environmental Uncertainty	.238	.105	.218	2.264	.025
	Risk Mitigation	.332	.079	.411	4.209	.000

Interaction	-.111	.043	-.209	-2.595	.011

a. Dependent Variable: Firm Performance

Source: Field Survey (2021)

From the Table, risk mitigation as the moderator variable had a negative influence on the relationship between environmental uncertainty and firm performance as indicated by the beta co-efficient of the interaction term at -.209. However, the moderation effect was statistically significant as demonstrated by the computed p-value of the beta co-efficient which stood at .011 and was less than .05. These findings support the claim that risk mitigation plays an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that risk mitigation plays an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Supply Risk Management Process Maturity Weakens the Effect of Behavioural Uncertainty on Firm Performance

The seventh hypothesis proposes that supply risk management process maturity weakens the effect of behavioural uncertainty on firm performance. A composite variable was formed for supply risk management process maturity (moderator), behavioural uncertainty (independence) and firm performance (dependence) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective. In relation to the study, Y, X, Z and XZ represented firm performance, behavioural uncertainty, supply risk management process maturity and the moderating interaction variable respectively. The key results interested in this instance included the Model Summary, the ANOVA and the Co-efficient. The findings are presented as follows.

Table 36: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.642[a]	.412	.402	.47317	.412	40.277	2	115	.000
2	.644[b]	.415	.400	.47389	.003	.653	1	114	.421

a. Predictors: (Constant), Supply Risk Management Process Maturity, Behavioural Uncertainty

b. Predictors: (Constant), Supply Risk Management Process Maturity, Behavioural Uncertainty, Interaction

Source: Field Survey (2021)

The model summary as depicted in Table 36 reveals two models with model 1 having only behavioural uncertainty as the independent variable and correlate with firm performance to the tune of 64.2 percent. Model 2 incorporated supply risk management process maturity as an additional independent variable together with the interaction effect variable whose correlation was 64.4 percent indicating a slight improvement. There was also a corresponding increase in the explanatory of model 2 from 41.2 percent to 41.5 percent signifying that behavioural uncertainty and supply risk management process maturity as independent variables explained 41.5 percent of the variation in firm performance denoting 0.3 percent increase in explanatory power. However, the adjusted R Square decreased from 40.2 percent to 40.0 percent, an indication that, if the population instead of the sample was used to estimate firm performance, then there would not be a strengthening of the explanatory power by 1.5 percent.

These findings support the claim that supply risk management process maturity plays an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that

supply risk management process maturity plays an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Table 37: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.035	2	9.018	40.277	.000[b]
	Residual	25.747	115	.224		
	Total	43.783	117			
2	Regression	18.182	3	6.061	26.988	.000[c]
	Residual	25.601	114	.225		
	Total	43.783	117			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Supply Risk Management Process Maturity, Behavioural Uncertainty
c. Predictors: (Constant), Supply Risk Management Process Maturity, Behavioural Uncertainty, Interaction

Source: Field Survey (2021)

The combined influence of behavioural uncertainty and supply risk management process maturity had a significant impact on firm performance as depicted by model's ANOVA p-value of 0.000 in Table 37. These findings support the claim that supply risk management process maturity significantly played an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that supply risk management process maturity significantly played an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Table 38: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	2.265	.288		7.875	.000
	Behavioural Uncertainty	-.131	.066	-.144	-1.981	.050
	Supply Risk Management Process Maturity	.485	.054	.651	8.964	.000
2	(Constant)	2.218	.294		7.556	.000
	Behavioural Uncertainty	-.122	.067	-.135	-1.830	.070
	Supply Risk Management Process Maturity	.491	.055	.659	8.977	.000
	Interaction	-.034	.042	-.059	-.808	.421

a. Dependent Variable: Firm Performance

Source: Field Survey (2021)

Supply risk management process maturity as the moderator variable had a negative influence on the relationship between behavioural uncertainty and firm performance as indicated by the beta co-efficient of the interaction term at -.059. However, the moderation effect was not statistically significant as demonstrated by the computed p-value of the beta co-efficient which stood at .421 and was above .05. These findings contradict the claim that supply risk management process maturity plays an intervening role between behavioural uncertainty and firm performance (Bode & Macdonald, 2017). These findings contradict the claim that supply risk management process maturity plays an intervening role between behavioural uncertainty and firm performance (Schiele, 2007).

Supply Risk Management Process Maturity Weakens the Effect of Environmental Uncertainty on Firm Performance

The eight hypothesis proposes that supply risk management process maturity weakens the effect of environmental uncertainty on firm performance. A composite variable was formed for supply risk management process maturity (moderator), environmental uncertainty (independence) and firm performance (dependence) through data transformation process in SPSS so as to provide the basis for a holistic approach to analyzing the data in respect of this research objective. In relation to the study, Y, X, Z and XZ represented firm performance, environmental uncertainty, supply risk management process maturity and the moderating interaction variable respectively. The key results interested in this instance included the Model Summary, the ANOVA and the Co-efficient. The findings are presented as follows.

Table 39: Model Summary

				Std. Error of	Change Statistics				
Model	R	R Square	Adjusted R Square	the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.634[a]	.402	.391	.47731	.402	38.588	2	115	.000
2	.639[b]	.408	.392	.47690	.006	1.198	1	114	.276

a. Predictors: (Constant), Supply Risk Management Process Maturity, Environmental Uncertainty

b. Predictors: (Constant), Supply Risk Management Process Maturity, Environmental Uncertainty, Interaction

Source: Field Survey (2021)

The model summary as depicted in Table 39 reveals two models with model 1 having only environmental uncertainty as the independent variable and correlate with firm performance to the tune of 63.4 percent. Model 2 incorporated supply risk management process maturity as an additional

independent variable together with the interaction effect variable whose correlation was 63.9 percent indicating a slight improvement. There was also a corresponding increase in the explanatory of model 2 from 40.2 percent to 40.8 percent signifying that environmental uncertainty and supply risk management process maturity as independent variables explained 40.8 percent of the variation in firm performance denoting 0.6 percent increase in explanatory power. However, the adjusted R Square increased from 39.1 percent to 39.2 percent, an indication that, if the population instead of the sample was used to estimate firm performance, then there would be a strengthening of the explanatory power by 1.5 percent.

These findings support the claim that supply risk management process maturity plays an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that supply risk management process maturity plays an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Table 40: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.583	2	8.791	38.588	.000[b]
	Residual	26.200	115	.228		
	Total	43.783	117			
2	Regression	17.855	3	5.952	26.169	.000[c]
	Residual	25.927	114	.227		
	Total	43.783	117			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Supply Risk Management Process Maturity, Environmental Uncertainty

c. Predictors: (Constant), Supply Risk Management Process Maturity, Environmental Uncertainty, Interaction

Source: Field Survey (2021)

The combined influence of environmental uncertainty and supply risk management process maturity had a significant impact on firm performance as depicted by model's ANOVA p-value of 0.000 in Table 40. These findings support the claim that supply risk management process maturity significantly played an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings support the claim that supply risk management process maturity significantly played an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Table 41: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.314	.294		4.464	.000
	Environmental Uncertainty	.070	.098	.064	.708	.480
	Supply Risk Management Process Maturity	.557	.085	.593	6.565	.000
2	(Constant)	1.384	.301		4.598	.000
	Environmental Uncertainty	.069	.098	.064	.706	.482
	Supply Risk Management Process Maturity	.545	.086	.580	6.371	.000
	Interaction	-.045	.041	-.080	-1.095	.276

a. Dependent Variable: Performance

Source: Field Survey (2021)

Additionally, supply risk management process maturity as the moderator variable had a negative influence on the relationship between environmental uncertainty and firm performance as indicated by the beta co-efficient of the interaction term at -.080. However, the moderation effect was

not statistically significant as demonstrated by the computed p-value of the beta co-efficient which stood at .276 and was less than .05. These findings contradict the claim that supply risk management process maturity plays an intervening role between environmental uncertainty and firm performance (Bode & Macdonald, 2017). These findings contradict the claim that supply risk management process maturity plays an intervening role between environmental uncertainty and firm performance (Schiele, 2007).

Chapter Summary

This division has provided information regarding the deductions of the study in this chapter, particularly those relating to the specific research objectives that were analyzed and interpreted. The findings were also discussed, given appreciation to their managerial repercussions, practical relevance and positions of previous empirical studies.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

The motivation for this study was to evaluate the effect of supply chain uncertainty on performance and provide empirical evidence for supply risk management moderating supply chain uncertainty in the poultry farms. This study was undertaken to assess uncertainty, supply risk management and their impact on the performance of poultry production firms in Ghana. Specifically, the study was conducted in the Dormaa Ahenkroh Municipality in the Bono Region. The study used an explanatory research design backed by a quantitative research approach. The population of the study was 182 registered members of the Dormaa Poultry Farmers Association (DPFA), while all were used for the sample size of the study. A structured questionnaire was used for the primary data collection. This section, however, provides information regarding the summary of the key findings, conclusions drawn on the respective study objectives, and the recommendations offered founded on the conclusions of the investigation. Again, suggestions for further studies were delivered in that detail.

Summary of Key Findings

The first objective of the study analysed the effect of supply chain uncertainty on firm performance in the poultry farms in Ghana. The first hypothesis sought to investigate the effect of environmental uncertainty on the performance of the poultry farmers in the Dormaa Ahenkro Municipality. The results showed a statistically significantly weak positive correlation between the predictor (environmental uncertainty) and firm performance. Regarding the

model's predictive capacity, it was discovered that the predictors accounted for a positive variance in firm performance. Close surveillance of the significance value indicated that this predictive model is statistically significant. There was a significant and positive effect of environmental uncertainty on firm performance.

The second hypothesis carried out to examine how changes in behavioural uncertainty if any changes in the firm performance of poultry farms in Ghana. The study shows there is a large and positive joint correlation between behavioural uncertainty and firm performance after controlling for the effect of other factors in the configured model. Observation of the co-efficient of determination results shows that changes in behavioural uncertainty accounts for positive change in firm performance after the effect of other factors having the capacity to influence firm performance. Behavioural uncertainty accounts for a statistically significant positive strong significant change in the firm performance. It was found out that behavioural uncertainty makes a statistically significant positive contribution to predicting the significant positive change in firm performance.

The second objective of the study analysed how supply risk management practices moderates the relationship between supply chain uncertainty and firm performance. The third hypothesis proposes that risk monitoring weakens the effect of behavioural uncertainty on firm performance. It was revealed that model 1 correlated with firm performance. Model 2 also revealed that the introduction of risk monitoring slightly improved firm performance. There was also a corresponding increase in the explanatory of model 2. The combined influence of behavioural uncertainty and risk monitoring had a significant

impact on firm performance. Additionally, it was found out that risk monitoring had a positive influence on the relationship between behavioural uncertainty and firm performance. However, the moderation effect was not statistically significant.

The fourth hypothesis proposes that risk monitoring weakens the effect of environmental uncertainty on firm performance. It was revealed that model 1 correlated with firm performance. Model 2 also revealed that the introduction of risk monitoring slightly improved firm performance. There was also a corresponding increase in the explanatory of model 2. The combined influence of environmental uncertainty and risk monitoring had a significant impact on firm performance. Risk monitoring positive influenced the relationship between environmental uncertainty and firm performance. However, the moderation effect was statistically significant.

The fifth hypothesis proposes that risk mitigation weakens the effect of behavioural uncertainty on firm performance. The model 1 revealed that behavioural uncertainty correlate with firm performance. Model 2 also revealed that the introduction of risk mitigation as slightly improved firm performance. There was also a corresponding increase in the explanatory of model 2. The combined influence of behavioural uncertainty and firm performance had a significant impact on firm performance. Risk mitigation positive influence on the relationship between behavioural uncertainty and firm performance. However, the moderation effect was not statistically significant.

The sixth hypothesis proposes that risk mitigation weakens the effect of environmental uncertainty on firm performance. The model 1 revealed that environmental uncertainty correlated with firm performance. Model 2 also

revealed that the introduction of risk mitigation moderately improved firm performance. There was also a corresponding increase in the explanatory of model 2. The combined influence of environmental uncertainty and risk mitigation had a significant impact on firm performance. Risk mitigation had a negative influence on the relationship between environmental uncertainty and firm performance. However, the moderation effect was statistically significant.

The seventh hypothesis proposes that supply risk management process maturity weakens the effect of behavioural uncertainty on firm performance. The model 1 revealed that behavioural uncertainty correlate with firm performance. Model 2 also revealed that the introduction of supply risk management process maturity slightly improved firm performance. There was also a corresponding increase in the explanatory of model 2. The combined influence of behavioural uncertainty and supply risk management process maturity had a significant impact on firm performance. Supply risk management process maturity had a negative influence on the relationship between behavioural uncertainty and firm performance. However, the moderation effect was not statistically significant.

The eight hypothesis proposes that supply risk management process maturity weakens the effect of environmental uncertainty on firm performance. The model 1 revealed that environmental uncertainty correlated with firm performance. Model 2 also revealed that the introduction of supply risk management process maturity as an additional independent variable slightly improved firm performance. There was also a corresponding increase in the explanatory of model 2. The combined influence of environmental uncertainty and supply risk management process maturity had a significant impact on firm

performance. Additionally, supply risk management process maturity had a negative influence on the relationship between environmental uncertainty and firm performance. However, the moderation effect was not statistically significant.

Conclusion

It can be concluded from the first objective that supply chain uncertainty predicts firm performance. Specifically, environmental uncertainty predicts firm performance. It implies that environmental uncertainty statistically significantly predicts weak firm performance. Also, behavioural uncertainty predicts firm performance of poultry farms in Ghana. This implies that behavioural uncertainty accounts for a statistically significant positive strong significant change in the firm performance.

It can be concluded from the second objective that supply risk management practices does not weaken the relationship between supply chain uncertainty and firm performance. Specifically, risk monitoring does not weaken the relationship between behavioural uncertainty and firm performance. Also, risk monitoring does weaken the relationship between environmental uncertainty and firm performance. In addition, risk mitigation does not weaken the relationship between behavioural uncertainty and firm performance. Furthermore, risk mitigation does weaken the relationship between environmental uncertainty and firm performance. Moreover, supply risk management process maturity does not weaken the relationship between environmental uncertainty and firm performance. Finally, Supply risk management process maturity does not weaken the relationship between behavioural uncertainty and firm performance.

Recommendations

Based on the findings of this study, these recommendations are offered to various stakeholders as to how they can utilize the various insights provided by the findings of this study. First of all, management of these poultry businesses should be put in place that can help identify and deal appropriately with uncertainty (both environmental and behavioural variables) that brought about the positive variance performance to increase the performance of the poultry industry in Dormaa Ahenkro context of this study. Again, it is advisable for the management of these poultry businesses, and for that matter Supply Chain Managers unit of the poultry farm, to put in place measures that would enhance effective supply risk management policies and strategies for the desired result of improved performance that would be significantly affected by the variations in these measures of supply risk management at poultry industry in Dormaa Ahenkro.

Furthermore, it is recommended for the management of the various poultry farms to institutionalize systematic research in its management of uncertainty to timely diagnose grey areas in its uncertainty that could be well-managed scientifically to improve the impact on performance and policies on the performance of the poultry industry in Dormaa Ahenkro. Such units must be resourced in terms of human capital, gadgets, technology, software and other needed resources that can empower the research to execute its obligations successfully. These findings will empower the management to know scientifically the areas of performance that can be influenced by the policies and practices of uncertainty and supply risk management policies.

Suggestions for Further Studies

Similar studies need to be conducted in other public poultry businesses to assess whether similar findings would be replicated or not. Again, the use of transformed variables in the study for supply risk uncertainty couldn't bring out the effect of the individual variables used in accessing performance; hence, a similar study can be conducted to look at the individual effect of the variables on supply chain uncertainty on performance. Besides, the inclusion of respondents in similar studies in public poultry business could provide varied opinion from a different perspective rather than limiting it to the views of only predominantly private-owned poultry businesses concerning the effect of supply chain uncertainty on their firm performance.

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APPENDICES

APPENDIX A: QUESTIONNAIRE

Hello respondent,

This questionnaire has been designed to solicit information for research undertaken to investigate the above topic. The information obtained from the survey will in no way reflect the identities of the participants. Your cooperation, attitudes, preferences, and opinions are very important to the study's success and will be kept strictly confidential. Your response will only be used when grouped with those of the other participants in the study. I deeply appreciate your cooperation in taking part in the study.

Consent to participate in Research

I understand that any conformation I share will remain confidential. When the research results are published or discussed at conferences, no information will be included that would reveal my identity or that of my institution. I am eighteen years of age or older. By agreeing to continue with the survey and submit a response to the researcher in question, I am consenting to participate in this research

I consent to participate in this survey: ☐ YES ☐ NO

Section A: Demographic Information

1. Sex: Male [ ] Female [ ]
2. Position: Farm manager [ ] Farm owner [ ] Supply chain manager [ ]
3. Firm size: Small-sized enterprise [ ] Medium sized enterprise [ ] Large-sized enterprise [ ]

4. Production capacity a. 50-5,000 birds [ ] 5001-10,000 birds [ ] Above 10,000 birds [ ]
5. Principal breed: Layers [ ] Broilers [ ] Layers and broilers [ ]
6. Form of business: Private Company [ ] Partnership [ ] Sole proprietorship [ ]

Section B: Supply Chain Uncertainty

To what extent do you agree with the following statements regarding the uncertainty among poultry farmers in the Dormaa Ahenkro municipality?

1-Strong Disagree; 2- Disagree; 3-Moderately agree; 4-Agree; 5-Strongly agree

Questionnaire was adapted from Murugesan et al. (2013); Simangunsong et al. (2012).

No	Behavioral uncertainty	1	2	3	4	5
1	It takes significant effort to detect whether or not suppliers conform to specifications and quality standards					
2	Excessive reliance on a particular supplier could be risky for the poultry business					
3	It is costly in time and effort to monitor the performance of key suppliers clearly					
4	Information asymmetry between farm managers and farm owners can result in opportunism.					
5	The constant change in customers' preferences distorts the poultry business.					

6	Farmers often purchase the wrong breed of day-old chicks due to bounded rationality.					
	Environmental uncertainty					
1	Persistent fuel hikes affect the poultry business					
2	Uncertainties from the impact of the covid-19 pandemic and other diseases make poultry the riskiest venture in the Agri-business					
3	The survival of poultry firms is currently threatened by tough competition amongst competitors					
4	As far as marketing is concerned, imported poultry products remain a force to reckon with in the poultry industry					
5	An increase in grains and prepared feed prices is taking a serious toll on the poultry business					
6	Despite the challenges the poultry industry faces, customers remain reluctant and non-compliant with any price increase in the poultry products					
7	The poultry industry does not benefit from any government subsidy					

Supply Risk Management

To what extent do you agree with the following statements regarding the supply risk management among poultry farmers in the Dormaa Ahenkro municipality?

1-Strong Disagree; 2- Disagree; 3-Moderately agree; 4-Agree; 5-Strongly agree.

The questionnaire was adopted from Reinhardt (2019) and Tubis and Werbi´nska-Wojciechowska (2021).

	Supply Risk Management					
	Risk monitoring	**1**	**2**	**3**	**4**	**5**
1	I fully know the tools and techniques for effective supply risk management in the poultry business					
2	Overall, I find supply risk management useful and helpful in my job as a poultry farm manager					
3	Supply risk management allows me to undertake complex study chain decisions more quickly and efficiently in my day-to-day activities as a poultry farmer.					
4	I am very positive and supportive of applying chain risk monitoring practices in my					
	Risk mitigation					
	For decision-making, information on critical events is communicated to only selected poultry farm managers.					
7	I know how to relate supply risk management tools and techniques to my poultry business process and decision making.					
8	The top management of the poultry business acknowledges the contributions and encourage individuals or teams which establish or enhance supply risk mitigation practices in our organization.					
9	My poultry business supply chain is robust against artificial or natural catastrophic events.					
	Supply risk management process maturity					

1	In case of an adverse event in the poultry business's supply processes, managers collect information from team members on the causes of the events and determine the consequences of its consequence.					
12	For critical events, managers of the poultry farms must periodically prepare a risk analysis based on their observation and knowledge					
13	Information on identified risks should only be communicated to the management board and few selected farm managers.					

Section C: Firm Performance

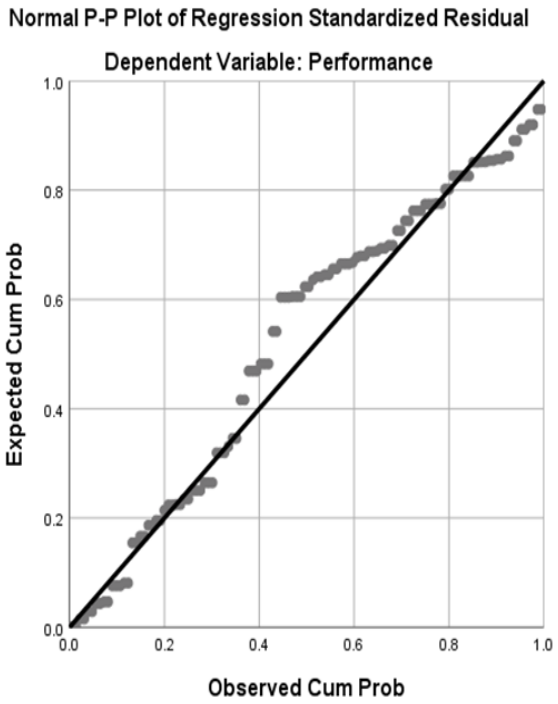
To what extent do you agree with the following statements regarding the performance among poultry farmers in the Dormaa Ahenkro municipality?

1-Strong Disagree; 2- Disagree; 3-Moderately agree; 4-Agree; 5-Strongly agree.

No	Performance	1	2	3	4	5
1	There has been a great reduction in the bird's mortality rate due to the breed purchased and strict bio-security.					
2	Using dual-purpose exotic breeds has increased egg production and the sizes of spent layers.					
3	Egg sizes are devoid of peewee eggs, mostly from large to extra-large eggs.					
4	The frequency of deliver of the poultry products has improved drastically.					

5	There is a high percentage of perfect order delivery in my poultry firm.					
6	Using a battery cage system to rear poultry birds in poultry farms reduces workforce.					
7	The battery cage system ensures clean eggs, reduces egg destruction, and increased number of birds per room.					
8	Reduction in procurement costs can increase the production of poultry products.					
9	Preparation of own feed to increase quality, reduce cost and increase both quantity and quality of eggs produced.					
10	The practice of internalizing transactions ensures access to quality and preferred input, reduction of cost and increase in savings.					

APPENDIX B: Normal Probability Plot



Appendix C: Test of Normality for Supply Chain Uncertainty

Appendix C: Test of Normality for Supply Chain Uncertainty

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.4433	4.2921	4.0141	.23275	118
Std. Predicted Value	-2.453	1.194	.000	1.000	118
Standard Error of Predicted Value	.053	.141	.073	.020	118
Adjusted Predicted Value	3.3937	4.3030	4.0134	.23463	118
Residual	-1.79961	.93838	.00000	.57522	118
Std. Residual	-3.115	1.624	.000	.996	118
Stud. Residual	-3.155	1.635	.001	1.005	118
Deleted Residual	-1.84614	.95102	.00069	.58630	118
Stud. Deleted Residual	-3.286	1.647	-.003	1.016	118
Mahal. Distance	.000	6.015	.992	1.264	118
Cook's Distance	.000	.129	.010	.019	118
Centered Leverage Value	.000	.051	.008	.011	118

a. Dependent Variable: Firm Performance

Source: Field survey, (2021)