

Uncertain Supply Chain Management

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Risk management and logistical performance: A case of the fishery supply chain north central coast of Vietnam

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ABSTRACT

In any given supply chain, risks can occur, and it can reduce the performance of an entire production line. To maintain a competitive advantage, manufacturers should anticipate and manage risks. This paper aims to assess the impact of risks associated with the fishery supply chain on logistics performance. The research was conducted with 297 seafood producers on the North Central Coast of Vietnam. The study results show that risk factors such as supply risks, market risks, operational risks, environmental risks, and financial risks have a direct impact on the logistical performance of firms in the fishery supply chain. The study also proposes solutions to limit risks for businesses.

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1. Introduction

Nowadays, supply chains operate in complex and rapidly changing environments (Wiengarten et al., 2017). This is partly because companies apply increasingly complex operating methods such as lean manufacturing, global outsourcing to gain competitive advantage (Tuncel & Alpan, 2010; Hallikas et al., 2004; Rao & Goldsby, 2009). Besides, the changing environment affects the aquatic ecosystems and under the impact of the Covid-19 pandemic, activities in the supply chain are more affected. This also increases the level of risk in the supply chain. Therefore, supply chain management (SCRM) is any risk of information flows, raw materials, products from the primary supplier to the delivery of the product to the end consumer. The view of Kauppi et al. (2016) shows that comprehensive risk management approaches along the supply chain are positively related to operational performance. The Economist magazine (2020) has ranked Vietnam in the top 16 most successful emerging economies in the world. According to World Bank data, with an average economic growth of 6.8% a year in the 2016–2019 period, Vietnam is among the top 10 highest growing countries. Therefore, Vietnam is not outside the global product supply chain and is considered as one of the important links in the process of manufacturing and distributing many world products (Kiêm, 2013). Along with the opportunities to join the global supply chain such as expanding markets and exporting goods, there are also difficulties and challenges such as highly competitive goods, being flexible, and facing risks. Vietnam is a coastal country located on the west coast of the East Sea with a long coastline of 3260 km and more than 3,000 islands of all sizes. This is also the point of Vietnam to develop the fisheries sector, especially in the North Central Coast region. According to VCCI (2020), the North Central Coast is the low-lying area of the country's economy. This region accounts for 15% of the country's population but only 5.5% of businesses. The North Central Coast has many types of marine migratory fish, distributed in the upper and bottom layers, most of them shrimp, crabs, crabs, clams, squid, etc. People in coastal areas exploit and produce with increasing catches. As for aquaculture, according to

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statistics of the General Department of Fisheries, the whole region can develop to raise nearly 163900 ha aquaculture areas, in That for freshwater farming is nearly 115,600 ha, salty and brackish water is over 48,300 ha; tens of millions of hectares of unexploited reservoir water surface with 1947 lakes. According to the Directorate of Fisheries (2020), the quality of economic growth in the fisheries sector in this area is mainly based on the growth factors in width, in favor of quantity; hence the efficiency is low. Growth in average fishing output in the period 2010 - 2014 still depends on more than 90% on the increase in the number of fishing boats, the factor of productivity growth accounts for less than 10%, the growth of output value depends mainly on production increase accounts for 85%, the price increase factor still accounts for a low proportion of 15%. Growth in the average aquaculture output value in the period 2010-2014 depends 88% on the increase in aquaculture production, export processing is mainly raw and preliminary processing, accounting for over 85%. low gain. According to the forum "The role of enterprises in economic development in the North Central region" (2020), sharing the production of seafood using the North Central Coast accounts for 1-3% of the total production of more than 4 million tons of aquaculture products of the country, the number of fishing boats is mainly onshore fishing boats. The application of high technology in farming and attracting businesses to invest is still very limited.

The question posed here is "How to reduce risks in the production and distribution process in the supply chain?". The biggest challenge facing developing country business managers is how to reduce risks in the supply networks (Krishnan, Parente and Shulman, 2006). Some studies by Pham et al. (2012), Tran et al. (2009) also show that supply chain risk management requires a combination of many factors, of which three important factors are the power, relationships, and business performance. According to Faizal and Palaniappan (2014) identified that the supply chain also has supplier, environment, demand, operational, and control risks. The research is based on supply chain risk management theory and conducted research on some typical enterprises in the fisheries sector in the North Central Coast, Vietnam. The obtained research results are the theoretical basis for finding the best direction for Vietnam's seafood product line in the supply chain.

2. Literature review and Hypothesis

2.1. Risk and risk management

Harland et al. (2003) identified that risk is often associated with uncertain events, hazards, damages or undesirable outcomes. According to Crichton (1999), risk is the probability to create a loss, and depends on three factors of danger, weakness and financial loss. Therefore, risk management must be demonstrated in accordance with a process to minimize its impacts to a minimum (Wang, 2009; Zsidisin, 2003; Gaonkar & Viswanadham, 2007; Tang, 2006).

2.2. Risk supply chain management

The definitions of risk in a supply chain context suggest this is a multidimensional concept. According to Jüttner et al. (2003), supply chain risk is any risk of the flow of information, materials, and products from the primary supplier to the delivery of the finished product to the end consumer. Ho et al. (2015) gave a broader overview of supply chain risk as "to the likelihood and the sudden impact of large (macro) and/or small (micro) events situations that adversely affect any part of a supply chain resulting in failures or irregularities at the operational, tactical, or strategic level".

In addition to the concepts of supply chain risk, there are many types of risk identified. Christopher and Peck (2004) propose three main types of risk along with five types of risk: 1) internal company risk (process risk and control risk), 2) external risk. but within the supply chain network (supply and demand risks) and 3) the risks outside the supply network (environmental risk). Within the global supply chain, Manuj and Mentzer (2008) divided the supply chain risk into eight categories: 1) supply risk - due to supply disruption, inventory, schedule, and public access. turmeric; prices are escalating; quality problems, unstable technology; complex products; frequent changes in material design; 2) operational risks - due to failure in operation; inadequate production capacity or process; high degree of process change; a change in technology; change manifested in performance; 3) demand risk - due to new product launch; change in demand (most wordy, seasonal, and new product launches); clutter in the system (due to demand distortion and amplification causing a Bullwhip effect); 4) safety risks - safety in information systems; infrastructure safety; the transport has been compromised by terrorism, acts of sabotage without purpose, crime, and intentional vandalism; 5) microeconomic risk - due to changes in wages, interest rates, and prices; 6) political risk - resulting from actions by national governments such as quota restrictions or sanctions; 7) competition risk - due to a lack of historical research on a competitor's activities and tactics; and 8) resource risk - because the required real source cannot be expected. In terms of sources of risk arising from stakeholders in the supply chain, Punniyamoorthy et al. (2013) divided supply chain risk into six categories: 1) Supplier risk, 2) Risk due to the producer, 3) Demand risk, 4) Logistics risk, 5) Information risk and 6) Environmental risk.

2.3. Hypothesis

The empirical study focuses on the relationship between these types of risks to the logistical performance of the fisheries business in the North Central Coast of Vietnam. There has also been a lot of research on the supply chain risks associated with logistics operations (Prater, 2005; Sanchez-Rodrigues et al., 2010; Simangunsong et al., 2012).

The study demonstrated and examined the framework in Figure 1. Exogenous variables are types of risk in the supply chain developed from previous studies (Punniyamoorthy et al., 2013; Manuj and Mentzer, 2008; Christopher and Peck, 2004). It

includes supply risk, market risk, financial risk, operational risk, and environmental risk. The endogenous variable is logistical performance. The logistic performance scale was verified by experience in Vietnamese seafood companies before we used it in this study. According to the document review and actual courier operations, logistics is measured by delivery performance, information accuracy, customer satisfaction and cargo safety (Holmberg, 2000; Lai, 2004; Sodhi et al., 2012).

H₁: Supply risk has a significant relationship with logistical performance.

H₂: Environmental risk affects logistical performance.

H₃: Operational risk has an effect on logistical performance.

H₄: Financial risk influences logistical performance.

H₅: Market risk affects logistical performance.

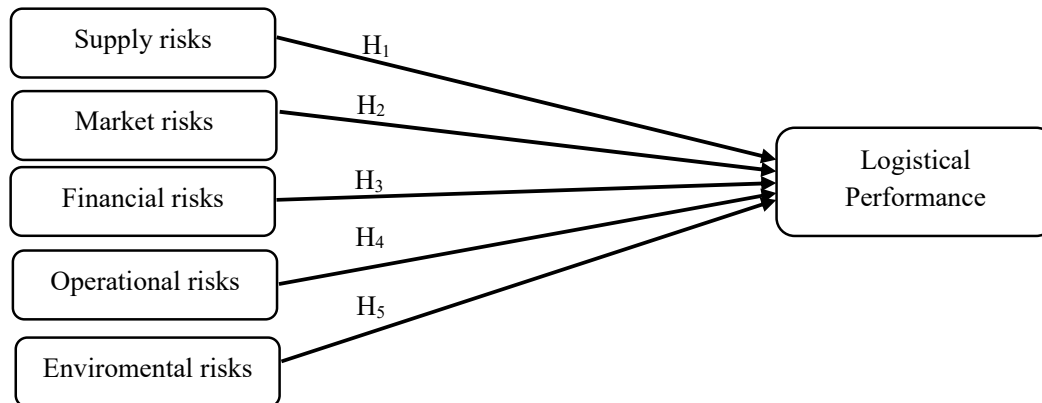


Fig. 1. Theoretical framework

There are many arguments about the impact of supply chain risk on logistics. According to Lee (2002), supply chain risks have an impact on logistics. There are too many risks in the supply chain that will have a negative impact on logistics performance (Christopher & Lee, 2004; Larson, 2009). Therefore, we propose that there is a significant relationship between supply chain risk and logistics performance. And then the conceptual model was tested in the fisheries sector in the North Central Coast of Vietnam

3. Methodology

3.1. Sample and Data Collection

Fishery is an industry with great potential for development not only in the North Central Coast but also in Vietnam. Because the study focused on the impact of risk in the supply chain on transport performance in the fisheries sector, the participants interviewed were those who caught, farmed, and traded aquatic products such as shrimp, fish, types of cockles, The study collected 297 questionnaires in 6 provinces in the North Central Coast such as Thanh Hoa (52 samples), Nghe An (45 samples), Ha Tinh (47 samples), Quang Binh (49 samples), Quang Tri (53 samples), Thua Thien - Hue (51 samples).

3.2. Method of Analysis

Model evaluation can be performed by evaluating the measurement model as an external model with reflection value and reliability checks. To know how well the value is obtained, the convergence value with a factor loading is more than 0.6 and the average variance extracted (AVE) is more than 0.5 (Chin 1995) can be used. Then, a structure can meet the reliability criteria if the value of Cronbach's alpha and the composite reliability (CR) is more than 0.7 (Hair, et al., 2014). Then, to analyze the data, this study using Structural Equation Model (SEM) analysis with SmartPLS 3.0 software was used as a tool to test hypotheses.

4. Results

4.1. Measurement Model

In this section, we present details of the measurement model. Table 1 presents the summary of some basic statistics associated with different components of the model. The table provides factor loading, t-value, mean and VIF.

Table 1
Descriptive statistics, reliability, and validity

Code	Items	Factor's loading	t-value	Mean	VIF
Supply risks (Cronbach's alpha: 0.901, CR: 0.931, AVE: 0.772)					
SR1	Frequent delays in the supply time of materials	0.858	60.204	3.47	2.371
SR2	Offer is not flexible	0.881	66.717	3.46	2.569
SR3	Depends on a single supplier for important items and has a long product life	0.889	74.836	3.45	2.670
SR4	The quality of the supply was poor	0.884	60.112	3.52	2.711
Operational risks (Cronbach's alpha: 0.845, CR: 0.889, AVE: 0.617)					
OR1	Production disruption	0.799	29.002	3.75	1.926
OR2	Production capacity is not enough	0.769	25.045	3.37	1.670
OR3	Inconsistent inventory / inventory handling / maintenance strategy	0.806	26.865	3.49	1.870
OR4	Organizational issues	0.756	19.610	3.37	1.681
OR5	Not flexible in terms of capacity	0.796	31.574	3.34	1.762
Enviroment risks (Cronbach's alpha: 0.854, CR: 0.901, AVE: 0.695)					
ER1	Unexpected events of force majeure such as strikes, riots ..., terrorism, wars, natural disasters	0.819	30.176	2.82	1.836
ER2	Policy uncertainty	0.832	33.075	2.64	1.861
ER3	The leadership of the government is not stable	0.867	50.197	2.78	2.315
ER4	Skilled personnel are not available	0.815	31.918	3.00	1.890
Financial risks (Cronbach's alpha: 0.826, CR: 0.883, AVE: 0.654)					
FR1	Credit	0.805	15.657	2.88	1.699
FR2	Ability to re-invest	0.839	16.209	2.97	1.708
FR3	Payment	0.800	12.482	2.72	1.725
FR4	Interest rate	0.789	15.133	2.66	1.857
Market risks (Cronbach's alpha: 0.858, CR: 0.897, AVE: 0.636)					
MR1	The information system does not guarantee security	0.757	24.398	3.37	1.743
MR2	Unexpected customers or unstable customers	0.774	22.518	3.27	1.782
MR3	Reputation risk	0.825	40.210	3.41	1.945
MR4	Broken external / internal infrastructure	0.835	40.466	3.26	1.941
MR5	Error in the demand forecast	0.794	28.024	3.24	1.791
Logistical Performance (Cronbach's alpha: 0.827, CR: 0.885, AVE: 0.659)					
LP1	Delivery on time	0.806	34.828	3.23	1.737
LP2	The raw materials are fully met during the production process	0.825	44.345	3.12	1.875
LP3	Favorable production and inventory planning strategy	0.799	35.883	3.16	1.701
LP4	The process of transporting goods takes place smoothly	0.816	37.996	3.06	1.822

4.2. Hypothesis Test Results

Table 2
Hypothesis Test

Hypothesis Test	P value	Results
H1 Supply risks have a significant relationship with logistical performance	0.000	Supported
H2 Enviroment risks affect logistical performance	0.000	Supported
H3 Operational risks have effect on logistical performance	0.000	Supported
H4 Financial risks influence logistical performance	0.007	Supported
H5 Market risks affect logistical performance	0.000	Supported

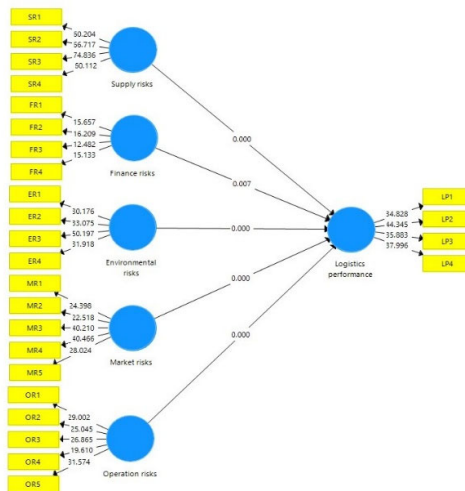


Fig. 2. The summary of path analysis

5. Discussion

Research focuses on the impact of supply chain risks on the logistical performance of the fisheries. The results show that 6 risks all have an impact on logistical performance. The research is also based on survey results to offer solutions to overcome the above risks.

5.1. Supply risks

The supply of raw materials for processing and export depends on large collectors. The raw materials are collected from many fragmentary and small sources, making the quality inconsistent, it is difficult to control chemical residues, and antibiotics are banned and cannot be traced back to the origin, difficult to use for processing, so export processing efficiency is not high. To properly deal with these limitations, it is required that processing and exporting companies need to actively look for areas to supply raw materials. In order to do this, companies must actively integrate vertically, directly organize the collection, directly sign product sales contracts, supply and share price information and regulations, product quality management, capital support, and willingness to share profits with farmers.

5.2. Market risks

Currently, the consumption of aquatic products is a difficult problem for farmers, because the household's ability to access the market, the ability to support community groups in linking product consumption is limited because the team leader is not qualified and does not have the legal status to contract with the agents as prescribed by law. In fact, most of the production in the provinces of the province is supplied to processing companies and exporters through collectors. Information on the quality, size, and selling price of shrimp is not clear to farmers. Therefore, they are always being collected for price pressure and quality products, leading. Sustainable development of the fisheries sector requires the establishment of aquaculture cooperatives associated with the institution of villages, communes, and specific farming areas.

5.3. Financial risks

The actors in the seafood supply chain need capital to invest to increase production. For example, farming households need capital to invest in pond infrastructure, water supply and drainage systems, seeds, etc. Processing and export companies need capital to invest in new technology production lines, buying materials, looking for export markets, etc. To do this, provinces in the North Central Coast must have the policy to allocate capital from the budget to support actors participating in the shrimp industry with many pictures and different formulas.

5.4. Operational risks

Collection activity shows a short product storage capacity of 3 to 5 days, indicating a restriction when harvested products are not in full bloom, not enough trips but collectors have to be transported to wholesale and Seafood processing and exporting facilities make transportation costs high. To overcome this disadvantage, it requires large collectors to increase investment in the construction of modern cold storage, absorb advanced storage technology to prolong storage time when the quantity of goods purchased is far away and the quantity is small ensure sufficient collection of goods and ensure product quality to reach consumers.

5.5. Environmental risks

Awareness and awareness of hygiene among farming households are limited. Natural farming practices, following habits, and focusing on convenience are still deeply rooted in households' awareness. Most farming households believe that protecting the environment and water hygiene increases farming costs, so it is difficult for oil products to have a competitive advantage. Besides, Vietnam has many storms landing in a year which also partly limits the supply to the market.

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