UNIVERSITY OF TURKU
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The role of contracts in international supply chain risk management

International Business
Bachelor's thesis

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Abstract

International supply chains ensure product availability globally. They are utilized to minimize costs and maximize efficiency in production. In an international world, where supply chains are stretched across multiple countries and jurisdiction, companies operating within supply chain face varying risks. This leads to the need for supply chain risk management, which refers to strategies and mechanisms that are used to minimize the effects of a disruption in the supply chain. This thesis will focus on contracts and contractual mechanisms used in international supply chain risk management.

The thesis attempts to identify and explain how contracts are used is supply chain risk management, focusing on international supply chains. This is done by reviewing existing literature around supply chain risks and contracts. Earlier literature presents many ways to mitigate risks, but only in specific industries or situations. In this thesis, supply chain risks are divided into internal and external categories, with more detailed sub-classifications. Contractual mechanisms and contract types are then presented and examined.

The findings show that international supply chains are changing and complicating, leading to the need for more precise and concrete risk management strategies. Additionally, this study shows that contracts are a vital part of supply chain risk management, as they are used in risk sharing, mitigating and reallocation.

Keywords: supply chain management, supply chain risk management, global supply chain, contract, risk mitigation, international trade

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Tiivistelmä

Kansainväliset toimitusketjut varmistavat tuotteiden saatavuuden maailmanlaajuisesti. Niitä hyödynnetään tuotantokustannusten minimoimiseksi ja tehokkuuden maksimoimiseksi. Kansainvälisessä maailmassa, jossa toimitusketjut ulottuvat useiden maiden ja lainkäyttöalueiden yli, toimitusketjussa toimivat yritykset kohtaavat monenlaisia riskejä. Tämä luo tarpeen toimitusketjujen riskienhallinnalle, joka käsittää strategioita ja mekanismeja, joilla pyritään minimoimaan toimitusketjun häiriöiden vaikutukset.

Tämä opinnäytetyö keskittyy kansainvälisen toimitusketjun riskienhallinnassa käytettäviin sopimuksiin ja sopimusmekanismeihin. Tämä tehdään tarkastelemalla olemassa olevaa kirjallisuutta toimitusketjujen riskeistä ja sopimuksista. Aikaisemmassa kirjallisuudessa esitetään monia tapoja lieventää riskejä, mutta ne rajoittuvat tiettyyn toimialaan tai tilanteeseen. Toimitusketjun riskit jaetaan sisäisiin ja ulkoisiin, ja niitä tarkastellaan tarkemmin alaluokittain. Sen jälkeen esitellään ja tarkastellaan sopimusmekanismeja ja sopimuslajeja.

Tulokset osoittavat, että kansainväliset toimitusketjut ovat muuttumassa ja monimutkaistumassa, mikä johtaa tarpeeseen tarkemmille ja konkreettisemmille riskienhallintastrategioille. Lisäksi tämä tutkimus osoittaa, että sopimukset ovat olennainen osa toimitusketjujen riskienhallintaa, sillä niitä käytetään riskien jakamisessa ja lieventämisessä.

Avainsanat: toimitusketjun hallinta, toimitusketjun riskienhallinta, globaali toimitusketju, sopimus, riskien hallinta, kansainvälinen kauppa

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1 Introduction

1.1 Background

Supply chains have a prominent role in ensuring product accessibility all around the world. Supply chains are utilized to lower the price of goods, by strategically choosing locations and transportation that is the cheapest. This happens in most industries, but the extent to which international supply chains can be used depends. Supply chains have started to internationalize more in the past decades, as globalization has made it possible and feasible. In literature, supply chains are viewed as a way to add value to the product, by describing it as a process where material, labour and technology are combined and then distributed and marketed (Gereffi, Humphrey & Sturgeon, 2005, 79). In supply chains, one company can either be a single part in a multicompany operation, or it can be vertically integrated, where the whole supply chain is operated within-firm (Hobbs, 1996, 19). Vertical integration in itself is viewed as a method for risk management, by controlling elements throughout the supply chain (Ersahin, Giannetti & Huang, 2024, 13). Due to uncertainty in supply and demand, shorter product lifecycles, outsourcing and globalization, supply chain management (SCM) must evolve into supply chain risk management (SCRM), in order to succeed (Singh, Mishra, Jain & Khurana, 2012, 273). For this thesis, the meaning of SCRM will focus on multi-organizational cooperation and collaboration to evaluate, identify and mitigate unexpected events or conditions that may cause negative effects on any part of the supply chain (Ho, Zheng, Yildiz & Talluri, 2015, 5036). Because most vertically integrated supply chains operate differently and have their own contractual mechanisms and supply chain risk management methods, they are excluded from this thesis.

Contracts play a valuable part in protection of complex supply chains that operate in multiple jurisdictions. When operating globally, firms face unique challenges that can vary from natural disasters, such as the Hurricane Catrina in 2005, to manmade conflicts, such as the World Trade Center terrorist attacks in 2001 and the following conflicts (Wagner & Bode, 2006, 301). This thesis attempts to bring together juridical ways for companies to minimize and manage risks that are ever present. From changing political landscaped to unpredictable disasters, contracts offer diverse ways to help companies survive, whether they are one part of the supply chain or own in entirely.

On top of these challenges, companies operating cross-border supply chains, whether wholly owned or outsourced, face multiple jurisdictions during the process. Depending on location, governance and legislation can vary significantly, creating a complex and fragmented international supply chain

(Schaper & Pollach, 2021, 3). Existing literature is fragmented and focused on either specific risks or risk management types, leaving a research gap, which this thesis attempts to study and fill.

1.2 Aim of the thesis

The main aim of this thesis is to examine and present the most useful and practical ways companies can protect their international supply chains using contractual mechanisms. In order to do this, this thesis will answer the main research question "How are contracts used in international supply chain risk management?" along with the following sub questions:

- What types of supply chain risks exist in international business?
- How does contractual risk management work in international supply chains?
- What contractual mechanisms are used to manage these risks?

The first sub question is meant to identify the causes leading to the need for contractual protection. The following sub question offers concrete mechanisms for supply chain risk management. The last sub question examines the way these mechanisms are used and what possible limitations they might have.

To create an understanding of these risks, this thesis will first go over the most well-known ones, categorised into broadly external and internal, with more specific sub-categorizations. Then it will go over the role contracts play, by showing their importance and meaning in international supply chains as well as some of the most vital elements that are present in useful contracts. Next, it will analyse and describe concrete clauses and rules that can be used to minimize risks. Lastly, it will conclude by summarizing the key findings, this thesis's limitations and give suggestions for future research related to international supply chains and contracts.

2 Risks present in international supply chains

2.1 Defining supply chain risks

In SCRM literature, the definition of risk is debated and has been defined in multiple ways. Existing literature has also provided definitions for both supply risk, which focus only on a supplier and a specific item from them (Ellis, Henry & Shockley, 2010, 36), and supply chain risks, where definitions include any risks for the flow from supply chain start to the end (Jüttner, Peck & Christopher, 2003, 200). This leads to a need for a concise but encompassing definition, which focuses on the supply chain as a whole. Multiple articles have created these by combining elements from previous publications.

For this thesis, the definition provided by Ho, Zheng, Yildiz and Talluri (2015, 5035) will be used. They state that a supply chain risk is "the likelihood and impact of unexpected macro and/or micro level events or conditions that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures or irregularities." This is chosen because it has evolved from earlier definitions and the creators have understood the scope and shortcomings of those definitions. In Table 1, different definitions and their scope are presented.

Table 1 Definitions of supply chain risk (Adapted from Ho et al., 2015, 5035)

Authors	Definition of supply chain risk	Scope
Zsidisin (2002, 222)	"The probability of an incident associated with inbound supply from individual supplier failures or the supply market occurring, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety."	Supply risks
Jüttner, Peck & Christopher (2003, 200)	"Any risks for the information, materials or products across organisation borders."	Information, material and product flow risk
Wagner & Bode (2006, 303)	"The negative deviation from the expected value of a certain performance measure, resulting in negative consequences for the focal firm."	General risks
Bogataj & Bogataj (2007, 291)	"The potential variation of outcomes that influence the decrease of value added at any activity cell in a chain."	General risks
Ellis, Henry & Shockley (2010, 36)	"An individual'sperception of the total potential loss associated with the disruption of supply of a particular purchased item from a particular supplier."	Supply risks
Ho et. al (2015, 5035	"The likelihood and impact of unexpected macro and/or micro level events or conditions that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures or irregularities."	Micro and macro level risks

2.2 Identifying the main risks

Supply chain risks can be and have been classified in multiple ways in previous literature and research. Classification varies from specific risk types on micro- and macro-levels to more broad categories, relating to the source of the risk (Ho et al., 2015, 5036). Most categorizations include divide into internal and external or macro and micro, which are then further sub-categorized, varying from article to article.

For this thesis, the risks will be categorized into six different supply chain risks as demonstrated by An et al. (2024, 525), which is adapted from Mitchell (1995) and Ho et al. (2015). Figure 1 shows the categorization, which divides the risks into first internal and external scope, and then by the frequency of their occurrences.

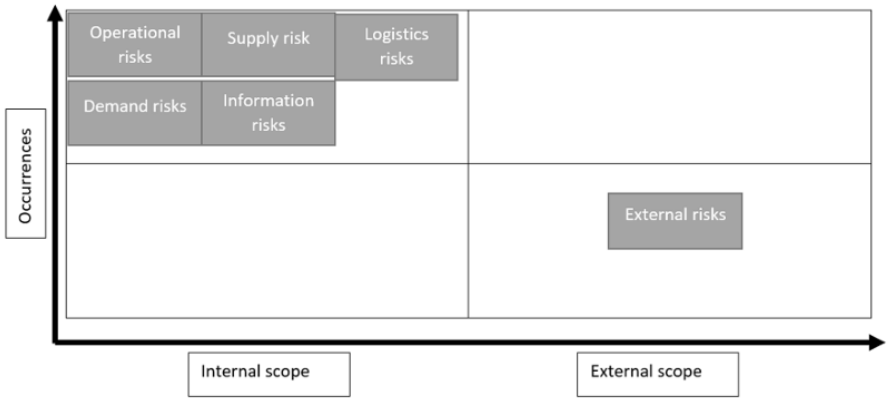

Figure 1 Supply chain risks (An et al., 2024, 525)

Internal scope, meaning, internal risk factors are created when there is a disconnect and lack of co-operation between different operators in the supply chain (Singh et al., 2012, 273). As An et al. (2024, 525) demonstrate, risks in the internal scope occur more frequently than external risks. Internal risks concern the process from within the supply chain and have varying levels of control from the company. Due to the possible inaccuracy of forecasting demand, these internal factors are almost expected and unavoidable in modern global supply chains.

External scope or external risks are factors that are caused by the environment in which the supply chain operates (Singh et al., 2012, 274). Categorizing external risks' specific categories is near impossible, because of the unpredictability of outside events. However, in chapter 2.1.1 some categorization is offered. In addition, external risk factors occur relatively rarely, especially when comparing to internal risks. Despite this, when they do occur, external events can create significant harm to supply chain, either directly or indirectly (An et al., 2024, 525).

As most risks have external and internal causes, this thesis will focus more on categorization and less on the scope divide. This chapter will go through each category presented in Figure 1 by discussing and illustrating them.

2.2.1 External risks

External risks occur, when there is a change in the operating environment of the supply chain, which can be influenced by economic, geographical or sociopolitical factors (An et al., 2024, 525). This means for example natural disasters, wars, pandemics, terrorist attacks or political or financial instability.

Natural disasters are among the most unpredictable external hazards a supply chain can face. Furthermore, due to climate change, their frequency is increasing. For example, a natural disaster can impact the delivery of goods and cause damage to infrastructure, leading to further delays in deliveries (Goerlandt & Islam, 2021, 1). Covid-19 pandemic caused severe disruptions to global supply chains, leading to international trade deficit and vulnerable supply chains (Khan, Waqas, Honggang, Ahmad & Yu, 2022, 1116). External risks often lead to risks within the internal scope.

2.2.2 Supply risks

Supply risks are caused by unusual behaviour and activity from upstream suppliers (An et al., 2024, 526). Upstream suppliers provide raw materials or parts to the company, which in turn it sells to the downstream customers (Wathne & Heide, 2004, 74). Supply risks are therefore caused by supplier, and can happen due to uncertainty in either price, quantity or quality (Nie, Boyacr, Gümüs, Ray & Zhang, 2017, 125). When a supply risk occurs, it can interrupt shipments towards downstream actors.

In addition to supply risk being caused by an internal part of the supply chain, they can also be caused by external causes. For instance, the Russia-Ukraine war has caused supply shortages in oil, causing price volatility for supply chains globally (Korosteleva, 2022, 1678–1679).

2.2.3 Demand risks

Demand risk in the supply chain occurs when forecasts of demand do not align with the actual demand from customers (Kumar, Tiwari & Babiceanu, 2010, 3718). This leads to either surplus in inventory, which creates additional costs and may affect the company’s stock (Hendricks & Singhal, 2009, 253), or deficit in inventory, which causes shortages in offerings (Kumar et al., 2010, 3718). In other words, demand risk leads to decreased efficiency and monetary loss, because the downstream supply chain isn’t operating optimally.

Changes in demand can happen quickly, depending on the industry the supply chain operates in. In the fashion industry for example, customers' needs change continuously based on internet or social media trends (Nguyen Thi, Nguyen Do Khanh, Ha Minh, Do Thi Thuy & Ngo Tien, 2023, 504–505). Demand risk is often caused by external factors, but it affects the supply chain internally.

2.2.4 Information risks

Communication and information between supply chain partners is essential in integrating supply chains flows and ensuring operations (Petratos & Faccia, 2023, 735). Information helps the various levels of supply chain to cooperate and increase their resilience and flexibility. Information risk therefore refers to disturbances in information flows throughout the supply chain (Petratos & Faccia, 2023, 739–740). According to SCRM literature, information risk is caused by either information leakage, where confidential information is revealed to unauthorized actors, or by vulnerability in the information technology (IT) infrastructure, where failures in the IT system causes negative losses to some part of the supply chain (Sharma & Routroy, 2016, 240).

In addition to correct information leaking to wrong parties, misinformation causes disruptions to supply chain and amplification of inaccurate information, whether that is minimizing a possible risk or highlighting incorrect information about the firm or supply chain (Petratos & Faccia, 2023, 751).

2.2.5 Logistics risks

Logistics risks occur when there are unpredicted and negative situation within the logistics of the supply chain, whether that is in packing, transportation or other process in logistics (Yousefi, Jahangoshai Rezaee & Moradi, 2020, 1068). There are many causes for logistics risk, which vary based on the particular process the risk occurs in. Logistics risks can be caused by lack of something, namely space or supply, or damages in supply or infrastructure (Yousefi et al., 2020, 1068).

External events, such as the Russia-Ukraine conflict, may also cause logistics risk, by forcing companies to reroute their supply chains, leading to increases in prices and delays (An et al., 2024, 527). In addition, logistics risks can arise from within the supply chain. Over time third-party suppliers in the supply chain may change their operation to be less costly or operate at a lower quality level, leading to quality fade (Whipple & Roh, 2010, 341). This in turn lowers the overall quality of the product, leading to other possible logistics risks amplifying as result.

2.2.6 Operational risks

Operational risks are disruptions brought on by issues within an organization (An et al., 2024, 528). They can be rooted in changes in technology or design, as well as labour disputes, such as underqualified labour or labour shortages (An et al., 2024, 534; Swierczek & Szozda, 2019, 751). In addition to resource related risks, global supply chains face risks related to international trade, such as exchange rate risks (Lai, Zhixiang, Xin and Chun-Hung, 2023, 1–3.)

2.3 The effects of risks to supply chain performance

Determining the total effect caused by risks is often difficult. This is only heightened in globally operating supply chains, where a disruption in one part of the supply chain may have consequential negative effect in other parts of the supply chain that may be located across the globe (cf. Singh et al., 2012, 273). The performance of a supply chain is severely impacted by these risks, and they cause losses in efficiency and productivity. Additionally, a global supply chain suffering from a disruption may face lowered brand perception, due to failures in customer service and deliveries or producing lower quality good. Reputational effects in turn may lead to decreased interest from consumers, causing lowered profits (Singhal, Agarwal & Mittal, 2011, 21).

From the financial point of view, logistics risks and demand risk create excessive inventory, leading to monetary losses and decreased utilization of capital (Singh et al., 2012, 274.) In addition, disruptions cause indirect costs, when a company is forced to resort to alternative suppliers or expedited shipping in order to meet their obligations. At the same time however, a company's profit may decrease due to inventory shortages or penalties from failure to fulfil contractual demands.

According to An et al. (2024, 535) information risk, alongside demand risk, has the highest impact on a supply chain's financial performance. In addition, information risk influences customer satisfaction the most. This implies that focusing on mitigating information risks and demand risks should be a company's most important consideration.

3 Contract-based methods for risk management in global supply chains

3.1 The function of contracts in risk management

Global supply chains face many risks throughout operating, leading to the need for supply chain risk management. This is especially vital when supply chain operates in multiple jurisdictions, where laws and regulations differ. They address multiple different possible disruptions that a global supply chain may face, by strengthening the cooperation between partners, using profit, risk or cost sharing (Hennet & Arda, 2008, 399). In the previous chapter, these possible risks were introduced and explained. This chapter will go over ways contract mechanisms and types are used to minimize the risks and their effects. Each risk categorization is not given a specific mechanism, because the best one to use varies from company to company and country to country.

While there are multiple frameworks for international trade, such as the United Nations Convention on Contracts for the International Sale of Goods (CISG), contractual agreements override the frameworks, allowing specifically tailored contracts (CISG, 1980, article 6). As global supply chain face increasingly disruptive risks and become more complex, more dynamic and efficient risk mitigation methods are employed.

3.2 Contractual risk management mechanisms

Contractual risk management can be done by either choosing specific contract types or implementing certain clauses and parameters into the contract. The risks described in this thesis, while often unpredictable, are possible to manage and minimize the effects of using contractual methods. By clearly defined obligations, responsibilities and clauses, contracts can reduce uncertainty in the supply chain and improve cooperation (Hennet & Arda, 2008, 400–402). The following categories of mechanisms were created from the existing literature.

3.2.1 Risk sharing and transferring

Risk sharing and transferring using contractual methods are essential in global supply chains in order to mitigate the consequences of the risks by distributing them (Han & Um, 2024, 9). Risk sharing and transferring can be done by outsourcing entirely, or by creating contracts that obligate suppliers and customers both to be involved in the process (Han & Um, 2024, 19).

Risk sharing can be offered by an operator in order to attract more suppliers to enter a specific market to allow diversifying (Tang, 2006a, 481). This can be done for example by offering to share financial risks with partners committing to certain quantities and then offering buy back for the unsold units (Tang, 2006b, 481). Overall, risk sharing demands collaboration between supply chain partners and understanding of each other. Buy back contracts and revenue sharing contracts are contract types that can be used to share risks associated with the supply chain (Tang, 2006b, 462). When relating to foreign exchange rates, a risk-sharing contract can be used to share profits or results caused by exchange rate movements, therefore enabling partners to choose the best policy for their specific situation (Kim & Park, 2014, 635).

Tang (2006b, 462) also presents quantity-based contracts as a way to share risks. They allow the manufacturer and retailer to adjust the contract terms based on the quantity ordered. In this, both parties share the uncertainty that comes with larger quantities.

In addition, quantity-based contracts can be used to transfer risk from one operator to another. When buyer orders large quantities or orders in advance, it assumes most of the risk for lower cost, whereas when manufacturer allows changes later in the process, it assumes risks relating to disruptions (Tang, 2006b, 462–463). In general, risk transferring is done using specific contractual methods or types, such as insurance contracts, Incoterms or flexible exchange-rate contracts or methods.

Insurance contracts employ specific types of insurances in orders to prevent losses, the most common being business interruption insurance. (Kao, Bora, Shang, 2022, 2824; Lei, Zhou & Zhao, 2026, 2326). Using insurances, companies transfer the risk to insurance companies, minimizing their loss that may be caused by disruption in another part of the supply chain (Kao et al., 2022, 2824).

International Commercial Terms (Incoterms®) are terms that in the sale of goods describe which party is responsible for the transportation and customs clearance, who is responsible for the costs at each stage of the delivery and where exactly the risk transfers from the seller to the buyer (ICC Finland, 2020). This is a standardized way for parties to allocate risk in international supply chains, where product moves from one country to another, especially when the countries have different legislations and laws. In addition, Incoterms® can be used to optimize supply chain routes and create flexibility around leveraging and within the supply chain, increasing efficiency (Kumar, 2010, 53–56).

Exchange-rate flexible methods can be used to mitigate risks related to foreign exchange rates and their unpredictability. Foreign exchange risk is considered to be one of the most impactful concerns in the supply chain (Liu & Nagurney, 2011, 539). While risk-sharing contracts can be used to manage risks, a more risk-aversive method of managing foreign exchange rates is by utilizing financial contracts. The company may buy currency call options from banks or other financial markets, which gives the holder the right to convert currency at a fixed price, reducing the effects of fluctuations (Kim & Park, 2014, 634–635).

Ogunranti, Ceryan and Avijit (2021, 423) propose two types of flexible contracts to transfer and share the risks. First is a bounded exchange rate contract, where both supply chain operators decide limits on the currency exchange rate. Within the bounds agreed upon one party's price stays fixed, while the other party's price increases or decreases depending on the realized exchange rate. However, if the rate falls outside the limits, the price is calculated from either of the bounded values. This limits the currency risk, by either transferring the risk entirely to the other party or by minimizing the risk outside of the bounds. The other contract is proportional exchange rate contract, which is an agreement where both parties share the gains or losses caused by exchange rate fluctuations. Therefore, any possible changes to the exchange rate are split according to percentages agreed upon in advance (Ogunranti et al., 2021, 425.) This proportional contract is used to reduce the risk on one party, especially in volatile environments.

To combat inventory risk in supply chain, push, pull and advance-purchase discount contracts can be utilized (Cachon, 2004, 222). In a push contract, the inventory risk is on the retailer, by forcing the retailer to preorder the inventory from the supplier who only offers a single price and only produces the required amount. In a pull contract on the other hand, the risk is assumed by the supplier, who offers both a single price and at-once orders, allowing the retailer to order when necessary. An advance-purchase discount contract combined both push and pull contracts. The supplier provides two prices, lower one for the preorder and higher price for the at-once orders. This way, the retailer is more enticed to prebook to benefit from the lower price, bearing some of the risk, and the supplier may produce excess inventory in preparation for at-once orders, bearing the risk on only those (Cachon, 2004, 223.)

3.2.2 Long-term, medium-term and short-term contracts

Supply chain parties have different relationships towards their suppliers, long-term or short-term partnerships (cf. Cohen & Agrawal, 1999, 784; Tang, 2006b, 455). In supply chain risk management, the choice between long-term contract and commitment or short-term contract is a

trade-off, that has been analysed throughout years and establishing long-term relationships have been seen as an important strategic choice (see, for example, Chen, Paulraj & Lado, 2004, 517; Cohen & Agrawal, 1999, 784; Talluri & Lee, 2010, 7303). In addition to long-term and short-term contracts, Talluri and Lee (2010, 7306) present a third option, a medium-term contract. It is as combination of long-term and short-term contract qualities, such as commitment and discounts while enabling flexibility. The three contract lengths each have different uses in supply chain risk management.

Short-term contracts are used, when the manufacturing firm isn't capable or willing to make investments or direct resources into improving the supply chain (Talluri & Lee, 2010, 7305). They offer flexibility to switch suppliers more easily and provide negotiation power for the company (Cohen & Agrawal, 1999, 784). Short-term contracts are therefore used, when operating in a highly volatile and changing market, where there are multiple viable suppliers.

Long-term contracts with small number of suppliers have their own advantages. Because of the commitment, all parties are invested in the relationship, it is easier and quicker to communicate, monitor and eliminate unnecessary spending. Due to this, long-term contracts help reducing prices and improving performance as a consequence of the parties' efforts. Additionally, long-term contracts enable the parties to decrease financial risks, by agreeing to a specific, fixed price (Cohen & Agrawal, 1999, 783–784.)

3.2.3 Force majeure clause

Force majeure is a contractual clause, which is used to limit or remove liability of a contract party (Firoozmand & Zamani, 2017, 395). In international environments, force majeure doesn't have a specific definition or scope. However, the United Nations Convention on Contracts for the International Sale of Goods (CISG) provides article 79, which is thought to cover force majeure events and other related situations (Wang & Shan, 2022, 141). Article 79 states that if a party fails to perform its obligations, it is not liable if it can be proven that the failure was due to an external and unforeseeable events (UN, 1980).

In addition, The International Chamber of Commerce has a force majeure and hardship clauses, which share similarities to the CISG article 79. It states that force majeure is an event or circumstance that prevents a party from performing its obligations as stated in the contract, if the party proves that the event is beyond reasonable control an unforeseeable, it is relieved from its contractual duty (ICC, 2020).

In supply chain risk management, force majeure clause can therefore be used to allocate risks in events such as natural disasters or pandemics. By applying force majeure to a supply contract, the party minimizes its own risks and possibility for litigation it courts. When worded correctly, force majeure can be used to benefit either the seller or the buyer, especially when operating cross-border.

3.2.4 Penalty and rebate clauses

When operating in multiple jurisdictions with varying regulations, penalties can be used to protect the supply chain and provide quality products. Lai et al. (2023, 1) present two types of penalty mechanisms, static penalty mechanism and dynamic penalty mechanism. While they argue that the dynamic penalty mechanism is superior to static penalty mechanism, are both mechanisms useful in risk management.

Both penalty mechanisms follow these four steps (Lai et al., 2023, 14): First, a disruption occurs to one manufacturer, leading to decreased supply. Second, the disruption affects the process of the other part or parts of supply chain, causing losses. Third, in order to mitigate the effect of the supply disruption, the affected party sings a contract with the manufacturer, where the affected party will charge a penalty from the manufacturer. Fourth, motivated by the penalty contract, the manufacturer will improve its factors and supply, therefore reducing the loss caused by the penalty. The core idea of a penalty contract is to protect and improve the supply chain. The amount of a static penalty is pre-determined, whereas the amount of a dynamic penalty is determined by moving factors, such as the function of time.

Service-level contract is a way to implement a penalty in order to incentivize the supplier to reach a target. In this thesis, the meaning of service level is defined as “the fraction of a manufacturer’s demand filled by the supplier in a given period” (Sieke, Seifert & Thonemann, 2012, 698.) Following this, in a service-level contract, the supplier agrees to a penalty payment if the previously agreed upon target service level is not reached. Similarly to penalty mechanisms, service-level contracts can be divided into a flat penalty contract, where the supplier payment is a fixed amount, and unit penalty contract, where the payment is charged based on the number of units that have been failed to deliver (Sieke et al., 2012, 701). Implementing a service-level contract ensures that the manufacturer maximizes its profits and the supplier achieves its expectations and strives to improve (Sieke et al., 2012, 711).

In order to maximize commitment from the retailer, Shafiq and Savino (2019, 512) developed a hybrid contract, which combined commitment penalty and risk-based revenue sharing. They found

that purely a penalty or revenue sharing weren't enough to motivate the retailer, due to the risk transferring. Their model offers higher revenue percentage in exchange for committing to expected demand, therefore avoiding over-purchasing. In addition, the retailer has flexibility in the shape of under-purchase penalty exemption, leading the contract to share the risk, rather than transferring (Shafiq & Savino, 2019, 524.)

Rebate clause or contract is used when attempting to protect the upstream supplier from risks in the supply chain (Y. Chen & Özer, 2019, 5619). In a rebate clause or contract, the retailer first pays the supplier a fixed fee for units ordered, and after the sales season, the supplier rewards retailers with rebate for items that were sold during the time period. This allows the retailer to sell at a lower price while ensuring that it makes a positive profit. As the supplier has sold the items before the sales season, the inventory risk transfers to the retailer, ultimately benefiting the supplier (Chen & Özer, 2019, 5624.) When executed with a proper target, a rebate clause or contract can protect the retailer in addition to the supplier, by creating coordination and common goals for both (Taylor, 2002, 1002).

3.3 Contract types and mechanisms in practice

As can be seen from the hybrid clauses and contract types, simply including one method of risk management into a contract isn't sufficient in truly protecting from complex issues and situations. The most useful risk management tools are a combination of risk sharing and transferring, depending on the location in the supply chain. Adding force majeure clause to any contract is suggested, because the clause is vital in protecting from external risks, whose frequency and probability has increased in the last years, due to heightened geopolitical environments and natural disasters caused by climate change. As sustainability and quality become more important for consumer perception, employing penalties for low-quality or unsustainable practices may protect company's brand image and reputation. Due to the lack of a concrete international law and law enforcement, adding these protective measures into a contract may save the company from disputes among supply chain partners.

4 Conclusions

This thesis has examined the ways contracts and contractual mechanisms can be used in order to minimize and manage risks in global supply chains. The main research question present in this thesis was “How are contracts used in international supply chain risk management?” In addition, this thesis aims to answer the sub questions, which relate to more specific parts of supply chain risk management. In order to answer the questions, this thesis defined and examined these risks. Then it explained how contracts in general can be used, after which it presented and examined concrete methods and contract types used in risk management.

First, this study identified how supply chain risks are categorized and why. The findings from chapter 2 show that existing literature has varying categorization that are dependent on the author’s research. This thesis chose to follow the classification by An et al. (2024, 525), as it provided clear and distinct categorization. Additionally, it was adapted from previous literature and improved upon.

Due to growing instability in financial and geopolitical environments, international supply chains face more disruptions than previously. The Covid-19 pandemic and increasing amounts of global conflicts (The Russia-Ukraine war, the US-Iran conflict) impact supply chains that rely on global transportation and the movement of goods. External factors increase uncertainty in supply chain survival and raise costs, due to shortages in gasoline and other resources needed. In addition to purely external events, disruptions from within the supply chain create risks and effects that hinder the supply chain ability to perform. The unpredictability and inaccuracy of demand forecasting increase the need for flexibility in supply chains alongside resilience. Understanding the possible risks and their effects is vital for supply chain risk management.

The findings in this thesis highlight the importance on contracts in risk management. It shows how different methods and contract types can be used to minimize risk or reallocate it entirely. In order to thrive in a fragmented and global supply chain, having a knowledge of already existing mechanisms is necessary. Contractual methods are often an inexpensive way to protect a partner or a party from litigation and further costs related to disputes in risk sharing and assuming.

In international supply chains, the need for concrete and harmonized rules is more pressing than ever. While international trade frameworks can be utilized, a one-size fits all view on contracts isn’t sustainable when facing complex supply chains and significant disruptions. The full effects to

international supply chain aren't truly realized yet and previous literature as well as future literature has many points of views into contracts and risk management.

This thesis contributes to existing literature by compiling previous studies from various sources into one and considering how juridical methods can be aligned into economic success. It provides firm categorisations to both supply chain risks and risk mitigation strategies. Compared to previous studies, this thesis confirmed many already known issues and risks in international supply chains. In addition, it combined the risks and strategies and showed that a combination of various risk management and mitigation methods is the most impactful and useful way to protect from risks in the supply chain. This study can be used both in a theoretical sense and practical sense to gain knowledge about supply chain risks and how to manage them. The managerial implications are similar, because while this thesis doesn't provide a framework suitable for every situation, it can be used to present the risks and tools of contractual supply chain risk management.

Due to this thesis being a literature review, it relies on existing academic literature. The findings and conclusions provided in this thesis are therefore formed around the existing literature, which may be focused on certain mechanisms or risks more than others. Risks present in a supply chain are complex and vast. In addition, new risk types are still emerging in literature. The risks and mechanisms discussed in this thesis were based on the existing literature and that they were truly contractual risk management methods.

Therefore, future research into supply chain risk management in general and via contractual mechanisms in necessary in order for supply chains to continue adapting and surviving. Adding sustainability view into risks is another possible research direction.

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Appendices

Appendix 1 Declaration the Use of Artificial Intelligence

Artificial intelligence has been used in this thesis in the ideation of topics for the thesis as well as to assist with grammar and vocabulary. The tools used, why they were used and how the information was confirmed are listed below. I understand that AI tools might have biases and offer incorrect information, so topics and proposition by AI have been verified using other existing literature not provided by AI.

1. Microsoft Copilot

Microsoft Copilot was used in the ideation process and editing throughout writing. During the ideation process, prompt used was “What are some possible points of view regarding international business, logistics and business law?” From this prompt I gathered ideas for the subject. Further ideation was done by me from existing literature that was not provided by Copilot.

I used Copilot during writing to improve the accessibility of the text. Questions were asked in the format of “What is a better way to say…?” and “What is a synonym for…?”. This information was verified using literature and vocabularies and was only used for rewriting individual phrases or words to clarify the meaning or make the text more suited for academic writing.

2. Scopus AI Query Builder

Scopus database’s AI query builder was used to search for literature. It was used in order to create more keywords that matched the original intention. For example, the prompt “Global supply chain risk management” was entered into the AI query builder, and the generated query was “"global supply chain" OR "supply chain" OR "supply chain management" OR "logistics" OR "value chain") AND (risk* OR "risk management" OR "risk assessment" OR "risk mitigation" OR "uncertainty" OR "vulnerability". Ai query builder therefore didn’t generate text or arguments but provided more in-depth key words that I then used critically to find relating literature. The literature found from this was verified using JUFO-portal and other sources.

3. DeepL

I used AI-powered translator to translate individual words or phrases from Finnis into English or to find synonyms for words. The suggestions were assessed critically and only the suitable and appropriate equivalents were used.