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# **Risks Management in The Wine Supply Chain During The Global Pandemic**

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## **ABSTRACT**

**Purpose** - The COVID-19 pandemic can be considered the worst global crisis since World War II. No one predicted this sudden catastrophe and how it would last until now. In particular, it has greatly impacted companies engaged in import and export. This research aims to identify the wine supply chain risks and learn how the wineries mitigate the risks. Provide a reference for supply chain risk management for wineries and small and medium-sized exporters

**Methodology** - This paper is based on a literature review and qualitative research. The data were collected through interviews with 35 wineries and associations from different regions that have exported, are exporting and want to export to China in the future.

**Findings** - Identified the supply chain risks faced by overseas wineries exporting to China in the context of the Covid-19 pandemic and the risk mitigation strategies they have adopted. Other risk mitigation options are summarized by reviewing similar cases and related literature reviews as a reference for when similar risks recur.

**Keywords** - Risk Management, Supply Chain Management, Risk Maturity Framework, Risk Matrix

**Paper Type** - Research paper

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## **1. Introduction**

Generally speaking, the global supply chain refers to sourcing, logistics, warehousing, customs clearance, distribution and retailing until the consumer receives the final product. It is a functional network chain connecting upstream brands and downstream customers while carrying a complex "flow of information, cargo and capital".

Compared with the domestic supply chain, the global supply chain is much more complex, involving more segments, longer logistics routes, slower capital turnover and more complicated information flow. Therefore, any disruption in the supply chain can be fatal to the enterprise.

This article will focus on the supply chain risks faced by wineries worldwide that export to China in the presence of the COVID-19 outbreak. Through interviews and literature review, an analysis of the current supply chain risks and how such risks are generated will be discussed. The study also reviews the approaches implemented by companies in similar situations in the past to provide useful guidance regarding risk mitigation. Finally, the study explores what wineries can do to mitigate such supply chain risks in the current scenario.

The samples selected for this study are global wine suppliers that are exporting and have exported to China, as well as those that intend to export to China in the future. Information about the supply chain risks they faced before and during the pandemic was collected through interviews. The collected data was analyzed based on the existing risk management framework.

## **2. Literature Review**

### **2.1 Supply Chain Risks**

Globalization and trade liberalization amplify the supply chain's vulnerability and increase the risk. The longer a supply chain is, the more vulnerable the supply chain actors are, increasing the risk of supply chain failure (Braithwaite & Hall, 1999).

With the broad adoption of off-shoring, outsourcing and lean manufacturing, many companies are diversifying their supply chains according to their businesses. It is also very common to have a supply chain involving multiple countries or regions during the process. Although these actions can help companies maximize their profits, at the same time, there are also many hidden risks.

Supply chain risk management (SCRM) is a systematic, phased approach to recognizing, evaluating, ranking, mitigating, and monitoring potential disruptions in the supply chain (Aqlan & Lam, 2016). With major disasters such as 9/11, the Gulf War, the SARS outbreak,

and COVID-19 in 2019, we are forced to explore more elaborate supply chain and risk assessment systems to prepare for the unexpected.

### 2.2 Risk Classification

Based on the predictability and controllability, sources of the risks can be classified into following categories :

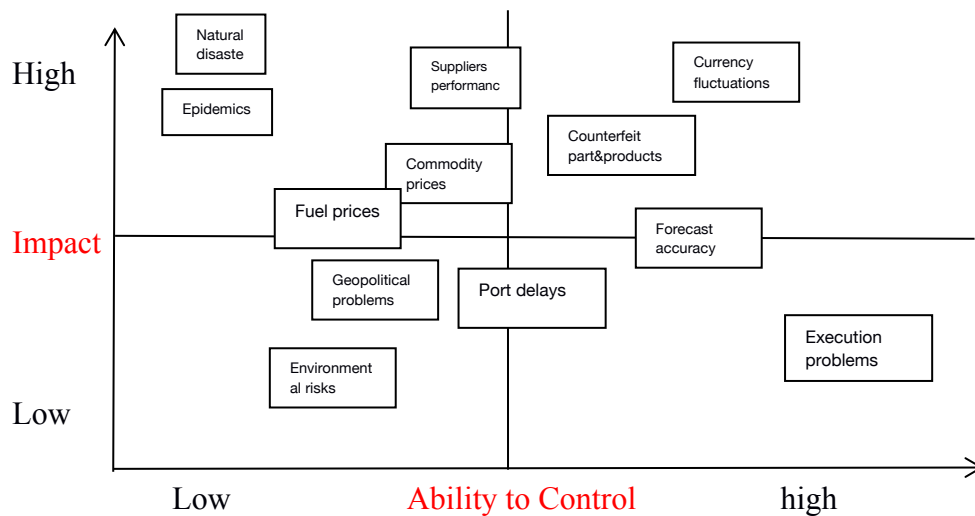
<p>Unknown - Unknown</p> <p>↑</p> <p>↓</p> <p>Know - Unknown</p>	<ul style="list-style-type: none"> <li>● Natural disasters</li> <li>● Geopolitical problems</li> <li>● Epidemics</li> <li>● Terrorist attacks</li> <li>● Environmental risks</li> <li>● Volatile fuel prices</li> <li>● Rising labor costs</li> <li>● Currency fluctuations</li> <li>● Counterfeit part and products</li> <li>● Port delays</li> <li>● Market changes</li> <li>● Suppliers performance</li> <li>● Forecast accuracy</li> <li>● Execution problems</li> </ul>	<p>Uncontrollable</p> <p>↑</p> <p>↓</p> <p>Controllable</p>
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(Adapted from Operations Rules Book by Prof D.Simchi-Levi, MIT,2010)

Unknown - Unknown: Refers to the types of risks that are difficult to predict with little data available and cannot be modeled.

Know - Unknown:Refers to the opposite types of risks with more data and can be predicted and built into models.

Risk position map according to the impact and control ability :



Companies need to establish a comprehensive risk management strategy, whether the risk is controllable or uncontrollable.

The risk classified by various authors can include the scale and occurrence (Blackhurst et al., 2005; Norrman & Jansson, 2004; Sheffi & Rice, 2005). Some other parameters to classify risks in SCM are: (i) Based on the sources of risk and mitigation strategies (Chopra & Sodhi, 2004); (ii) Organizational risks, environmental risks, and network risks (Jüttner et al., 2010); (iii) Demand and supply risks (Manuj & Mentzer, 2008); (iv) Industry and organizational risks (Rao & Goldsby, 2009); and (v) Network risks(Garvey et al., 2015).

Uncertain business environments can lead to supply chain risks. Uncertainty can be seen as a risk that can undermine supply chain performance. Some authors classify risks in the supply chain as operational, network, and external (Handfield & McCormack, 2008). Operational risk is due to the failure of strategic reconfigurations within the system. Network risk arises from the supplier network layer, based on supplier strategies and supplier agreements in the supply chain network. Finally, external risk arises from the organization's external environment, which poses a significant threat to the existing business environment.

### 2.3 Risk Management and The Challenges

“Risk management refers to strategies, methods, and supporting tools to identify and control risk to an acceptable level” (Alhawari et al.2012). Also, risk management can be described as a synchronized set of actions and methods that guide an organization to minimize risk and achieve organizational goals. Managing risk enables decision-makers to understand and assess the impact of risk in supply chain networks. Controlling complexity can improve cost efficiency and reduce risk. The estimation of risk leads to better risk management, reduces the extent of losses, and improves supply chain resilience. Contingency planning for disruptions makes companies resilient and provides a competitive advantage (Sheffi, 2005).



### 2.3.1 Nissan case study

Moving on to Ford's risk management process, now take a look at how the large globalized corporations manage supply chain risk in the context of reality.

By reviewing past risk management cases, it can be noted that how Nissan responded to the earthquake in 2011 is a great example of risk management that companies could learn from. At the time, Nissan was one of the top three automakers in Japan. The earthquake triggered a major tsunami and nuclear environmental disaster, which led to the suspension of 80% of Nissan's vehicle production operations.

According to a follow-up investigation, Nissan suffered the most due to the tragedy. However, in the following six months, Nissan's production dropped by only 3.8%, while the total value of the entire auto industry fell by 24%. By the end of the year, Nissan's production increased almost 10%, while the rest was still suffering from the unexpected incident.

How did Nissan successfully manage all those risks and unexpected challenges? To sum up, we can say that Nissan was well prepared. Regarding to risk management Nissan's actions can be divided into three main parts, including preventive actions, initial activities when disasters occur and recovery actions.

When earthquakes above level 5 occur, or other natural disasters that cause serious damage or impact to Nissan's business activities, the First Response Team will gather information and decide on the action to be taken based on the results. Meanwhile, Nissan works with suppliers to develop Business Continuity Plans (BCPs). This includes evaluation of priorities and developing responses to continue the priority work.

Regular training and simulations are very important. In an interview later in 2012, Nissan's COO Toshiyuki Shiga mentioned that before the earthquake in 2011, training was conducted on the same assumptions. In fact, Nissan organized training every year so that all employees knew what they should do in case of a big disaster. Including including how to take immediate action after disasters and restart operations Etc. in a PDCA (Plan, Do, Check, Act) cycle. Every time, the assumptions about disasters are expanded in order to minimize the unexpected events to happen.

After years of experience, Nissan has developed advanced capabilities, such as flexibility in their supply chain and risk management. This can be seen in Nissan's full awareness of its supply chain (both upstream and downstream) and its comprehensive understanding of the supply capabilities of its different suppliers, such as first-tier & second-tier, when accidents occur. Balance manufacturing and sourcing footprint to sales footprint to reduce the supply chain risk occurring from production interruptions.

The reason that Nissan can successfully manage the risks depends on the link between customer value and operational strategy. How much they value and ensure high-quality and



cost-effective products to their customers by applying principles, risk mitigation methods and comprehensive plans way ahead of time just to make sure their supply.

### 2.4 Risk Matrix

The risk matrix is a fundamental tool used in the risk assessment process to identify the level of risk according to the probability or likelihood of a particular incident occurring and its impact. The consequence severity can be in various forms depending on the complexity of the scenario, but the principle, in general, is the same. It is a straightforward tool to visualize the risk.

Overall Risk= likelihood x consequence

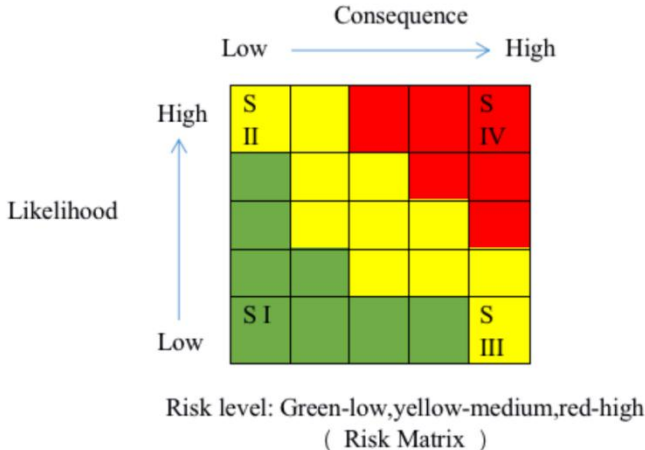
Scenario I: Suppose there is a road, and every fifteen minutes, a bicycle passes on this road; In this scenario, the likelihood of getting hit by the bicycle is "Low", and the consequence of hitting it will also be "Low", therefore the overall risk is low.

Scenario II: Assuming multiple bicycles pass on the same road, the likelihood of having an accident will be "high" in this case. However, the consequence will remain the same "Low".

Scenario III: Assuming on the same road a truck pass by instead of bicycle in every fifteen minutes. In this scenario, the likelihood of hitting by a truck will be "Low", but the impact of the consequence will be "High".

Scenario IV: Last, let us assume many trucks are passing the same road; In this situation, the likelihood and the consequence will be both "High",so the overall risk is high.

The scenarios are distributed in the matrix according to the high and low levels of likelihood and consequence.



The risk matrix is a basic form. While it provides an excellent visual representation of the risk distribution, its limitations include being subjective, not involving a particular time frame, and being not consistently interpretive.

## 2.5 Supply Chain Risk Maturity Framework

In order to succeed in the complicated, dynamic business world, companies need to deploy capabilities along with the supply chain management and the risk management dimensions.

The MIT supply chain risk study group came up with the risk maturity model based on the data (customer value, operational strategies, risk and complexity Etc.) that they collected from 209 companies to help them identify their positions at the risk management level. (Categorize the companies)

### Immature level

Level I: Functional supply chain management and Ad-Hoc management of risk

Level II: Internal supply chain integration and positioning of planned buffers to manage disruptions

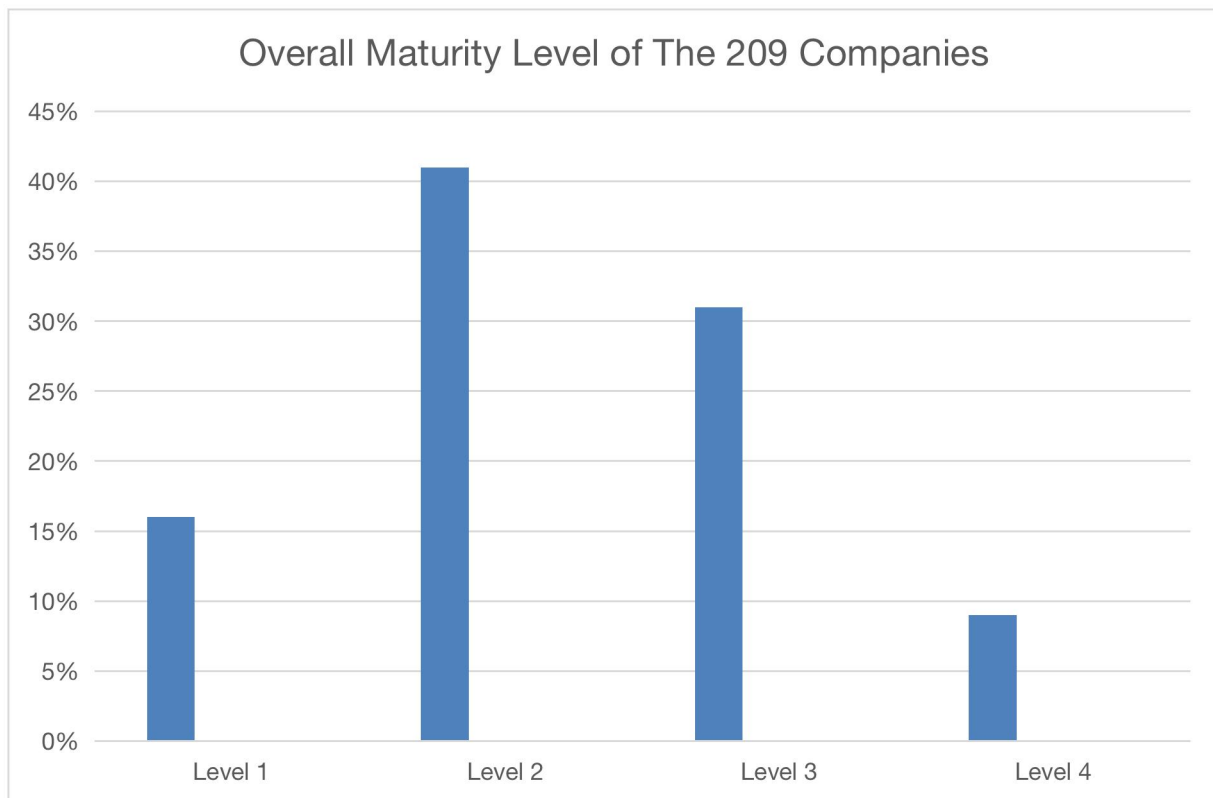
### Mature level

Level III: External supply chain collaboration and proactive risk response.

Level IV: Dynamic supply chain adaptation and fully flexible response to risk.

Immature	Level 1 (Functional supply chain/Ad-Hoc management of risk)	-Supply chain risk management is being done across functional level. No cross-functional supply chain collaboration.  -Ad-Hoc: when a company is facing risks, there is no risk management processing place
	Level 2 (Integrated/buffer planning)	-Have internal collaboration among different supply chain channels  -Internal collaboration and communication to customize risk plans together  -Knowing the performance status of the supply chain
Mature	Level 3 (collaborative/proactive)	-Adding external suppliers to the supply chain for more efficient management  -Conduct proactive risk management  -Proactively look for potential risks and vulnerabilities in the supply chain
	Level 4 (dynamic/ flexible)	- Adaptation to market changes (demand)  - Implement flexibility (product design)

(Supply Chain Risk Maturity Framework)



(Distribution of overall maturity level of 209 companies)

From the result, we can see that almost 60% of the companies pay less attention to risk management or do not have abilities, and 40% of the companies developed mature abilities to cope with risks.

The study shows that companies that had at least 3 incidents in the past 12 months suffered from 3% or higher negative impact on their performance, and these impacts involve all dimensions. Depending on the level of risk management, mature-level companies are more resilient to supply chain disruptions than immature ones.

Comparing companies that applied flexible strategies to companies that applied cost-effective strategies; only 13% of the companies with flexible strategies faced the impact of risks; on the other hand, 46% of the companies with cost-effective strategies suffered from risk. This illustrates that companies that use flexible strategies are more resilient to risk. Segmentation of the risk is also essential. Companies that segment the risk are more resilient than those that take risk as a whole unit.

The research also shows that mature level companies have better financial performance (higher EBIT margin, inventory turnover ratios Etc.) compare to immature level companies.

## 2.6 Mitigation Strategies

When it comes to risk, it is natural to think about purchasing insurance. Buying insurance may seem like the best way to hedge the risk and cover the losses if an accident occurs. However, no insurance on the market can guarantee 100% of claims. In fact, when an accident occurs due to the inability to meet demand in time, it can directly damage the brand's reputation and, even for some large companies, can affect its stock market performance. These are all things that insurance cannot cover.

Risk monitoring plays a critical role before disruptions occur. Force majeure disruptions are challenging to manage but can be estimated through an intentional risk assessment strategy, identifying risk indicators, and applying Total Quality Management (TQM) principles to share information among supply chain management partners. Strategies of controlling risk can be divided into seven categories: prevention, rearrangement, guesswork, vertical integration, risk-sharing, and technology and security (Jüttner et al., 2010; Miller, 1992).

As mentioned earlier, Nissan's in-depth cooperation with suppliers is one of the key reasons why it can recover quickly from damage. Therefore, proactively qualifying alternative and repeat purchases can be very important, allowing companies to move quickly to new suppliers when necessary.

According to the research done by MIT, the main risk mitigation strategies implemented by 209 companies are as followed:

1. Create and implement a business continuity plan
2. Implement dual sourcing strategies
3. Use both regional and global strategy
4. Pursue a 1st and 2nd supplier collaboration.

Not surprisingly, all those strategies overlap with Nissan's risk mitigation strategies.

## 2.7 Supply Chain Risks Study in China

In comparison to the rest of the world, China's research on supply chain risk follows global trends and it does not have some significant findings of its own.

The supply chain is a top-down supply and distribution network between producers, processors, distributors, retailers and consumers (Xu, F. C. and Meng, S. D., 2010). In China, the main risks associated with supply chains are mainly complexity and length, as well as low-risk maturity level of companies, incomplete supply chain criteria and low starting points. Supply chain risk identification is the process of identifying the factors that affect supply chain operations and create supply chain vulnerabilities.

According to Ding Weidong (2003), the supply chain risks are mainly categorized as natural environment risks and social environment risks, including risks from suppliers, information asymmetry, logistics risks, financial risks, market fluctuation risks, partner risks, and profit-sharing risks. Ma Shihua (2003) adds to the above moral, political, economic, legal, and supply and demand risks.

In calculating supply chain risk, Zhou Nanyang from Central South University in China proposed using the risk diffusion model to solve the problem, which considers not the one-way risk traffic between risk factors but the possibility of two-way traffic between risks. For example, suppose a large retailer has multiple suppliers. In the risk assessment, he suggested that the risk can be analyzed by risk factors, nodal enterprises and supply chain network integration.

Yanshan Liu and Junhai Ma (2008) from Tianjin University, China, established an assessment model using a combination of a set of rough theories and grey evaluation theory to evaluate the risk level of the supply chain and came up with a supply chain risk assessment index system. The process is: to establish a supply chain risk assessment indicator system, determine the weight of each risk attribute indicator using rough theories, and construct a risk evaluation matrix using grey system theory.

The strategies to prevent supply chain risks include

- flexibility strategy
- establishing strategic partnerships with supply chain members
- customizing contingency plans for various incidents
- protecting information exposures
- adopting outsourcing strategy to disperse risks
- strong supply chain culture-building to create shared values
- strong purchasing management to optimize logistics and distribution
- early involvement of suppliers
- strengthening daily risk management
- strengthening government incentives for supply chain companies.

### 3. Problem statement

#### 3.1 China's Wine Market

As an emerging wine market, China has tremendous growth potential. After years of building the business foundation, continuously opening up its market to the world and launching more supportive policies to advocate for overseas businesses to bring their products to China. Therefore, people in the industry have always been optimistic about the growth of the wine market in China.

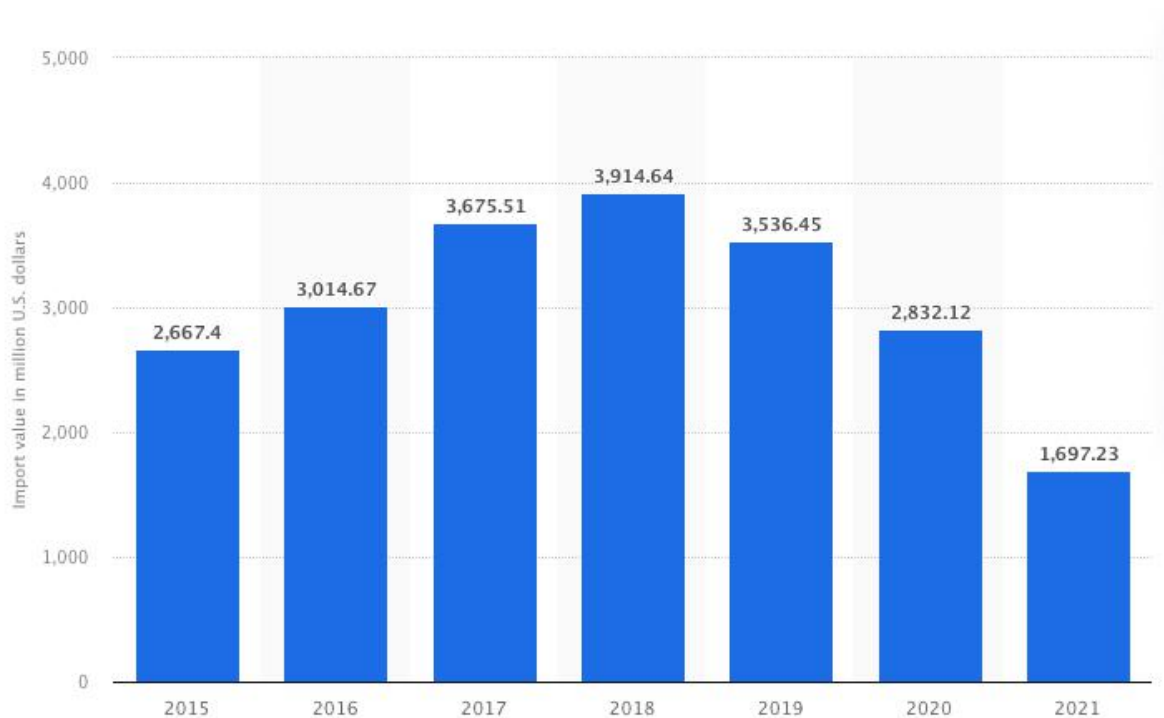
The concept of wine as an everyday drink and presents for significant holidays are becoming increasingly popular. Nowadays, consumers in China are more exposed to wine and more interested in learning about wine culture, like how the coffee culture was buildup from the beginning to now widely popular all across China. Wine also needs time to reach the same level, without doubts. Indeed, the wine market experienced a significant downturn like any other business during the COVID-19 pandemic.

According to the IWSR (International Wines and Spirits Record UK), the wine volumes in China dropped by almost 20% from 2019-to 2020, with imported volumes declining more than 30% due to the COVID-19 pandemic and the safety policies such as lock-down, limiting social interactions, strict traveling policies Etc.however, there is no significant decline in the number of wine consumers. According to the consumer usage and attitude data collected by Wine Intelligence, there are more than 50 million wine consumers in China. In addition, Wine Intelligence estimates that more than 55% of this group drinks imported wine at least once a month.

The Chinese wine market can be divided into two general segments. The first is the regular group, which has certain knowledge of wine culture and has purchasing or drinking habits. They resemble consumers in developed wine markets, and their wine drinking frequency is at least once a month, even once a week. The second purchasing group is much bigger; their behaviors and attitudes are difficult to track or measure. They are more likely to be influenced by trends, holidays, special events, politics, environments, Etc. Those are the timing when customers purchase the most. Some of the customers from this group might not repurchase after,the declining changes mentioned at the beginning might be due to the effect of this big group.

### 3.2 Wine import under the shock of the global pandemic

According to the "Annual import value of wine in China from 2015 to 2021" from Statista, as can be seen, after three years of steady growth from 2015 to 2018, China imported about \$4 billion worth of wine, reaching the highest peak. However, from 2019 there has been a significant decrease in total wine imports due to the global epidemic's direct impact and the rise of domestic wine in China. The table-1 shows that the total wine import value in 2021 is near 1.7 billion U.S. dollars.



**Table-1**  
(Annual import value of wine in China from 2015 to 2021; Statista, Published by Yihan Ma, Mar 15, 2022 )

Now let us look at China's top 10 wine exporters this year. Compared to before, it can be seen that one of the significant differences is that Australia has been completely removed from this list due to the anti-dumping tariffs imposed by China on Australian wines ranging from 116.2% to 218.4%.

The data released by Chinese customs (Table-2) shows that the Old World wine regions such as France, Italy and Spain dominate the top four spots, respectively. However, besides Spain, which showed a 31% positive increase compared to last year, France and Italy showed an 18% and 11% decline. Portugal, on the other hand, collapsed by 42%.

With the popularity of South American wines in China in recent years, Chile became the second largest exporter after France, with a \$19 million value worth in 2022.

New Zealand and the United States filled the gap left by Australian exporters, with their wine exports to China increasing by more than 160 per cent each. New Zealand's wine export value to China more than doubled and reached \$1.06 million.

Eastern European countries are another group of strong competitors. Georgia, one of the most representative of all, increased the most, up 365% compared to last year.



## China's Top 10 Wine Exporters in February 2022 vs 2021

Rank	Country	Value in 2022	Value in 2021	% Change
1	France	US\$37,213,410	US\$37,213,410	-18%
2	Chile	US\$19,463,654	US\$17,894,401	+9%
3	Italy	US\$9,440,841	US\$10,568,581	-11%
4	Spain	US\$8,170,433	US\$6,233,835	+31%
5	United States	US\$4,889,506	US\$1,845,067	+165%
6	Georgia	US\$1,931,513	US\$415,682	+365%
7	South Africa	US\$1,084,614	US\$1,408,24	-23%
8	New Zealand	US\$1,055,790	US\$405,291	+161%
9	Germany	US\$1,033,675	US\$1,040,988	=
10	Portugal	US\$915,665	US\$1,587,293	-42%
	Total	US\$89,136,207	US\$105,809,969	-16%

Source: China Customs

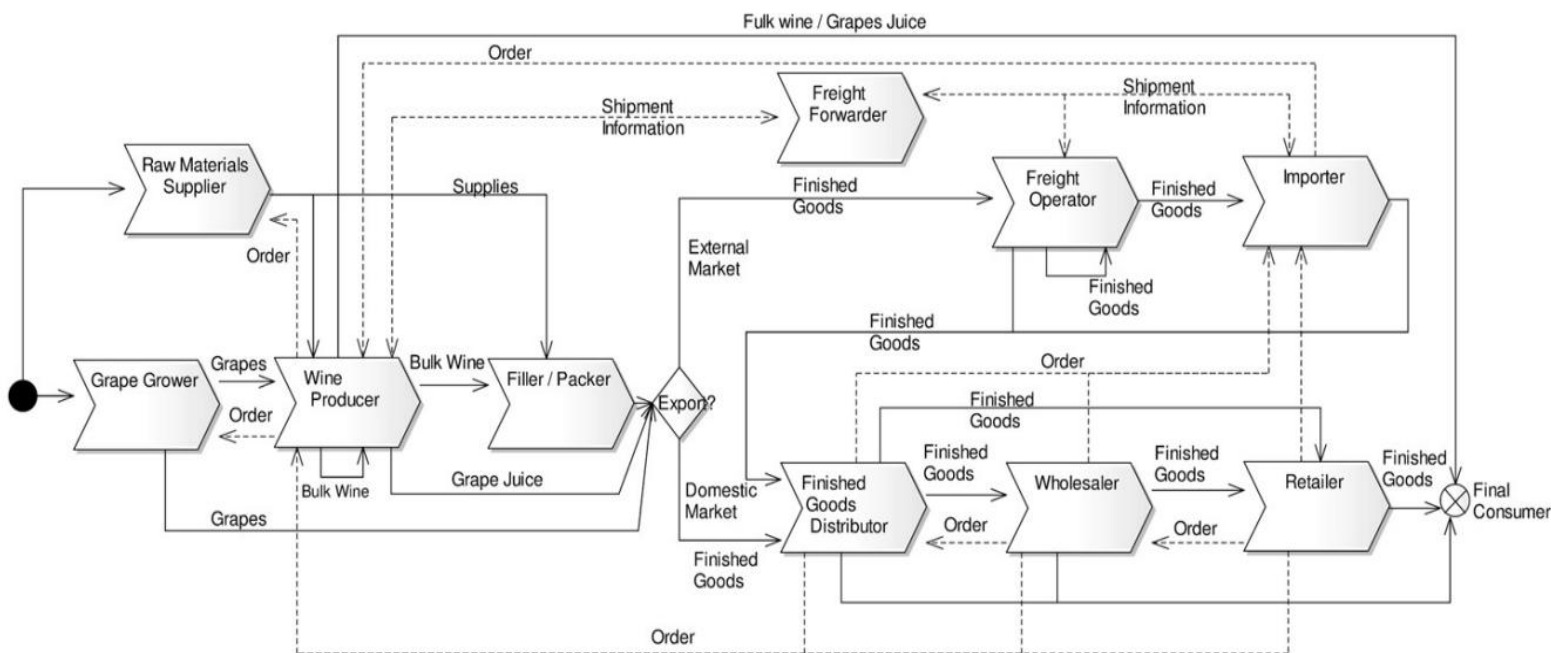
(Table-2)

China's sustained growth in wine imports before the epidemic made the world believe this tendency would remain the same. Natural disasters, epidemics, political situations Etc. can be challenging to predict. Meanwhile, because the wine businesses in China are not thoroughly well-developed, many importers and exporters do not fully consider many risks in the supply chain. The lack of comprehensive risk mitigation plans in advance left many small and medium-sized importers and suppliers in a difficult situation.

#### 4. Supply chain risks faced by wine suppliers

In this section, the entire process from beginning of wine production to finally purchased by consumers in China will be taken into consideration, as well as the aspects of risk that may occur at each nodes. In general managing supply chain risks includes the following processes they are risk identification, risk analysis and evaluation, and risk mitigation. In this study, 35 wine suppliers from different countries were interviewed. Some of them have worked as wine supplier with Chinese importers for years, some have offices in China, and some are looking forward to entering China market soon in the future. Regardless, they all described the problems they are facing in their supply chains and how they are dealing with them as a wine supplier, other related topics on supply chain risk management will also be covered in this part.

## 4.1 The Wine Supply Chain



(Table 3 An illustration of the Wine supply chain.)

For wine import and export, the proper functioning of the supply chain is essential. Problems with any node can cause very serious consequences. Therefore, it is necessary to have a formal and generic model of the wine supply chain, which represents all the possible instances, and be aware of the possible risks that may occur during the supply chain.

Every supply chain consists of several nodes representing the different professionals and the place in the whole process, where they complete their work to ensure the whole supply chain operates smoothly. (table 3) shows the material flow (represented by continuous lines) and information flows ( represented by dotted lines ). This representative model has been defined following the supply chain modeling approach described by Lambert et al. (2008) and Fernanda A. Garcia (2010).

### Grape Grower

As the starter of the supply chain, the grape grower is mainly responsible for the cultivation and collection of the grapes. The quality and quantity of the grapes directly affect the level and amount of the final products. The primary responsibilities of a grape grower are: planting grapes and cultivating and pruning vines, culling substandard vineyards, and fertilizing the vineyards. Controlling the plague, harvesting the grapes, etc.

**Raw Material Supplier**

Responsible for supplying clients with all the supplies needed for wine-making, filling and packaging. Main activities include: taking orders, preparing orders, sending supplies to the customers, store supplies Etc.

**Wine Producer**

Wine producers are responsible for receiving grapes, elaborating, manufacturing and/or blending wine products. The winemaking process depends on the type of wine to be produced (Llera & Martnengo, 2004). In general, the main activities of winemaking are: receiving and weighing the grapes, crushing, steaming and pressing the juice, adding sulfites and decanting yeast, and fermentation. Also, cooling, clarifying, stabilizing, and temperature control. This is followed by storage in stainless steel tanks or oak barrels, filtration, preparation for bottling, ageing in the bottle, Etc. Depending on the type of wine produced, the process can be different.

**Filler/Packer**

The filler/packer is responsible for receiving, analyzing, filling, packaging, and dispatching the finished products. The filler/packer receives containers of bulk wine from the wine producer and then fills the wine into different types of packaging; consumer units, such as bottles, bag-in-boxes, Tetra Paks, Etc., are all manufactured according to the wine batches provided. The next step is to pack the consumer units into cartons, pallets, or other logistic units.

**Freight Forwarder**

This part is responsible for organizing the shipment planning, which is the process of choosing the frequency and deciding which orders should be assigned for each shipment. It also includes the transport of goods safely and efficiently on behalf of exporters, importers or other companies or individuals, and sometimes includes taking care of packaging and storage. Typical activities include (Frazelle 2002): researching and planning the most efficient transportation route (taking into account the nature, cost, timing and safety of the goods), arranging proper packaging (considering climate, terrain, weight, nature and cost of the goods), and delivering or warehousing the goods at their final destination.

**Freight operators**

They provide cargo transportation services from the winery to the importer or other operators such as distributors, wholesalers, retailers, etc., through different carriers such as airplanes, trains, cars or cargo ships.

**Importer**

Purchases goods from wine producers and is in charge of receiving, storing, managing inventory and dispatching finished products, which are received from freight forwarders through freight carriers. The importer sells and delivers the finished product to a distributor or wholesaler in the target country, depending on the distribution channel used in that country.

The importer is responsible for import customs procedures and related tariffs. Sometimes, the importer also serves as a wholesaler or distributor.

### **Finished goods distributor**

Is responsible for receiving, storing, managing inventory, and delivering finished products and repackaging and labelling products according to the customer's specific requirements.

### **Wholesaler**

Wholesalers receive stock pallets and cartons from distributors and select and deliver goods to retail stores. In business, they may place new orders with distributors and importers or directly order from the winery/wine producer.

### **Retailer**

Depending on the distribution channel, the retailer receives the finished products from distributors or wholesalers. They directly sell the products to final consumers – channels including supermarkets, liquor stores, hotels, restaurants, clubs, etc.

### **The final consumer**

This is the end of the supply chain, the final consumer of the product. There are also cases where the product is returned for some reason.

## 4.2 Wine supply chain risks

The possible risks in the wine supply chain can be broadly classified into the following categories: financial, operational, external, market and reputational risks.

### 4.2.1 Operational risks

The operational risks in the wine supply chain are one of the most fatal ones. Risk occurs during growing grapes, sourcing materials, producing wine and shipping the goods Etc., therefor focusing on this part is very important.

- **Grape growing stage**

Choosing the right planting environment is very critical. The climate and weather significantly impact the quality of the wine. Determines how fast the wine grapes will grow, the taste and how well those grapes will turn into wine. With a relatively stable climate, producers can be predicted how the wine will be. Cooler temperatures produce wines with higher acidity but lower sugar and alcohol content. Hot climates increase the ripening process, leading to wines with higher sugar content, alcohol content, and a fuller body. Growing varieties that are not suited to that particular climate will produce lower-quality wines.

Besides natural factors, how the producer manipulates the vines also affects the quality of wine production. Canopy managing, pruning, and harvesting is also critical factor, as harvesting too early or too late can result in grapes that lack the perfect balance. Whether the producer harvests by hand or mechanically also affects the quality of the grapes.

- Sourcing stage

Source risk includes all risks associated with procuring materials, dry goods, labor, machinery, and other services raised by participants. Dry goods include all inventory items used in the bottling and packaging wine and other items used in the wine-making process. It includes the items used to age the wine, such as yeast and oak barrels.

- Wine-making stage

The wine-making process is important in determining the final quality of the wine. Wineries follow these four main steps in producing wine, maceration, fermentation, extraction and aging, and they must ensure consistency to get the best out of the grapes. Substances such as sulfur dioxide, processing enzymes, barrel aging, and oxygen management all play a role in improving the quality of the wine.

- Shipping stage

The transportation of wine is a tricky issue, which requires considering the packaging, temperature, container, type of shipping and the possibility of damages caused by accidents during shipping, Etc. Due to these factors, wine can be very expensive to ship globally. Further risks include losing cargo during the shipment, disruptions of critical routes because of political tensions, weather disruptions, Etc.

More detailed descriptions of operational risks are shortage or poor quality of needed materials. Supply problems with suppliers of goods and services. Management of inventory and shipping (logistics delays/damage). Internal staff-related, such as lack of training, staff attrition, occupational health and safety of employees. Also, issues such as poor process control, operational failures, equipment and machine breakdowns Etc.

#### 4.2.2 External risks

External risks are usually unexpected and cannot be fully predicted in advance. Usually, it is very difficult to predict and control, for example, natural disasters, political changes, global pandemics etc.; such risks may not happen very often, but when they occur, they often cause serious damages.

#### Customs and regulations

Wine import/export customs clearance procedures are more complex than general customs clearance of goods in China. Especially due to the global pandemic, exporting foreign goods to China requires extra tests and procedures, which leads to increased cost and time. It is important to understand the target country's regulations before exporting, as regulations change rapidly, especially in emerging markets such as China. When exporting to China or anywhere else, it is essential to ensure full compliance with the national regulations of the local authorities of food&beverages. In addition, in China, the GB standard (National Standard; Guobiao) must be followed. For example, trademark registration before export, registering the business with AQSIQ, providing the wine label translation, providing all necessary documents, Etc.

The basic external risks include shortage of primary energy sources such as water and electricity, environmental safety, criminal risks and delivery risks such as weather disrupting transportation routes, as well as the impact of natural disasters, political tensions and epidemic diseases.

#### 4.2.3 Market risks

##### Planning stage

The sales forecast is customer demand for various wine types within the planning period. For example, most wineries that export wine to China claim that Chinese buyers prefer red wines over white wines. They are more cost-oriented and prefer low-price wines over high-quality ones. In the beginning, it was true, but in recent years with the development of the wine market, consumers started to know more about wine and have become more critical when choosing. However, because China is an emerging wine market, consumption habits are still considered unstable, making it difficult to predict and evaluate.

Examples of market risks include demand and capacity planning, customer loss, delayed deliveries, and the risk of changes in demand due to sales promotions Etc.

#### 4.2.4 Financial risks

Financial risks in the supply chain can be critical; for example, investing in a new vineyard can be a significant risk considering the changing market, customer tastes and demands. It also requires years of continuous investment. Other causes of financial risk in the wine supply chain include financial mismanagement, price and cost fluctuations, transportation costs, cost overruns, interest rate fluctuations, the unsustainability of critical suppliers and customers, foreign exchange risk, Etc.

#### 4.2.5 Reputational risks

This mainly refers to brand reputation damage due to poor product quality or bad service experience. Customers asking for a return of payment or stopping purchasing can be due to poor quality of products, inadequate after-sales service, relationships with unethical suppliers or business partners, Etc. It will undoubtedly hamper the expansion of business.

#### 4.3 Research study

The study adopted the qualitative research method, aim to identify current supply chain risks faced by the wineries and associations (experienced in exporting to China or intending to export to China in the future) and the strategies they are using to manage these risks, especially in the context of frequent epidemic outbreaks occurring in China. The Data is collected through interviews with the wineries and associations. The analysis is based on

content analysis and aims to provide the wineries with an in-depth overview of wine supply chain risks at the moment and how wineries are coping with the risks as a reference.

4.3.1 Research Sample

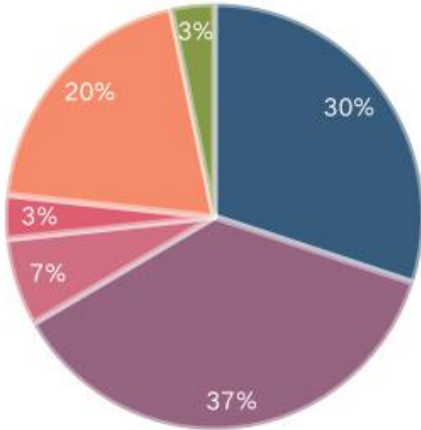
The interviewees were selected based on China's top 10 wine exporter countries. The wineries interviewed were from Western Europe, Eastern Europe, South America, North America, and Oceania. The interviewees included wineries and wine associations. All of them are engaged or involved in wine export businesses. This research collected data through face-to-face interviews and analyzed using content analysis. The names of the interviewees and their companies cannot be provided directly for privacy reasons.

Total sample size	35
Number of wineries	30
Number of associations	5
Exported to China	26(associations included)
NEVER exported to China	9
Currently exporting to China	11
Planning to export to China in the next 5 years	35

(Sample Categories)

Regional distribution of the samples

- Eastern Europe   ■ Western Europe   ■ North America
- Middle East   ■ South America   ■ Oceania



(regional distribution of the samples)

#### 4.3.2 Data collection and analysis

Data was collected through face-to-face interviews with the export managers of 35 different wineries and associations. Needed information were recorded through personal notes. The interview was conducted during the Prowine exhibition, held in Dusseldorf, Germany on May 15-17.

The interview was first opened with the question regarding the supply chain risks that occurred while exporting before the epidemic. Comparing the risks in the wine supply chain before and during the outbreak revealed that the risks in the wine export supply chain were actually quite similar. The difference is in the risk impact and how the risks are ranked at different times.

Regarding the biggest supply chain risk before the pandemic, one of the most common answers were the risks in the grape growing process. Natural disasters and other risks related to the grape growing process were considered to be the most critical risks since its directly related to the quality and volume of the final production. From the data provided in the State of the World Viticulture Sector in 2020 report can be seen that, after a relatively stable global wine production from 2006 to 2012, global wine production experienced sharp increases and decreases, respectively. The downward trend began in 2013 and reached its lowest in the past two decades in 2017, with global wine production below 250mhl. Then a sharp increase was shown from 2017 to 2018, with over 290mhl global production. Immediately afterward, a significant decline was followed. (\*mhl is million hectolitres)

For wineries exporting abroad, especially to China, the risks generated during shipping are also emphasized as one of the main challenges they face in terms of shipping methods and packaging. Other financial risks include fluctuations in procurement, production and shipping costs Etc. External risks showed the most impact in recent years due to the global crises, such as customs clearance, local regulations, natural disasters, political and social issues Etc. Operational process risks were also mentioned, including disruption of supplier cooperation, an insufficient supply of raw materials, problems with the quality of raw materials, delays in transportation, cargo damages or losses, Etc. Market risks such as disruptions of buyer cooperation and errors in market demand evaluation and reputation-related risks were also mentioned.

The more specific details of current risks are listed below, by severity.

#### **COVID-19 pandemic**

The most common answer received is the Covid-19 outbreak. The entire wine supply chain was affected at various levels due to the risks caused by the outbreak. Although most parts of the world, the situations seem to be getting more stable and gradually returning to normal. However, the situation for wineries exporting to China seems not turning around yet. As in April, the wineries were again affected by the outbreak in Shanghai. Wineries mentioned that the long period and lack of supportive policy made the export process extremely difficult.



They try their best to stay positive, hoping the situation will improve soon. However, the impact of Covid-19 will require a long time for them to recover from it.

### **Shortage of materials**

Regarding this question, the same answer was received from all interviewees and associations: the shortage of materials, including dry goods such as glass, labels, cork Etc. Along with other reasons, this has directly contributed to the complexity and rapidly increasing global wine supply chain costs. In a report published in November 2021, the chief supply chain officer for Saxco, an international wine packaging company, claimed that the global wine supply chains are currently under the most extreme challenges that he has seen in his entire career so far." Everything from glass to shipping is completely strained" he said. The main reason behind this phenomenon is the Covid-19 pandemic that spread worldwide, causing manufacturers to be unable to produce normally and causing wine producers great difficulties importing bottles and sourcing other raw materials.

### **War and political reasons**

Another risk is the war going on in Ukraine. Especially for Eastern Europe wineries, wineries in the region around Ukraine have been affected significantly. In an interview with Moldovan wineries, they said the war has severely damaged the entire Eastern European wine supply chain. Some factories in those countries stopped production to help refugees; as for the factories inside Ukraine, it is impossible for them to continue production due to the war. Many wineries that have been ordering bottle packaging and labels from Ukraine for a long time are caught in a situation where they need to find a new supplier immediately.

The war also led to serious inflation. Blocking the main port of Odesa in Ukraine, disrupting shipping, causing blocks at other harbors, and leading to logistical standstills and the inability to transport goods on time.

Political reasons are causing negative impacts on trade between the two countries. For example, Australia went from its previous status as China's largest wine exporter to being imposed an extremely high 212% tariff by China. Also, the tension between Canada as well, resulting the trade reduction between the two countries. According to the interview, those political issues lead to serious damage for many with great losses.

### **Export difficulty**

Another consistent answer given by all the wineries is that the challenge of exporting to China has become extremely difficult since the outbreak. Whether wineries that are currently still selling in China or those that are temporarily on hold, even those that are not in the market yet are saying how difficult it is to ship goods to mainland China at the moment. Due to the pandemic, the customs clearance procedures have become more complicated as the containers need to be tested for covid-19, additional documentation requests, lack of custom staffs slowed down the process, resulting in many wines being stuck in China customs. Wineries responded that before the outbreak, Chinese customs received up to 350 cases of Chilean wine per day, but now only an average of 50 cases per day pass through customs, with the rest

being stuck in the port, neither being sold nor consumed. On the other hand, for the wineries with stocks in China, competition in the market is less intense than before the pandemic.

As imports and exports can be very tricky, wineries with inventory in China are in an advantageous position to sell their stocks normally. However, most of the wineries that have already finished their stocks in China are facing a passive position, with export difficulties causing wine suppliers to be unable to secure their supplies in time. Finally, for those wineries that have not entered the Chinese market, the situation is now more of a wait-and-see approach, as they all claim to be waiting for the outbreak to pass before taking action.

### **Travel restriction**

Traveling during the pandemic is very difficult with long quarantine periods, and strict traveling policies change many business activities from offline to online. Wine buyers are unable to go abroad to select wines, and foreign wineries are unable to attend exhibitions or do business operations in China as before. This led to many wineries losing the opportunity to develop new customers. Due to the complexity of Chinese imports and the decline in wine consumption, many small and medium-sized importers have stepped out of business. Wineries that have businesses involved in China responded that the number of importers they are currently working with from China had decreased at least 20%, resulting in a loss of buyers and a significant decrease in orders placed by Chinese buyers and an increase in order cancellations.

### **Cost increases in general**

Shanghai, as the city with the largest number of foreign companies in China and an important consumer market for wine, is the preferred location for many wineries to set up offices. The wineries said that the rebound of the pandemic has caused their teams to be unable to work normally, but they still have to pay staff salaries, rents, Etc., which increased the cost in general.

## 4.2.3 Risk Mitigation Approaches

### **Risk mitigation methods used**

When asked what strategies they are using to mitigate the risks, their responses were not so different either. The risks wineries are facing now are mainly external, indicating that they are pretty passive in this situation. Due to the shortage of materials, shipping difficulties and so on, which increased costs and prices, as the solution most wineries chose to stay in the local market or export to the European market.

Some of the export managers who were based in China, responsible for the Asian market, mentioned relocating their offices from mainland China to Hong Kong or other countries in Southeast Asia in order to travel freely and manage their already existing businesses. Due to the difficulties in exporting to China, the rise of the Chinese wine industry, and the fact that

the wine market is already very competitive in China, some wineries are considering developing other Asian markets such as Korea, Japan and other Southeast Asian countries.

Asking if wineries hold either a positive or negative attitude toward the future Chinese market and whether they are planning to export to China in the next 3 to 5 years, on this issue, all wineries, whether they have entered the Chinese market or not, responded positively and consistently, expressing their confidence towards the Chinese wine market after the outbreak. They are enthusiastic about exporting to China. Those who have already entered China market mentioned that although the Chinese market is very competitive, this is mainly in the first and second-tier cities; as a large country, China's economic development is not synchronized, and the gap between the different levels of the city is still very different, there are many wineries have shifted their focus from the big cities like Shanghai, Beijing, Guangzhou to the second and third-tier cities, where not many imported products, the market is not very competitive, more consumers, there are more opportunities. Even those who never export to China, even in Asia, are saying that as soon as the situation gets controlled, they will work on developing China market. It is complicated, but it is large and important at the same time; obviously, no one wants to miss the chance.

### **Risk mitigation suggestions**

From Nissan's case

At the beginning of the article, the Nissan case was mentioned, about how Nissan responded to and managed the risks under the impact of natural disasters and turned the difficulties into opportunities to enhance its positions in the automobile industry. It is certainly a classic case study for wineries struggling with external risks. Of course, being realistic, Nissan was a large-scale corporation in the business before the incident happened. As one of the top 3 Japanese car producers, Nissan is the one with the ability to control and manage the risks compared to many small, middle-sized businesses. Most wineries do not have such strong capabilities and resources. However, Nissan's mitigation strategies still can be valuable to learn from for many wineries. Firstly, Nissan has full awareness of its supply chain, both upstream and downstream, and the supply capabilities of its suppliers and partners when an incident happens. During the interviews, it was noted that wineries tend to look for suppliers within a certain region, such as glass bottle manufacturers, and cork suppliers are concentrated in a certain area, thus making it difficult for wineries to find new suppliers in time when accidents occur. Taking into account potential risks as comprehensively as possible and develop solutions accordingly. Develop adequate plans for prevention, initial response and recovery, make sure practice regularly. There are also approaches such as improving supply chain flexibility, centralized planning plus decentralized execution, organizing regular training etc., to mitigate risks.

Applying Risk matrix and risk maturity framework

Since each winery has different conditions, applying the Risk Matrix and the supply chain risk maturity framework mentioned earlier in the article to identify the level of risk and the distribution can be the start of the process. Managers need to consider all aspects of the risks that may arise in the supply chain, identify the risks, analyze the risks, develop comprehensive risk mitigation strategies according to the risks, and continuously improve the company's maturity level in handling risks.

Here are more specific risk mitigation strategies based on each stage of the supply chain:

Be as comprehensive as possible regarding predicting risks in the supply chain. Conduct as much proactive planning as possible.

Develop customer loyalty. Many wineries that have never exported to China claim that they are hesitant to take the first step because the Chinese market is very complex, in their opinion. Wineries exported to China also have relatively poor knowledge of the Chinese buyers nowadays. In their opinion, Chinese buyers prefer red wines over white wines and seek lower prices than quality. This phenomenon did exist in the beginning, which led to importers always looking for cheaper wines, resulting in wineries and buyers having very fragile relationships. However, with the development of the wine industry in China, this phenomenon has changed. Therefore, getting to know the customers and building strong relationships is very important. Get to know the customer's preferences and manage their expectations while being flexible and adaptable enough to change when incidents occur.

When negotiating with suppliers, wineries should weigh the pros and cons, look at the bigger picture, and establish multiple-tier supplier relationships rather than limiting themselves with fewer options. Hold extra stocks of essential materials or alternatives to avoid shortages.

As for the risks that may arise during the grape growing process, mitigation strategies ensure energy supply for production, such as water conservation and recycling. Prepare solutions for possible natural disasters. Ensuring avoiding planting problems that may occur during the grape growing process, such as parasitic infestation, monitoring the sugar content, pH, acidity, etc.

The shipping process is the riskiest part; wineries should consider using new transportation methods, such as using new high-tech transport methods or suitable shipping methods such as barrels to ensure that during the transport process wine won't be damaged easily due to the bottling or deteriorated because of the transport conditions and timing. Regarding customs, can seek help from custom brokers to ensure the process.

## 5. Conclusion

The purpose of this study was to identify possible risks in the wine supply chain. The study provides an insight into the risks involved in the wine supply chain, especially in the context

of the Covid-19 pandemic. Learning the risk management approaches from large companies such as Nissan to cope with the difficulties. Applying risk management framework to businesses in order to measure companies' risk mitigation ability and develop plans accordingly. Aim to be a useful reference for wineries and SMEs facing risk management problems.

The qualitative research method used in this study lacks numeral data to support the theory. Also, the amount of information obtained about the sample was not comprehensive enough; not all detailed risks were identified. This study can be used as a reference to get more insight into wine supply chain risk management, highly recommended that wine producers implement and use more comprehensive risk management tools, which would help in better risk management.

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