

# Overview of the Uncertainty and Supply Chain Risk in Vietnamese Garment and Textile Firms: The Moderating Role of Supply Chain Flexibility in Risk Mitigation

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## Abstract

To stay competitive in the market, firms are forced to offer high levels of customization and product offerings, which leads to high uncertainty in the supply chain. Consequently, in uncertain environment, firms would face the risk of supply disruptions, production, and delivery delays, resulting in poor operational performance. This paper aims to analyze and review the literature on operational uncertainty and risks in the supply chain that enterprises face. On that basis, the study outlines research gaps and future research needs.

**Keywords:** Supply chain risk; Environmental uncertainty; Supply chain flexibility

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## 1. Introduction

Global supply chain has been an indispensable part in the context of international business for decades. The global supply chain plays a crucial role as it participates in almost all life activities taking place in the world. For businesses, an efficient supply chain creates a competitive advantage because it not only helps control and optimize all kinds of costs for businesses, but also helps ameliorates customer service. On a broader scale, supply chains contribute to the well-being of each country and enhance the development of the global economy. In recent years, due to globalization trends and mergers between companies, the uncertainty and risks in corporate supply chains have increased (Abrahamsson, Aldin and Stahre 2003). In which, risk is an aspect of uncertainty in the operational environment of enterprises. These risks cause complexity in the supply chain, occur frequently and are defined as operational risks of the supply chain (Thun and Hoenig, 2011). In recent years, the outbreak of the COVID-19 pandemic has dramatically disrupted the global supply chain (Araz et al. 2020). The first quarter of 2020 witnessed a 3% decline in global trade value, specifically, 94% of companies in Fortune 100 experiencing supply chain disruptions due to COVID-19 (Teodoro and Rodriguez, 2020).

During the first months of 2020, that China implemented the lockdown policy due to the Covid pandemic immediately affected the export activities of countries (Araz et al. 2020). As the result, the global apparel supply chain, including Vietnam was strongly affected. Vietnam is the world's third largest exporter of clothes with 6.2% of the global market share. In the process of international economic integration, along with high competitiveness, the textile and garment industry has been the key export industry of Vietnam. The textile industry creates about 2.5 million jobs in Vietnam (2017). There are about 6000 textile and garment companies in Vietnam, 70% of which operate in the clothing manufacturing sector. Thus, the uncertainty and risks in the supply chain, especially the supply chain of the textile industry, would greatly deteriorate the economy in general and textile enterprises in particular. Despite the opportunities from Free Trade Agreements, in 2020, the textile and garment industry suffered from the most negative and prolonged impacts of the Covid-19 pandemic. The index of industrial production (IIP) of the textile industry decreased by 0.5% because the Covid-19 pandemic disrupted the supply of raw materials, shrank the consumption market of garment products. Besides, the demand for textile products dropped sharply when consumers around the world purchased essential supplies in pandemic. Therefore, it is imperative for the textile industry to find ways to survive and develop in accordance with the new context. The study of supply chain risk factors will help textile enterprises be proactive in building risk management strategies and better operational efficiency. However, in Vietnam, research on supply chain risks in the textile and garment sector are quite sparse and their scope is not comprehensive. In addition, these studies have not yet provided specific and appropriate solutions for supply chain uncertainty and risks. This paper will focus on supply chain uncertainty in terms of operational risk and the factors that promote and mitigate supply chain operational risk.

To minimize the risk of supply chain disruption, previous studies have suggested that flexibility is the best way to prevent risk. Supply chain flexibility is often seen as the key solution to uncertainty and competitiveness in the market (Sreedevi, 2017). "Flexibility" has been studied for many years from an economics perspective

(Lavington, 1921; Jones and Ostroy, 1984; Devereux and Engel, 2003) and an organizational perspective (Burns and Stalker, 1961; Boynton). and Victor, 1991; Golden and Powell, 2000). Sreedevi and Saranga (2017) have shown that supply flexibility, manufacturing flexibility and distribution/logistics flexibility have a moderating role in the relationship between environmental uncertainty and supply chain risk. Flexibility represents the ability of a company to adapt to unforeseen changes in the environment during the production process as well as in the market. The relationship between uncertainty and flexibility is an inseparable one because flexibility is often seen as the response to adapt to environmental uncertainty (Mascarenhas, 1981; Gupta and Goyal, 1989; Upton, 1995). Suarez et al. (1991) argue that flexibility will allow manufacturers to respond quickly to market changes.

From the abovementioned theory and practice, it is imperative to make an overview of issues related to supply chain uncertainty, supply chain risks, and the moderating role of supply chain flexibility in risks mitigation. Hence, further research directions are proposed to provide solutions for businesses, especially textile and garment enterprises in Vietnam.

## **2. Research method**

The main research method used is qualitative. The research team used, analyzed, and compared primary and secondary data sources from previous relevant scientific studies.

## **3. Literature review**

### **3.1. Research on supply chain risk**

The increasing ramifications of supply chain risks on the performance of firms (Kleindorfer and Saad, 2005) has caught the attention of both academic researchers and industry practitioners in the field of supply chain management (Bogataj and Bogataj, 2007; Matsuo, 2015 and Li et. al., 2015). Especially, supply chain risks are skyrocketing across industries as companies witness significant changes in their business environment due to intense competitive pressure and the globalization of market. (Wagner et al., 2009). Therefore, from the perspective of many scholars in the world and in Vietnam, many studies on supply chain risks have been carried out.

In 2013, Chen et al conducted research and proposed measures to alleviate supply chain risks by considering supply chain cooperation as a risk mitigation strategy. Three types of risks were addressed: supply risk, demand risk and process risk. Simultaneously, these types of risks are related to three forms of cooperation: suppliers' cooperation, customers cooperation and internal cooperation. With data collected from 203 manufacturing companies in Australia, the result shows that each area of cooperation effectively reduces the respective types of supply chain risks. However, only the mitigation strategies of process risk and demand risk have a direct impact on supply chain performance. In addition, both supply risk and demand risk increase process risk.

Regarding the manufacturing supply chain in India, Pradhan et al conducted another study in 2014 to identify, analyze, evaluate, and manage risk issues. Various risks are identified through the process of discussion among managers and engineers. The risks are classified into delivery performance, fluctuations in the final supplier's supply and demand, changes, and practices in business. These risks exist to the extent: suppliers, manufacturers, and customers. The results show that the level of impact of each risk has significance for supply chain risk management. Through the Pareto analysis, the scholars also concluded that: 20% of the highest risk factors come from the organization and the supplier, 54% of the risk comes from the supplier, and 46% of the existential risk is related to the organization

In 2018, Kumar et al carried-out research on supply risk, production risk and corporate performance in China. The data was collected through survey questionnaires from manufacturing supply chain expertise and through semi-structured interviews with Chinese manufacturers. Kumar pointed out that in China's manufacturing context, both supply risk management and production risk management are vital for firm performance because there is a high correlation between business performance and production risk as well as supply risk management activities.

Most recently, supply chain risks in the apparel manufacturing industry in low-cost countries have been assessed (Handfield et al., 2020). Scholars have provided probabilities and impact scores for 23 different supply base risks across 10 countries in the apparel sector. The most significant long-term risks of supply disruptions for apparel in low-cost countries are risks stemming from human resource regulation, workplace problems, inflation costs, safety violations and social welfare violations.

In Vietnam, there are also several studies on supply chain risks, specifically:

In 2017, Nguyen Thi Thu Hang and her colleagues conducted a study on risk factors in Vietnam's garment supply chain. Data was collected from garment enterprises in Ho Chi Minh City to identify risk factors in the Vietnamese garment supply chain when partial FOB orders are made. Through in-depth interviews with some managers of Nha Be Garment Joint Stock Company, Saigon 3 Garment Joint Stock Company, Phung Dong

Garment Joint Stock Company, Como Co., Ltd; the research showed the types of risks in Vietnamese apparel supply chain are: supplier risk, production risk, demand risk, logistics risk, information risk, environmental risk.

Truong Quang and his colleagues (2018) proposed an insight into the relationship between risk factors and supply chain performance. Risks are categorized according to four criteria: environment, supply chain flows, level of impact and probability. Particularly, external risk, time risk, information risk, financial risk, supply risk, operational risk, demand risk are the main risk factors. The research showed that: supply risk, operational risk and demand risk are the core risks affecting supply chain performance.

Le Thu Huong and Nguyen Duy Thanh (2020) classify risk factors affecting the overall supply chain of the wood industry in Vietnam into: supply risks (adverse events of the timber industry, inability to meet the needs of customers), environmental and information risks (risks from asymmetric information or false information of the market caused by external factors (macroeconomic crisis, inaccurate prediction of natural disasters...), operational risk, demand risk and logistics risk. Theories of the study are developed from previous supply risk theories and finally refined by experts.

### **3.2. Research on supply chain risk factors**

Supply chains are prone to disruption caused by internal or external. In the study of Hao et al (2010), supply chain risks can be caused by factors of the natural environment such as fires, earthquakes and social factors such as strikes or terrorist attacks.

Sayed et al (2016) performed an exploratory study to determine whether supply chain structure affects supply chain risk. This study was conducted in several small and medium enterprises in South Africa. The result indicated that supply chain structure has an influence on supply chain risk. In addition, investment in infrastructure and supplier relationships are the most influential characteristics of supply chain structure on supply chain risk. The structure of the supply chain also affects the operations and financial risks of the business.

Khan (2018) pointed out that product design has an impact on supply chain risk. Design is a decisive factor in the supply chain risk management strategy.

In their study, Salamai et al (2019) argued that external events, such as an increase in the price of a particular product due to environmental factors significantly affect supply chain risk.

Research conducted by Sreedevi et al (2017) based on data from 91 manufacturing companies in India indicated that supply chain uncertainty led to supply chain risk; and in uncertain environment, supply flexibility and manufacturing flexibility help to mitigate supply and manufacturing risks.

### **3.3. Research on supply chain uncertainty**

Supply chain uncertainty is an issue that several managers face (Hult et al. 2010). This is also an issue that has received a lot of attention from researchers.

Chin Fu-Ho et al (2005) used structural equation modeling to measure uncertainty in the supply chain. The study collected corporate data from the Taiwanese government's published documents. The research showed that supply uncertainty, customer demand uncertainty and manufacturing process uncertainty are crucial predictors affecting supply chain flexibility and supply chain performance.

Mihir Dash et al (2009) categorized the types of uncertainty in the apparel supply chain and highlighted the effects of the uncertainty on the supply chain. The data used in the study were collected from 50 textile manufacturing units in India. The result indicated that factors affecting supply chain uncertainty include demand uncertainty, supply uncertainty, cost uncertainty, equipment failure, supply disruptions, changes in customer preferences, new fashion trends, and government policies.

Using a hierarchical regression approach, Barbara Flynn et al. (2016) based on data collected from 339 manufacturing plants in three industries, located in 10 countries with manufacturing backgrounds, to develop the theory of supply chain uncertainty. The results indicated that there are three main types of uncertainty in the supply chain. The first is micro-level uncertainty caused by changes in technical inputs, which is in accordance with the supply chain management documents. The second is meso-level uncertainty, which is the lack of information required by a supply chain member. This type of uncertainty corresponds to the viewpoint of information processing theory. The third is macro-level uncertainty, which is related to the ambiguous situations that supply chain members face in the changing external environment. These three types of uncertainty coexist in a supply chain and can interact with each other. Micro- and meso-level uncertainty is positively correlated with supply chain integration, and macro-level uncertainty is negatively related to it. The centralized and standardized organizational structure variables moderate, reinforce, or lessen the main effects of uncertainty.

Tidd, Joseph (2017) used data collected from 156 small and medium enterprises in Turkey to study the influence of environmental uncertainties on corporate innovation. This study defined the concept of environmental uncertainty including three aspects – competitive intensity, market/demand turbulence, technological uncertainty. The result showed that market/demand volatility and technology uncertainty have a positive influence on innovation of SMEs. Contrary to common belief, competitive intensity has no effect on the

innovation of an SME.

Wang et al.'s study (2018) relied on data collected from 98 courier companies in Australia to analyze the effects of supply chain uncertainty and supply chain risks on logistics performance of the express delivery field in Australia. The research results categorized fifteen types of risks and uncertainties into three different groups including: Uncertainty and risk from the company side, uncertainty and risk from the customer side, uncertainty, and risk from the external environment. Specifically, uncertainties and risks from the company's side include delay in receiving/delivering goods, poor internal information sharing process, operational incapacity, problems related to warehousing, poor communication between the company and the truck driver. Uncertainties and risks from customers include Default from customers, rising customer expectations, incorrect forecast of customer's freight volume, changing preferences from customers, customers refusing to pay shipping cost. Finally, environmental uncertainties and risks include traffic congestion, volatile fuel prices, labor/carrier shortages, legal/policy uncertainty of the government, weather/disaster/strike. In addition, the research result also showed that supply chain uncertainty and supply chain risks have a negative impact on logistics performance.

Wang and Jie's study (2019) provided an insight into uncertainty and suggested supply chain risk management strategies for pharmaceutical companies. From a business perspective, the study pointed out two main types of supply chain uncertainties and supply chain risks in the pharmaceutical sector. Specifically, internal risks and uncertainties; external risks and uncertainties are considered. Internal uncertainties and risks include operational uncertainty and risk, financial uncertainty and risk, and quality-related uncertainty and risk. External uncertainties and risks include supply uncertainty and risk, demand uncertainty and risk, and environmental uncertainty and risk.

Research by Ngo Hoang Thao Trang (2016) evaluated the impact of environmental uncertainty on business performance through the moderating role of business networks. The study was based on small and medium enterprises survey data from 10 provinces in Vietnam. Research has shown that uncertainties in suppliers sourcing, uncertainties from customers worsen the expansion and diversification of relationships in business.

### **3.4. Research on supply chain flexibility**

Supply chain flexibility is considered as one of the main solutions to help businesses alleviate uncertainty and face increasing competition in the market. (Sreedevi et al., 2017).

Martínez Sánchez and Pérez (2005) studied the relationship between aspects of supply chain flexibility and firm performance. The survey was carried out on a representative sample of 126 car suppliers in Spain. Accordingly, the result has shown a positive relationship between supply chain flexibility and business performance. On the other hand, the result suggests that companies should focus on enhancing basic flexibility (at the store level) rather than aggregate flexibility (at the customer-supplier level). However, aggregate flexibility is more positively related to firm performance than basic flexibility. As a result, many companies may have missed the opportunity to enhance their competitiveness by underestimating the flexibility of customers and suppliers.

Based on data collected from 7 Spanish manufacturers in different industries, Tachizawa et al (2007) conducted an empirical study on supply flexibility and other aspects of supply chain flexibility to investigate why and how companies enhance supply flexibility. The semi-structured interview method was applied by interviewing purchasing managers or people with equivalent positions in companies. The result has shown that companies need supply flexibility for several reasons (fluctuations in production schedules, poor producer capacity, changing demand, seasonality of demand and market forecast accuracy); Companies implement this type of flexibility with two key strategies: "improving supplier responsiveness" and "flexible sourcing."

Tang et al (2008) studied the significance of supply chain flexibility in reducing supply chain risks. Using a mathematical analysis model, the authors recommended some flexible strategies such as: flexible supply through multiple suppliers and flexible supply contracts, process flexibility through enhancing flexibility in production process, and product flexibility strategy through product delay, especially flexible pricing strategy through responsive pricing.

Muntaka et al. (2009) investigated the impact of supply chain flexibility on business performance, Pearson's structural equation and correlation model were used. Three elements of supply chain flexibility including capacity of adaptability, interoperability and leanness were analyzed. The result indicated that supply chain flexibility is significantly correlated with business performance.

Liao et al. (2010) studied the relationship between supply flexibility and supply chain performance. The study was conducted on data collected from 201 people who are directors or supply chain managers, purchasing managers or other leaders in the company with in-depth knowledge of supply chain operations. A Likert scale was used to measure supply flexibility and confirmatory factor analysis (CFA) was performed to evaluate the measurable attributes. The result has shown that supply network flexibility and supply flexibility boost supply chain performance.

Based on survey from manufacturing companies in Germany, Merschmann and Thonemann (2011)



analyzed the relationship between environmental uncertainty, supply chain flexibility and firm performance. Structural equation modeling was used to answer one of the key operational management questions: Does the fit between environmental uncertainty and supply chain flexibility lead to competitive advantages? The result has shown that under uncertain environment, companies with more flexible supply chains have better performance than companies with less flexible supply chains, while in certain environments the opposite is true.

Kim et al (2013) conducted research on the impact of manufacturing flexibility on the adaptation of supply chain. The method of partial least squares (PLS) of structural equation modeling (SEM) was applied. The results indicated that among the aspects of manufacturing process flexibility, market flexibility is the one that directly affect the adaptability of the supply chain. Other aspects of manufacturing process flexibility such as machines, technology, labor, and the flexibility of new products also positively affect the supply chain adaptability. Especially, business environment has a regulatory impact on the relationship between market flexibility and supply chain adaptability.

#### 4. Conclusion

In conclusion, research on supply chain uncertainty and supply chain risks are diverse in contexts and subjects. Regarding risks and supply chain risks factors, the approaches of previous scholars are listing the types of uncertainties and risks, showing the relationships between those types of risks to the business's operations/performance. In terms of supply chain uncertainty, the approaching direction is from a business perspective and data analysis method is structural equation modeling (SEM). Not only do these studies have theoretical value but also have empirical significance. However, research gaps are unavoidable:

Firstly, almost all studies have shown the factors causing supply chain risks as well as research on the impact of these supply chain risks on business operations. However, these studies only list and categorize the types of risks (for example, the study of Kumar et al. 2018, the study of Handfield et al., 2020), very few studies focus on identifying mechanisms to alleviate uncertainties and mitigate supply chain risks (research by Chen et al., 2013; study by Pradhan et al. 2014 and study by Ho et al., 2015). Supply chain uncertainty were generally studied, without delving into corporate uncertainty - the common type of uncertainty in business.

Second, supply chain flexibility is considered as a key solution to reduce uncertainty for businesses, but very few empirical studies have been carried out on the role of supply chain flexibility in alleviating supply chain risks (Tang et al., 2008). Furthermore, while numerous empirical studies identify that flexibility is crucial for supply chain risk management, these studies do not specify what kind of flexibility and what degree of flexibility is suitable (Tang and Tomlin, 2008). Pujawan (2004) points out that companies should be careful in appreciating the level of flexibility because achieving a high level of flexibility is very expensive. Therefore, it is imperative to conduct empirical study to understand and properly define the context of different types of flexibility to reduce supply chain risks.

Third, some studies are only based on case study (Hallikas et al., 2004 and Tang, 2006) and based on conceptual frameworks (Trkman and McCrumb, 2009 and Tang and Musa, 2011), empirical studies are still in their nascent stage. Thun and Hoenig (2011) and Sodhi et. al., (2012) also pointed out the scarcity of empirical investigations in the field of supply chain risk management. Therefore, linkages need to be established between the various factors discussed above: supply chain flexibility, environmental uncertainty, and supply chain risk to fill the gap.

Fourth, research in Vietnam on uncertainty and supply chain risks is considerably sparse and only focus on a few businesses, there has been no studies on the relationship between uncertainty and supply chain risks. In addition, the results of some studies are not significant as scholars use qualitative research method (researched by Nguyen Thi Thu Hang et al., 2017).

Thus, although various types of supply chain uncertainties and risks have been highlighted in previous studies, the relationship between them has not been analyzed, specific solutions to reduce supply chain risks have not been suggested. Besides, these studies are not comprehensive, and the research scope is still narrow. From these problems, the study named "Supply chain instability and risks in Vietnamese textile and garment enterprises: the moderating role of supply chain flexibility in mitigating risks" are conducted to address the remaining gaps.

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