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Behavioural Determinants of Out-of-Stock Aversion in Supply Chains: A Risk-Based Model

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Abstract

Buyers in supply chain exhibits risk avoidance preference in making inventory ordering decision under supply uncertainty. In supply chain with stringent service level requirement, out-of-stock aversion is an important risk avoidance preference of decision makers in making inventory orders. This research explores the individual-level behavioural determinants of out-of-stock aversion in supply chain facing risk of supply disruption. The aim is to enhance understanding of buyer's behavioural preference for out-of-stock aversion by proposing a conceptual model based on the risk construct theory and the framework of risky decision making. The conceptual model presented here formulates several propositions related to overordering driven by out-of-stock aversion preference. It draws upon extensive literature on behavioural inventory ordering decisions under supply uncertainty and individual risky decision-making to provide a comprehensive understanding of this behavioural preference among the purchasing personnels. The proposed model presents how a buyer's risk preference influences stockout avoidance overordering. Furthermore, by incorporating the behavioural view of supply disruption risk, the model offers a comprehensive perspective on understanding the behavioural preference of out-of-stock aversion. Findings suggested that individual propensity to risk aversion and perceived supply disruption risk are the key behavioural factors that drive the psychological process behind out-of-stock aversion. The proposed model lacks empirical testing and thus the developed prepositions remain open for validation. This paper lays the groundwork for future empirical research on behavioural perspective of risk driven inventory ordering under supply risks, particularly through field studies.

Keywords

Overordering, Out-of-stock aversion, Perceived risk, Risk aversion, Risk avoidance

1. Introduction

As modern supply chains grow increasingly complex and global, managing inventory amid supply risks has become one of the most challenging tasks for managers. At various stages of the supply chain decision makers must make inventory orders while facing uncertainty in supply (Hofstra et al. 2024). While risk management tools and frameworks exist to support decision-making under uncertainty, but they often assume rational decision-making and objective risk assessments. However, behavioural research in operations management suggests that decision-makers operate with individual's limitation in information processing, preference for lower-risk options, and further may have misperceptions of risk (Ancarani et al. 2013), (Donohue et. al. 2020). Therefore, fully rational decision-making with objective risk assessments is impractical due to the inherent uncertainty in supply environments. As a result, decision-making about inventory ordering quantity in risky supply environments can be influenced by subjective risk assessments and individual risk attitude.

When facing risky supply environments, decision makers often display behavioural preferences in inventory ordering that reflect their underlying risk propensities. These behaviours depend on whether the random event of supply failure align with buyers' expectations or not. When shortages stem from sudden and unexpected events, inventory decisions

typically reflect risk-seeking behaviour, as buyers respond aggressively to abrupt supply interruptions taking the risk that the supply failure may continue in future periods also (Hung and Ryu 2008). In contrast, when shortages are anticipated, buyers tend to show risk-averse behaviour and exhibit a preference for avoiding stockouts—referred to as out-of-stock aversion (Di Mauro et al. 2020). For example, overstocking in anticipation of uncertain inbound shipments or inventory discrepancies reflect out-of-stock aversion (Hofstra et al. 2024). The preference for out-of-stock aversion can also arise under coordination risk: when information sharing with suppliers is limited, managers may attribute potential supply failures to supplier incompetence and therefore hold additional coordination stock to avoid stockouts (Croson et al. 2014), (Sarkar and Kumar 2015).

Importantly, out-of-stock aversion is driven primarily by the perception of supply shortages rather than by actual disruptions. It becomes more pronounced among purchasing managers when shortage costs are high, leading them to adopt proactive risk-mitigation strategies, such as accumulating inventory in anticipation of potential disruptions. Prior research has largely examined stockout avoidance as a reactive form of risk-driven hoarding following disruptions, emphasizing the role of affective responses, risk-mitigation motives, and social influences (Sheu 2016), (Sheu and Kuo 2020). However, limited attention has been given to the proactive, behavioural drivers of overordering motivated by out-of-stock aversion before disruptions occur.

This study seeks to address this gap by examining the individual-level behavioural determinants of proactive overordering motivated by out-of-stock aversion. Recent experimental research shows that overstocking behaviour under supply uncertainty is linked to individual risk aversion levels (Cannella et al. 2019), (Di Mauro et al. 2020). Building on this, the present study adopts a behavioural view of supply risk, incorporating both subjective risk perceptions and individual risk propensities for making inventory order quantity decisions. Guided by the theory of risky decision making (Sitkin and Pablo 1992), stockout avoidance overordering is conceptualized as a form of risk-avoidance behaviour. Accordingly, the proposed conceptual model examines how a decision maker's risk aversion propensity mediates the relationship between their risk preference and stockout avoidance overordering, and how their perceived supply disruption risk moderates, the relationship between risk aversion propensity and stockout avoidance overordering. This approach provides a more comprehensive behavioural explanation of out-of-stock aversion and offers meaningful implications for supply chain risk theory.

2. Research objectives

This research has two primary objectives as given below:

- To understand how individual risk preference leads to overordering in supply chain under supply uncertainty.
- To explore the role of supply disruption risk perception in influencing the out-of-stock aversion driven overordering in supply chain.

3. Background study

3.1 Risk taking behaviour

The behavioural risk literature identifies risk taking framework as a key framework for explaining inventory decision making under perceived supply risks. Prospect theory given by Kahneman and Tversky (1979) is the most recognized early theory on individual decision making under risk. According to this theory, an individual's behaviour under risky environment is primarily influenced by how the situation is framed i.e., whether it is perceived within a gain domain or a loss domain. In Prospect theory, individuals are assumed to have had minor loss experiences in the past for negatively labelled situations and minor gain experiences for positively labelled situations. Assuming such scenario, researchers predicted when situation is positively labelled, people will show risk avoiding behaviour while in negatively labelled situation people will show risk seeking behaviour (Kahneman and Tversky 1979), (Singh 1986). But some researchers had a different view and proposed risk avoidance behaviour in negatively labelled situation where decision maker perceived the situation in threatening terms (Janis and Mann, 1977), (Staw et. al. 1981). The possible reason in this case could be large loss experiences of the participants in the past. Similarly, some researchers including (March and Shipra 1987), (Osborn and Jackson 1988), and (Thaler and Johnson 1990) identify risk seeking behaviour in positive labelled situation where decision maker starts focusing on the opportunities inherent in the situation. The possible reason in this case could be large gain experiences of the participants in the past. As per reconceptualized model of risk-taking behaviour proposed by (Sitkin and Pablo 1992), the difference in sign of the relationship between loss/gain domain and risk-taking behaviour in different studies could be due to nature of risk propensity of the decision maker (i.e., risk seeking propensity or risk averse propensity) in different studies depending upon their past gain/loss experiences (Refer Figure -1 and Figure - 2).

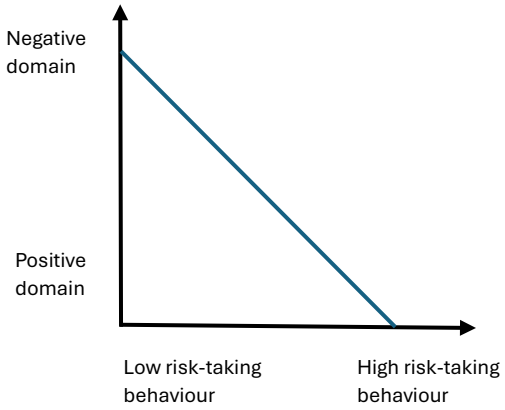

Figure 1. Risk-taking behaviour of the decision maker with risk averse propensity

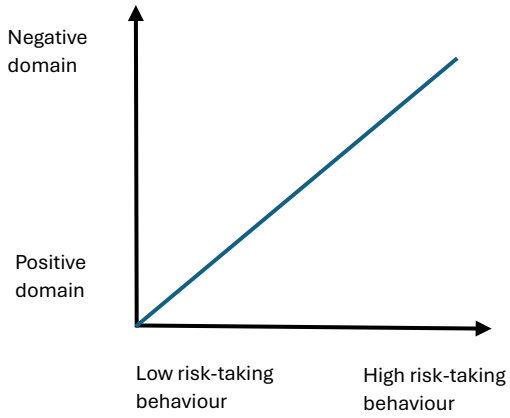

Figure 2. Risk-taking behaviour of the decision maker with risk seeking propensity

Risk propensity reflects the extent of individual willingness to take or avoid risks (MacCrimmon and Wehrung 1990). Decision-makers may exhibit either a risk-seeking propensity or risk-averse propensity, leading to increasingly risk-taking or risk-avoiding behaviour. In (Sitkin and Pablo 1992) model, risk propensity is conceptualized as variable individual trait which may vary over time. According to their proposed risk-taking framework, risk propensity explains the current tendency of decision maker to take or avoid risk in a decision problem based on their personal risk preference in the given domain, failure or success due to their risk propensity in past outcome and inertia to their past's risk propensity. Individual propensity to risk thus depends upon individual risk preference and further tends to persist over time due to inertia and then will have a stable pattern. But prior success in risk seeking or risk averse behaviour can alter decision maker's risk propensity as per their prior outcome. An individual risk propensity is thus recognized as an emergent property which could be risk seeking propensity or risk averse propensity over time depending upon their general risk preference in the domain and prior outcome history (Sitkin and Weingart 1995).

3.2 Risk construct theory

According to Sitkin and Weingart (1995) risk perception reflects the individual assessment of potential threat involved in the risk faced. High perception of risk implies that there is high potential of threat involved in the risk. High risk perception will lead to more risk avoidance behaviour as compared to the case of low-risk perception. In some cases, people perceive high risk in positively framed situation than in the negatively framed situation thus tends to be more risk averse in former than in the later situation (Kahneman and Tversky 1979). While there are some cases, when people perceive high risk in negatively framed situation than in the positively framed situation, thus tends to be more risk averse in former than in the later situation (Staw et. al. 1981), (Janis and Mann 1977). The relative salience of threat or opportunity varies with varying risk propensity; thus, individual risk perceptions is dependent on their risk propensities. Individuals with risk seeking propensities will focus more on positive outcomes than on negative outcomes (March and Shipra 1987). Thus, decision makers with risk-seeking propensity perceive less threat in a negatively framed situation compared to those with risk-averse tendencies. Similarly, decision makers with risk-seeking propensity perceive more opportunity in a positively framed situation compared to their risk-averse counterparts.

4. Conceptual model and prepositions development

Stockout avoidance overordering stems from risk aversion motivations of buyer in situation of perceived supply scarcity. To explore the behavioural factors that influence the preference for stockout avoidance, a conceptual model is proposed (Figure 3), drawing from model of risky decision making (Sitkin and Pablo 1992) and risk construct theory (Yates and Stone 1992). Risky decision-making can involve multiple outcomes: any outcome preferred over the reference is considered a gain, while an outcome less preferred than the reference is seen as a loss. In the proposed model, supply disruption risk is conceptualized according to Yates and Stone's theory, which views risk as a combination of the likelihood and consequences of loss, measured relative to a specific reference outcome.

In inventory ordering decision, two possible outcomes must be considered: either increasing inventory at the expense of higher holding costs or not increasing inventory, thereby risking stockouts and incurring shortage costs. In inventory replenishment decision, decision makers behavioural preference to avoid the risk of stockouts situation is due to high shortage costs (Cannella et. al. 2019). Therefore, in context of higher service level requirement, holding less inventory will be viewed as a loss compared to holding more, given the greater impact of shortage costs. In multi-echelon supply chains, firms that need to guarantee certain level of service level to their customers want to avoid running out-of-stock situation (Di Mauro et. al. 2020). Consequently, buyers tend to increase safety stock levels when they perceive a potential threat of future stockouts due to a limited supply base. Here, buyer's preference to increase inventory holdings is manifested as stockout avoidance overordering, which can be viewed as a risk-averse response in making inventory ordering under limited supply.

As discussed in Section 2, individual risky behaviour is determined by individual risk propensity and their subjective risk perceptions. Therefore, understanding out-of-stock aversion using the theory of risky decision making, the proposed framework conceptualized two behavioural determinants of stockout avoidance overordering: the individual risk averse propensity and their perception of supply disruption risk. The risk aversion propensity is an emergent characteristic which is determined by individual risk preference to avoid risk i9n the domain and the outcome history of their risky behaviour in past. The conceptualization of the behavioural determinants and the propositions developed are briefly discussed in following sub-sections.

4.1 Risk aversion propensity

Decision-makers exhibit varying degrees of risk propensity over time, ranging from risk-seeking to risk-averse tendencies (Sitkin and Weingart 1995). Here in our context, risk aversion propensity is operationalized as individual's current tendency to avoid risk when deciding inventory order quantities under risky supply. It is conceptualized based on (Sitkin and Pablo 1992) model that propensity to risk avoidance can change over a period. Thus, it is a changeable trait that can be learned with experience. The proposed model considers risk-averse propensity as a pre-dispositional characteristic of buyers, influencing their tendency to avoid running out-of-stock when supply risks are perceived as a significant threat.

4.2 Perceived supply disruption risk

In the context of supply risk-driven overordering, supply shortage is conceptualized as potential future losses arising from the disruption in supply. Disruption is as an event that may interrupt the normal flow of material and further lead to an abrupt termination of the movement of goods (Wilson 2007). Supply disruption has number of loss elements that may originate from different events or sources such as transportation delays (Sanchez-Rodrigues et. al. 2010), risk events in extended supply chain such as natural disaster and political instability that affects supplier's operations and transportation disruptions (Zsidisin and Wagner 2010) etc. Perceived supply disruption risk is thus formed through the cumulative effect of all these loss elements. Further, Zsidisin (2003) conceptualizes supply risk based on Yates and Stone (1992) risk construct theory, viewing it as a combination of the perceived likelihood and significance of loss. Accordingly, supply disruption risk perception is here conceptualized as a formative construct, where both the probability of supplier failure and the magnitude of its consequences shape individual perceptions of supply disruption.

4.3 Risk preference as a determinant of risk aversion propensity under supply risk

Risk preference is an intrinsic tendency of individual for taking or avoiding risk in the given domain (Brockhaus 1980). It is a stable characteristic of an individual that cannot be changed easily. In context of this study, risk preference is operationalized as motivation of the decision makers for taking or avoiding risk in purchasing/procurement domain. In addition, risk aversion propensity is operationalized as motivation to avoid risk in inventory ordering decision under risky supply. Individual's general tendency to take or avoid risk in the domain is a good predictor of individual's attitudes toward risk in a specific decision problem in that domain (Sitkin and Pablo 1992). Thus, Decision maker's propensity to risk aversion will be determined by his/her risk preference of avoiding risk in purchasing/procurement related decisions.

Thus, the proposed testable proposition 1 is as follows:
P1- A higher level of risk preference of avoiding risk in purchasing/procurement domain will lead to a higher level of risk aversion propensity in inventory order quantity decisions.

4.4 Outcome history as a determinant of risk aversion propensity under supply risk

Outcome history is the degree to which the decision maker believes that his past risk-taking behaviour was successful or not (Sitkin and Weingart 1995). If decision maker's outcome history is that they were successful in risk averse ordering behaviour, then they will demonstrate increasingly risk aversion propensity (March and Shapira 1987). In contrast, if decision maker's outcome history is failure in risk seeking ordering behaviour in situation of supply scarcity, then they will change their propensity from risk seeking to risk aversion. In context of inventory order quantity decision, if decision-maker feels that he or she has been successful in making risk avoidance overordering, then he or she will be more actively motivated for future overordering with increased confidence of success.

P2- Past successes in risk avoidance overordering will positively affect a decision-maker's risk aversion propensity for inventory order quantity decisions

4.5 Risk aversion propensity and stockout avoidance overordering under supply risk

Decision makers are inclined to make risky decisions based on the strength of their risk propensity (Brockhaus 1980). In risk taking framework, risk propensity is the immediate determinant of individual risk-taking behaviour (Sitkin and Pablo 1992). Further empirical study is available that examined the direct effect of risk propensity on risk taking behaviour and identified it as significant factor (Wong 2005). Therefore, it can be hypothesized that individuals with a low-risk propensity (i.e., risk averse individuals) are likely to engage in risk avoiding option. Under stringent service level requirement, buyers prioritize stockout prevention to avoid shortage costs (Di Mauro et. al. 2020). Individuals with high risk aversion propensity are more likely to accept higher inventory levels and incur increased holding costs in exchange for improved customer satisfaction and minimized backorders (Cannella et. al. 2019). Holding lesser inventory will be a risky option in face of severe supply risk due to high shortage cost. As overstocking more will reduce the stockout risk, thus in context of the study, stockout avoidance overordering can be linked to buyer's risk averse propensity.

Thus, the proposed testable proposition 3 is as follows:

P3- A higher level of buyer's risk aversion propensity will positively affect their preference to stockout avoidance overordering.

4.6 Risk aversion propensity and supply disruption risk perception

Individuals with low-risk propensity (i.e., risk-averse individuals) tend to overestimate the likelihood of negative outcomes compared to positive ones (Schneider and Lopes 1986). In general, they are more likely to perceive situations in terms of potential negative outcomes (March and Shapira 1987). In risk-taking framework, risk perception (i.e., perceived threats from negative situations) are hypothesized to positively correlate with individual risk aversion (Sitkin and Pablo 1992). Furthermore, empirical studies on the relationship between risk propensity and perceived risk suggest that higher risk-taking propensity tends to lower perceived risk (Sitkin and Weingart 1995). Under supply disruption risk context, most individuals in supply chain exhibit risk aversion (i.e., low-risk propensity), specifically a strong aversion to stockout risks (Cannella et. al. 2019). Therefore, based on the theories proposed by Sitkin and Pablo (1992) and Sitkin and Weingart (1995), individuals with higher levels of risk aversion (low-risk propensity) will perceive greater threats from supply disruption risks in such environments.

Thus, the proposed testable Proposition 4 is as follows:

P4- A higher level of buyer's risk aversion propensity will positively affect their perceptions of supply disruption risk.

4.7 The moderation role of supply disruption risk perception

Previous research including prospect theory, have predicted that perceived risk is a key explanatory variable that can account for the variation in risk-taking behaviour. However, there was dilemma regarding the sign of the relationship between perceived risk (negative labelled i.e., loss domain or positively labelled i.e., gain domain) and risk-taking behaviour (i.e., risk-taking or risk avoidance), as discussed in Section 3. The reconceptualized model of risk-taking behaviour addressed this dilemma by conceptualizing a new variable i.e., risk propensity (Sitkin and Pablo 1992). The theory posited that risk propensity explains the variation in risk-taking behaviour within the boundaries set by individual risk perceptions. Perceived risk thus amplifies the connection between risk propensity and risk-taking behaviour. Thus, individuals with a risk averse propensity will increasingly exhibit risk-avoiding behaviour as perceived risk increases. Consequently, in context of inventory ordering under risky supply, it can be hypothesized that the strength with which risk aversion propensity led to stockout avoidance overordering will depend upon the level of supply disruption risk perceptions (Figure 3).

Thus, the proposed testable proposition 5 is as follows:

P5- The impact of individuals risk aversion propensity on stockout avoidance overordering will be strengthened by higher level of perceived supply disruption risk.

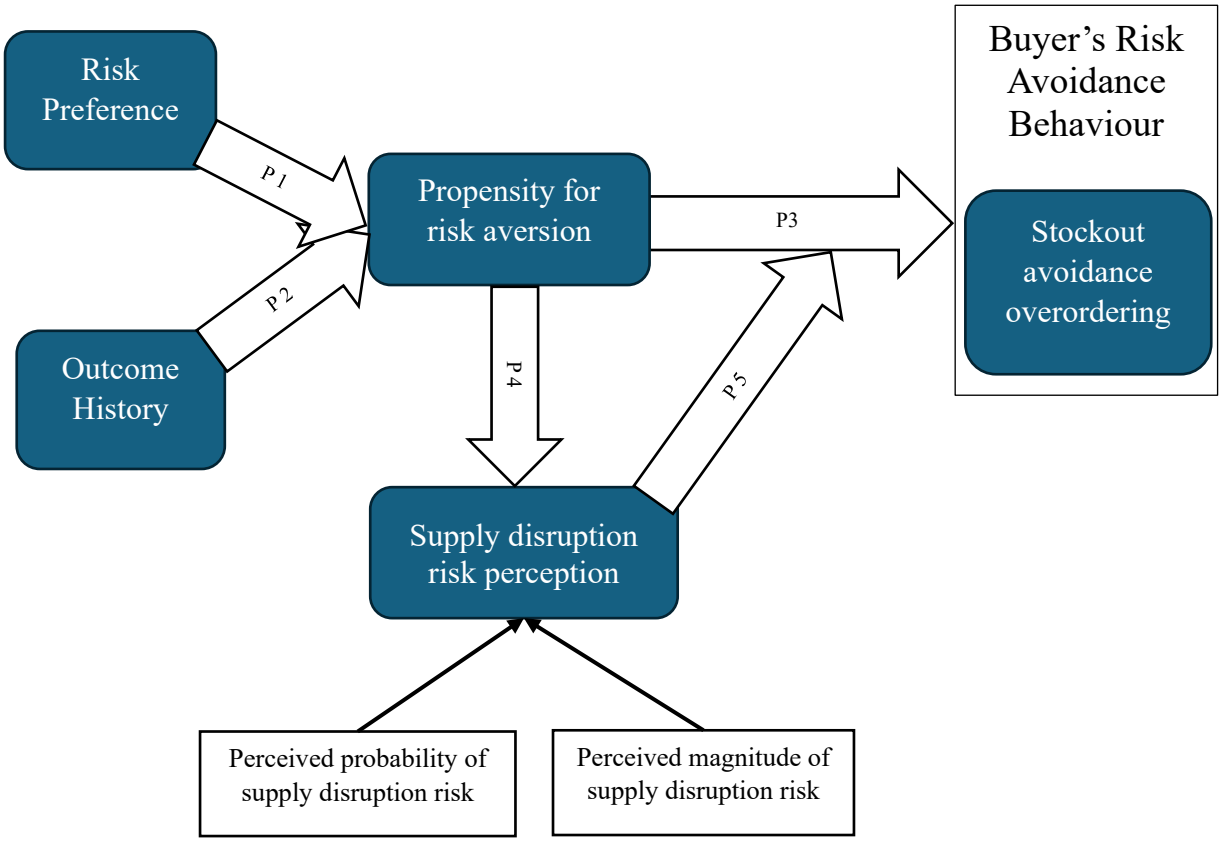

Figure 3. Proposed conceptual model

5. Discussion

The proposed conceptual model identifies the individual-level behavioural driver of out-of-stock aversion preference in inventory ordering. Supply chain that promises high service level for their customer are more prone to stockout avoidance overordering due to high shortage cost. Individual risk preference to avoid risk in purchasing/procurement domain and successful risk avoidance overordering in past are driving the out-of-stock aversion preference of buyers through risk aversion propensity. However, risk aversion propensity will drive the out-of-stock aversion preference only when there is high perceived supply disruption risk. In addition, individual propensity to risk aversion enhances supply disruption risk perceptions, which increases their motivation to stockout avoidance overordering. Moreover, the supply disruption risk perception can also moderate the causal relationship between risk aversion and stockout aversion overordering.

Future scope lies in the empirical validation of the proposed model through field studies. Survey needs to be conducted through operationalization of the conceptualized constructs based on previous literature. In this study, perceived supply disruption risk is conceptualized as the higher order formative construct. Perceived supply disruption risk consists of perceptual measures of both the probability and magnitude of various supply-side risks. Therefore, overall perceived supply disruption risk will become the higher order construct which can be measured using number of first order constructs with perceptual measures of probability and magnitude of potential losses and can be adapted from existing literature (Ellis et al. 2010), (Tse et al. 2021) to fit the supply scenario in the selected study area. Similarly, previous research can also be used to adapt measures for risk preference, outcome history and risk aversion propensity (Sitkin and Weingart 1995), (Shim et. al. 2009), Cantor et. al. 2014).

6. Research Implications

Previous research on the behavioural investigation of inventory ordering in multi-echelon supply chains has primarily relied on laboratory experiments using students or purchasing professionals as participants. These studies have examined the effect of individual risk attitudes on inventory ordering behaviour (Cannella et al. 2019), (Di Mauro et al. 2020). However, observing supply partners' ordering behaviour in actual supply environments can provide a more accurate understanding of behavioural preferences in inventory decisions (Sterman and Dogan 2015). The present research offers a theoretical implication by encouraging future studies to investigate risk-propensity-driven behavioural preferences in inventory ordering using field data rather than controlled experiments. Specifically, this study identifies perceived supply disruption risk as a significant determinant of stockout-avoidance overordering, in addition to buyers' inherent risk-averse propensity.

The overall perceived supply disruption risk is conceptualized as a cumulative assessment of risks arising from multiple supply-side sources, integrating both the probability and magnitude of potential losses. In real-world supply chains, decision makers perceive risks from diverse events such as yield variability (He and Zhao 2012), quality failures (Tse et al. 2021), or natural disasters (Sheu 2016), all contributing to the overall perceived disruption risk. Therefore, empirical research grounded in the proposed framework can be particularly insightful in industries highly exposed to supply-side uncertainties, such as agro-based supply chains, where data on perceived supply disruption risks and related constructs can be collected to test the proposed hypotheses.

From a managerial perspective, this study provides insights into mitigating behavioural drivers of overordering. Excessive ordering increases inventory holding costs and reduces overall supply chain profitability. While demand fluctuations can naturally cause overordering, this research highlights that behavioural responses to perceived supply risks may also lead to similar outcomes. Hence, minimizing supply uncertainty for downstream partners becomes critical to reducing risk-driven stockout aversion. Supply chain contracts can formalize inter-firm communication and reduce reliance on informal, verbal exchanges, thereby lowering perceived supply disruption risks. Similarly, leveraging digital technologies to facilitate real-time information sharing across supply chain stages can mitigate coordination risk and improve transparency. By enhancing formal communication and visibility, managers can reduce perceived rather than actual disruption risks, thereby limiting overordering behaviour rooted in stockout aversion.

7. Conclusion

This research draws on theories from behavioural science, to provide theoretical insights into behavioural preferences in inventory ordering. It suggests the use of behavioural risk theories to further understand the behavioural aspects of proactive risk-driven overordering in the context of supply-side risk. This study successfully proposed a novel conceptual model for investigating the risk avoidance overordering behaviour namely, out-of-stock aversion in

distributing channels. Here, risk avoidance behaviour in inventory ordering decision is conceptualized based on the existing framework for examining individual risky decision making given by (Sitkin and Pablo 1992). This research applies two theoretical perspectives of individual risk propensity and subjective risk perceptions to guide researchers and lays the foundation for future empirical research about psychological factors that may influence behavioural preference in inventory ordering under supply risk.

In particular, the buyer's preference to out-of-stock aversion in multi-echelon supply chains can be evaluated using the proposed framework. Behavioural risk theories suggest that it can be influenced by both an individual's disposition toward risk (a dispositional attribute) and their subjective perception of supply risk (a situational attribute). The proposed framework focuses solely on the individual level behavioural factors influencing risky ordering decisions, without accounting for other contextual elements outlined in risk-taking framework (Sitkin and Pablo 1992). Future studies could expand on this theory by examining how social influences and cultural norms shape supply risk perceptions and the further impact on inventory ordering behaviour.

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Biographies

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Rajat Agrawal is a Professor at Department of Management Studies, Indian Institute of Technology Roorkee, Uttarakhand, India. Currently, he is Head of the Department of Management Studies. He has also worked as Associate Dean for Innovation and Incubation, IPR Chair Professor of DPIIT, Govt of India at IIT Roorkee. He is also a Joint faculty member at Center of Excellence for Disaster Mitigation and Management and Associate faculty member at Center of Excellence for Transportation Management, IIT Roorkee. He initiated the process of establishing the Design Innovation Centre at IIT Roorkee and presently Co-PI and Co-coordinator of the Centre. He was a visiting fellow to

Copenhagen Business School, Copenhagen, Denmark. He was awarded the ICCR Chair in Indonesia in 2016-17. His area of interest is Production and Operations Management including Supply Chain Management, Manufacturing Strategy and World Class Manufacturing. He has more than 120 research papers in refereed journals and more than 25 research papers in refereed conference proceedings. He has authored one book published by Bloomsbury and book chapters in 8 books. He has organized the First PANIIT International Management Conference in 2018.