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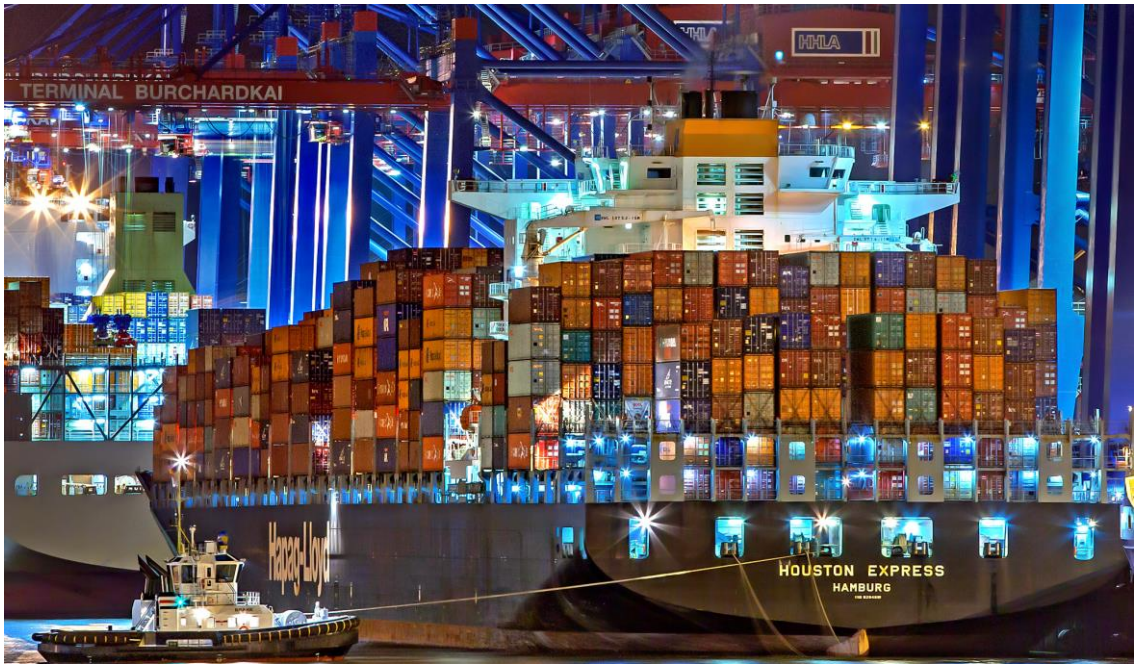

Impact of logistics trends on the Asia-Europe supply chains

A study of relocation of production and the current transportation market

Bachelor's thesis in International Logistics

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CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2022
www.chalmers.se

Report number E2022:101

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Göteborg, Sverige 2022

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Abstract

The future of transportation is standing on the brink of a revolution. The environmental question grows stronger by every day and the current state of reliability, high prices and venerability of the shipping market lays as foundation to the current debates of reshoring and alternative modes of transport. The purpose of this thesis is to improve the understanding of the effects that logistics trends have on production localization in China-Europe supply chains.

To evaluate and study this, interviews and a survey was conducted with persons of interests working in relevant market areas in relevant positions to give valuable information and data. This information and data were collected to find what the current trends, prerequisites, and disruptions are, and how they will affect companies moving goods from China to Europe or Sweden, both today and in the future. The study is aimed towards companies already having production and moving goods from China to Europe, these types of companies will be referred to as “target companies” throughout the report. The question that rises are then if it is possible to keep doing this while the situation is getting worse or if the companies should move their production somewhere they are not forced to rely on the long transports. Using the collected data from both interviews and a survey the results has been compiled and compared. To find out if the trends, prerequisites, and disruptions are common to both the interviewees and our target companies in the background. The result showed that it is not only the transport situation that is a factor regarding reshoring now, because the situation is not *that* bad. Right now, the trends with reliability of getting cargo on time is clearly the most concerning issue. Right now, it is clear that you have to take in account not only transport perils but also disruptions like war, canal blockages and global lockdowns.

Keywords: Reshoring, transport, supply chain, shipping, production, schedule reliability, logistics trends

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Preface

During the spring semester 2022, the following degree project was carried out. The course comprises 15 higher education credits and is the final step towards a degree from the International Logistics program at Chalmers University of Technology, the program corresponds to 180 higher education credits.

We would like to take this opportunity to thank everyone who participated in the interviews and responded to surveys, this was the basis so that this degree project could be carried out in the best way.
We would also like to thank our supervisor Patrik Fager who has helped us during the work and provided valuable input and feedback.

List of Abbreviations

3PL – Third-party logistics
BRI – Belt and Road initiative
FEU – Forty-foot equivalent unit
GVC – Global value chain
HFO – Heavy Fuel Oil
IMO – International Maritime Organization
IRU – International Road Transport Union
KPI – Key Performance Indicator
LCL – Less than container load
LNG – Liquid Natural Gas
TEU – Twenty-foot equivalent unit
VC – Value chain

1. Introduction

The introduction presents the reports background, purpose, research questions and scope, and why the subject of logistics trends is interesting for the global trade right now.

1.1 Background

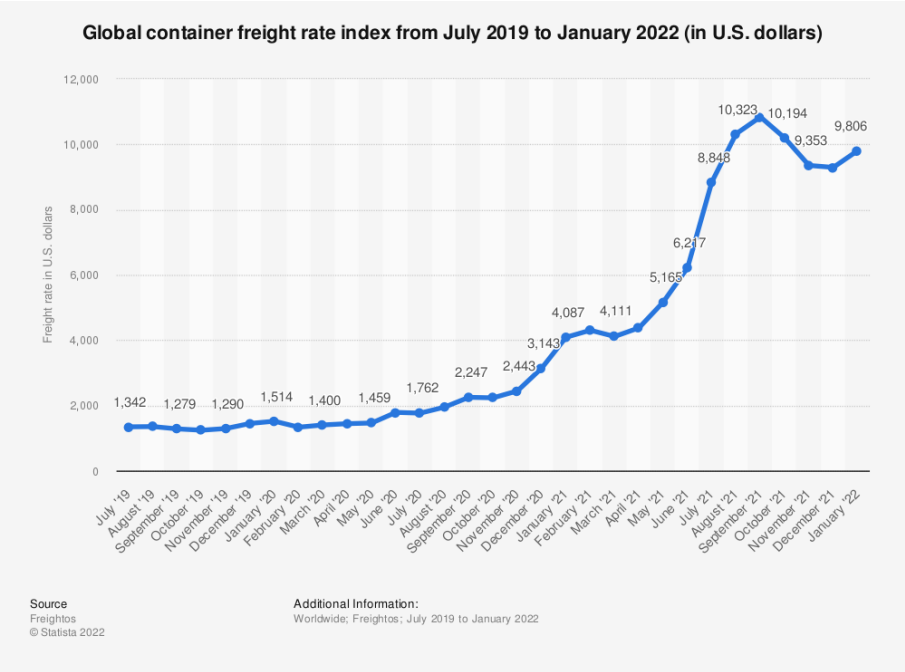
The past years have presented us with new challenges associated to supply chain management like decreased schedule reliance, high prices and container imbalances (Ivanov, 2020). The global supply chain shortages due to the covid-19 pandemic, Suez blockage and geopolitical trade war between different major countries are examples of challenges that not many companies were prepared to handle (Ivanov, 2020). But these challenges have also revealed a willingness from the shippers and companies who use transport from China to Europe to better understand and prepare for the future according to the major shipping line A.P. Møller-Mærsk A/S (2021).

Production outside your own country's border is common, and especially to move production to Asia. Even if the company is present in many different markets around the world, the production is usually moved to Asia and China to lower the production costs. Thus, it is important to study this logistic sector for the future. The transport between the continents has been cheap and easy in the past, but with increasing disturbance and imbalances with containers and vessels, it is not that easy and cheap anymore (Hoffman, 2021). The logistics sector that this report will revolve around is therefore the one called The 21st Century Maritime Silk Road which is the nautical route of the Belt and Road initiative (Belt and Road, 2013). The Belt and Road initiative (BRI) is aiming to provide efficient sea routes from Asia to Europe but also African countries (Belt and Road, 2013) hence it will be a natural part of the logistic sector this report will study.

Over the last couple of years demand and prices for transport from Asia to Europe have skyrocketed (Statista, 2022) which can be seen in figure 1, and flexibility and service levels plummeted (Statista, 2021), this creates a need for reflection and analysis about the future. The elephant in the room, Covid-19, is one of the steppingstones that makes this question more relevant than before. The supply chain is on most peoples' lips nowadays due to its impact on global trade and the economy. The major disruptions covid-19 caused alongside the blockage of Suez initiated huge consequences (Panwar et al., 2022). As a producing company, with production in e.g., China, the disturbances, imbalances, and price increases could have a huge impact on the business. Goods could arrive months later and companies that based their production on just-in-time got heavily impacted. The thought of relocating the production could come to mind reducing the risk, cost, and increase resilience. The choice the target companies face is whether to keep the production and supply chain as they are or relocate the production to avoid the disruptions.

As represented in figure 1, all the rates in every container market have increased during the last two years. This comes from a time with stable rates and the only other big impacts in near time has been the economic crisis of 2007/2008 and times when oil prices have increased to higher levels. Although, not as continuous as we can see now. Among the increased rates other issues has arisen and to support future decisions, the price of transport cannot be the only factor to consider. The schedule reliance and environmental impact should be considered to reach customer needs and reduce emissions.

Figure 1. Global container freight rate index from July 2019 to January 2022 in U.S. dollars (Statista, 2022).



Note: Data from global freight carriers showing the rate for a 40-foot container in any lane

1.2 Purpose

The purpose of this thesis is to improve the understanding of the effects that logistics trends have on production localization in China-Europe supply chains. In this study, theories, prerequisites, and trends within the transport logistics along the 21st-century maritime silk road will be analyzed to help companies to understand what the future of supply chain management and production localization may look like. It will also provide support for the decision-making process in these companies regarding their supply chain and explore the effects of the current market situation and prognoses in the future.
The study can be a guideline for further evaluation in the process of relocating production.

1.3 The scope of the report

The scope that this report will handle in the logistics area will need to be delimited. It will focus on the logistical area of transports of goods along the 21st Century Maritime Silk Road, but since this is a large area with many different provinces and countries that all have different types of character, the report's research will not be limited to a specific case, but the focus will mainly be on port of Shanghai and the port of Hamburg and their nearby counterparts. On this route, most of the goods between Asia and Europe are being transported every year, and it is therefore representative of the other routes as well.

1.3.1 Target companies

The target companies of this study are defined as a producing company that uses transport from China to Europe frequently with a thought of relocating their production to Europe. The target companies are mainly using containers as carrier unit when transporting both finished products and

spare parts on sea. This study can support future decisions in the supply chain and to help them develop and widen their knowledge in the area of both flexible, economical, and sustainable supply chains.

1.4 Specified question statement

To support the purpose of the study, there are research questions that need to be answered. The current state of important prerequisites is important to answer first before we can know how they affect the target companies. If there is research telling us the future is in China for producing companies, we can help the target companies to understand why and what effects it will have on them. It could be the other way around that the trends are showing that companies are moving to Europe and are relocating their production due to different reasons. logistics trends are in the scope of this study viewed as any prerequisites or disruptions that have a substantial impact on the performance of China-Europe shipping supply chains.

Important logistics trends could be identified to gain general knowledge about the market outlooks, if there are any transformations ongoing, like replacing vessel transport with train transport. It could also show where in the market cycle we are and if the key performance indicators (KPIs) are on a cyclic dip or if the situation has changed regarding prices and schedule reliance.

1. *What is the current state of important logistics trends in the planning environment regarding the global supply chain of goods from China to Europe?*

The next step is to analyze the results from research question 1 (RQ1), how these logistics trends could affect companies that are considering or are in an early stage of moving production from China to Europe. This will be handled in RQ2.

2. *How do these logistics trends identified in RQ1, affect the target companies moving goods from China to Europe?*

Once the two RQs have been answered, a foundation has been set to understand how these logistics trends on the global supply chain affect the target companies. This data could then in turn lead to recommendations possible to use in future decision-making and to be able to determine whether the current transport situation could lead to reshoring.

2. Theory

In this chapter all the statistical data and theory that is related to the research questions and relevant to the understanding of the report will be presented. The theory brought up in this chapter was selected with respect to the research questions, meaning that only theory that was deemed relevant for finding answers to the research questions will be discussed. Therefore, current, and future logistics trends will be mentioned within the theory part and further results presented in the result part.

2.1, an overview of the main aspects involved in decision of where to locate production is presented. In 2.2, the key features of global trade are discussed, including the organization of global value chains and new technology and environment. In 2.3 includes how the physical transports are organized and together with 2.4 presents all costs related to the transportations of products. 2.5 further introduces the logistical trends in more detail and brings up topics like Covid-19, Suez Canal blockage and war.

2.1 Location of production

The decision to produce in a low-cost country has often been driven by low labor costs where China is the most used destination for Swedish companies. Other countries nearby Sweden are also used for production but not to the same extent as China (Lennartsson & Lindholm, 2006), examples could be Poland or the Baltic states. The definition of a low-cost country is not defined but an often-used measure is wages (Ketokivi et al., 2017) where there is a clear difference in wages if we compare Sweden or Switzerland's high wages to China or Indonesia's low wages. A common sight is that the company's headquarter is located in the "high-cost" country while their production is located somewhere else. There are also other factors than low labor costs that are driving to locate the production in these countries, according to S. Burciu (Burciu et al., 2016) like the availability of raw materials and a working infrastructure regarding transport and logistics.

2.1.1 Outsourcing

Outsourcing is a commonly used phenomenon among companies today. It means that the company moves parts of its operation to another company instead, examples of operations that are common to outsource are, production, logistics, administration, and IT. For example, when outsourcing the logistic operations of a company it gets moved to something that is called a third-party logistics firm or 3PL for short.
Twin (2021) describes that companies often use outsourcing to cut down on costs in several parts of the value chain. For example, if a company would outsource storage, they will not only save money on the storage facilities but also costs that are indirect costs associated to it. Like personnel costs for warehouse workers and customer service, equipment, and technology to only mention a few.
Another driving factor, apart from the cost-effective one, for a company to outsource different parts of the value chain is to be able to focus more on core aspects of the company. But Twin (2021) also mentions some cons with outsourcing, for example lack of communication between the parties may result in delays and eventually unnecessary cost. He continues to describe there can also be a risk of security threats when sharing sensitive information with a third party.

2.1.2 Reshoring

Reshoring is described in the study by the European Parliament (2021) to be the process of moving production of something back "home". As previously mentioned in the background, home could be where the headquarters or customers are located. The meaning of reshoring is a question of *where* and not by *who* a product is manufactured by, and it is not comparable to insourcing and outsourcing as outsourcing could be done to a local supplier. In a study performed by Alessandra Vecchi (2018) three main drivers was recognized as follows: (1) shorten supply chain, (2) reduction of shipping costs, (3) come closer to customers. These are not solely the reasons but the *main* reasons. All reasons to reshore are listed below and the three main drivers are included.
The other reasons of reshoring can further be categorized into seven aspects as follows (Stentoft et al., 2016):

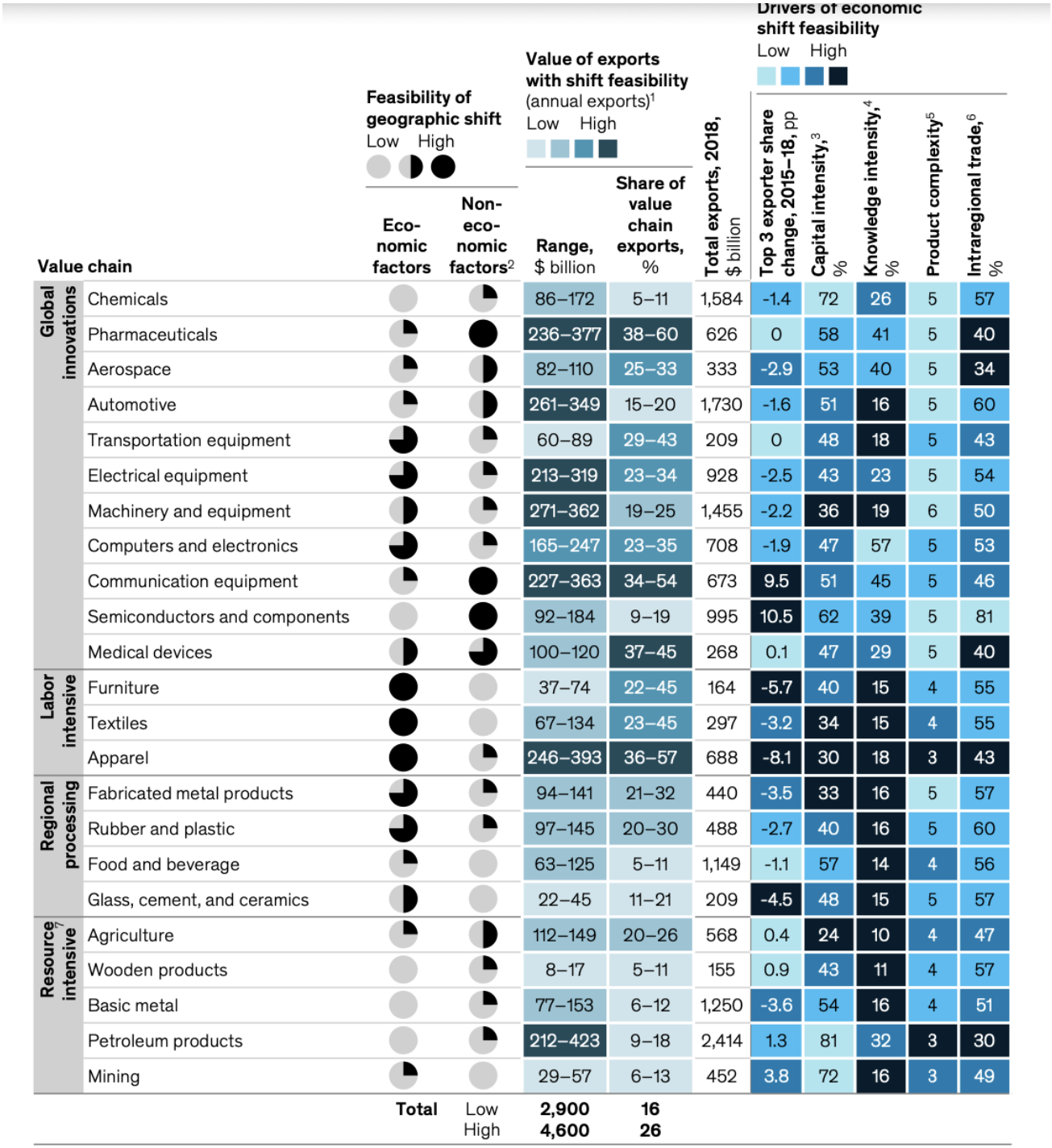
- Cost
- Quality
- Time and flexibility
- Access to skill and knowledge
- Risks
- Market

- Other factors*

*Other factors could be incentives from governments, initial misjudgment of moving production, R&D.

Issues mentioned in the cost aspect includes increased labor costs and increased logistic costs. In logistic costs as per Stentoft et al. (2016) late deliveries are included. In the quality aspect Stentoft et al. (2016) recognized the actual quality of the product was inadequate. Time and flexibility issues is exemplified as increased lead-time, demand fluctuations, supply-chain resilience. The other aspects are important but not to the extent to be further described in this study. As an opposite to reshoring, there is also offshoring. Offshoring is described and driven by the same factors, except shorten supply chains, as reshoring but reversed according to Stentoft et al (2016).

Figure 2. The potential for value chains to shift across borders over the next five years depends on economic and non-economic factors (Lund et al., 2020)



1. Low-end sizing = global imports from outside importing country's region average of economic and noneconomic feasibility. High-end sizing = global imports from outside importing country's region maximum of economic and noneconomic feasibility. 2. Noneconomic factors take into account goods deemed essential or targeted for national security or economic competitiveness considerations, based on proposed and enacted government policies and definitions of essential goods. 3. Amount of capital compensation as a share of gross output. 4. Defined as share of labor with a tertiary education. 5. Product Complexity Index measures the relative substitutability of production across sites of products in value chain. 6. Percent of total trade that takes place within same region as its importer. 7. Dependent on access to resources that are geographically determined.

Source: Federal Reserve Bank of St. Louis; Observatory of Economic Complexity; UN Comtrade; US Bureau of Economic Analysis; US Bureau of Labor Statistics; World Input-Output Database; McKinsey Global Institute analysis

To broaden the perspective and include different market segments in the result and discussion regarding reshoring, figure 2 is included. The report by the McKinsey Global Institute (2020) has examined twenty-three different industries and their potential to be moved across borders to come closer to their main markets (reshoring). These twenty-three industries have then been divided in to

four different categories of value chains, global innovations, labor-intensive chains, regional processing, and resource intensive chains. The figure does not examine if it is feasible to move production from Asia to Europe or Sweden, but to move the production closer to their main markets. For example, pharmaceuticals have a great possibility to move the production facilities to where it is needed for simpler distribution, but it is not as feasible in an economical perspective. As seen the most feasible goods to be moved considering economic factors is labor intensive products. This is because of the risen labor costs in the dominating countries for producing labor intensive products and it has already begun, we can today see more and more clothes, shoes and furniture produced in Sweden and Europe (Lund et al., 2020). When studying the above table further, one can perceive that the value chains in the global innovations category is the most suitable category for reshoring back to the EU considering non-economic factors.

2.2 Global trade

To put the global trade in perspective, in 1980 approximately 18% of the worlds' exports originated from East Asia and particularly China, to have increased up to 66% in 2018 (UN comtrade, 2017). This shows that China and surrounding areas plays a significant role in the global trade market even if the extreme growth was halted by the economic crisis of 2007/2008 (UN comtrade, 2017). The effects of 2007/2008 crisis did not recover to its former levels of growth in exports, but the development and economic growth of the countries could continue (UN comtrade, 2017) and stabilized the exports. A factor that made the growth of global trade possible was the possibility of digital communication. Traders did not need to travel abroad to formulate contracts with foreign suppliers and the communication chain started to become more efficient (UN comtrade, 2017).

2.2.1 Global value chains (GVCs)

GVCs or International production sharing is a phenomenon that has expanded exponentially in the last four decades. It refers to when the production of a product is split up into different segments/components that then are carried out and or produced in various locations in different countries.

2.2.2 New technology and environment

New technology in the transport industry has not developed as quickly as production and manufacturing technology until the early 2000s (Wangsa et al., 2022). New technology in the transport and logistics market is often referring to improved and more efficient engines, new fuels, or automated driving (Wangsa et al., 2022). The means of transport used when transporting along the BRI have been using, and still using dirty fuels with a high level of carbon emissions. The first initiative from a governing body to reduce air emissions from vessels came from the international maritime organization (IMO). IMO introduced a regulation called "IMO 2020" which limits the Sulphur levels in a vessel's fuel to a maximum of 0,5% (International Maritime Organization, 2020). Because of this, some shipping lines started to implement the use of liquified natural gas (LNG) to reduce the Sulphur levels and carbon emissions. The carbon emissions reduce with approximately 25% when using LNG compared to heavy fuel oil (HFO) which is the standard fuel used today (International Maritime Organization, 2020). Further improvement to a cleaner shipping industry could be inducement to use wind or electric powered vessels. But to notice, the technology is not available yet.
At the same time, the efficiency of trucks will likely continue with more efficient engines, less weight, and cleaner fuels. From biofuels to electric propulsion.

2.3 Transport of products

Transporting products from China to Europe is usually done by train, vessel, or air and traditionally the goods are delivered to a port, terminal, or airport via truck. The differences in the modes of transport are transit time, Co2 emissions, capacity, and price. Usually, goods are transported in containers on sea and train but in smaller units for air shipments. Other forms of shipments could be break bulk, which means the cargo is not in a cargo holder but placed freely on a vessel in forms of pallets, bags, drums and similar.

Table 1.

Mode of transport (Shanghai →Hamburg)	**Transit Time (Days)**
Air	3-8
Train	16-18
Sea	32-35

Note. Transit time is from adequate place of loading. For example, Port or Airport. Without any delay or congestion in account. Adapted from www.dsv.com/en/our-solutions/modes-of-transport

2.3.1 Sea freight

The transportation of containers at sea is done by large vessels that can carry up to 24.000 twenty-foot equivalent units (TEU). There are also forty-foot equivalent units (FEU). One FEU is equal to two TEU. The large capacity of container vessels makes it a cheap option to transport large quantities. If a shipper has smaller quantities that is less than a container (LCL) there are options to use this service offered by 3pl.
From Shanghai to Hamburg there are several checkpoints to be passed along the way, one of the more major ones are the Suez Canal. According to Ann LaRocco, (2022) the Suez Canal Authority (SCA) made roughly 625 000 dollars from every one-way transit a large containership makes. This price has now been announced by the SCA to be increased by 6% biggening this February 2022, this means that the former price of 625 000 dollars per transit now has risen to 675 000 dollars. The reason to pass this way is to reduce the transit time of making the round trip around Africa, the reduction in length by passing though the Suez Canal and paying the charges will reduce the overall cost more than going around.

2.3.2 Air freight

Airfreight is done by both passenger airlines and pure cargo airlines. The capacity of an aircraft is significantly less than both train and vessel, but it is much faster. Cargo for air freight is usually loaded into fixed cargo holders that fits the inside of the aircraft but could also be palletized, bagged or similar. Some carriers can carry project or non-standardized cargo as well.

2.3.3 Train freight

Trains are in most cases pure cargo trains. The trains can carry both TEUs and FEUs and bulk or break-bulk. The capacity of a train is significantly lower than vessel, but it can carry a lot more than aircrafts. It makes it a good alternative to air transport to both lower emissions and costs, but it’s a less flexible product as the rails are fixed to certain destinations and routes.

The use of train freight has not been growing as quick as the other modes of transport. In the last years it has become a rising alternative to both sea and air freight due to its relative quick transit time and less impact on the environment.

2.4 Transportation costs

The cost for a transport customer can be divided into different areas. There are two main areas, namely capital costs, and the cost to buy the actual transport.

2.4.1 Capital cost and tied up capital

A Companies' assets could be divided into fixed assets and current assets. The flow of products from supplier or production facility will tie capital. When capital is invested in a product or asset, the cash flow will be negatively affected. The capital spent on a product or asset could be invested in another way to earn money. A simple way to illustrate the tied capital on a transport between Shanghai and Hamburg is shown below in two examples (Jonsson & Mattsson, 2016).

- 1000 units is shipped from Shanghai to Hamburg every 35th day all around the year. It will take approximately 33 days and the value of each unit is 10 000 SEK.

Average stock = $\frac{33\times1000+2\times0}{35} \approx 943$ units

Average tied up capital = $943 \times 10000 = 9\ 430\ 000\ SEK$

- 1000 units is shipped from Mora in Sweden to Hamburg every 35th day all around the year. It will take approximately 4 days and the value of each unit is 10 000 SEK.

Average stock = $\frac{4\times1000+31\times0}{35} \approx 114$ units

Average tied up capital = $114 \times 10000 = 1\ 143\ 000\ SEK$

As we can see, by just moving the start of transport from Shanghai to Mora and shorten the transit time from 33 days to 4 days will reduce the tied capital during transport by 8 287 000 SEK. The same example could be used as to change from sea transport to air transport where the transit time decreases significantly. Although as described below, the cost to buy the transport would be different.

2.4.2 Actual transport cost

Traditionally a company with need of transports would either go directly to a carrier e.g., shipping line or they could use a 3PL (outsource) who manage their actual purchase of transports. In both cases the procurement is divided into lanes, where the purchaser (shipper) tells the carrier or 3PL what lanes they are interested in and the expected volumes. This could for example be Shanghai → Hamburg 30 units / week, Singapore → Gothenburg 20 units /week and so forth. The transport buyer can then decide what carrier or 3PL company they will use for each line. The transport buyer can set up minimum requirements regarding transit times, prices, length of contract and reliability and even more. More lately it has become more popular from the carriers' side to provide customers with packages to ensure cargo for both west and eastbound trade for themselves. As an example, if the shipping company sells transport service from Shanghai to Hamburg, and the shipper also needs

transport from Hamburg to Stockholm, they would provide a package of both transport services because the carrier has other cargo in Stockholm that needs to be transported back to Asia. This could also lower the transportation costs for the buyer in long term since the repositioning of empty units would decrease (Novack et al., 2019). As demonstrated in figure 1, the rates have increased and resulting the actual cost of transportation will increase. The figure represents the rates of any lane and can therefore represent the market this report is investigating. It is hard to know the exact rates for each mode and route, as one must be a customer to get access to instant quotes. The rates could also be covered by agreements or contracts for each customer. But as a general note, sea transport is the cheapest option, train transport medium and air transport are the most expensive mode of transport.

2.5 Logistics trends in supply chain

There were two major events that initially started the disturbance of global supply chains. Firstly Covid-19 pandemic and secondly the blockage of Suez Canal. Covid-19 was declared as a global pandemic 11 March 2020 by World Health Organization. The level of globalization at this time led to global effects and everyone was affected (Negrutiu, 2021). With major shutdowns and lockdowns around the world, both production facilities, ports, ships, and other important infrastructure were affected. Delays and shutdowns made the global supply chains unreliable and big bottlenecks occurred. Some argue that the big problem was not the disruptions and bottlenecks, but the increased demand of products combined with limited production capacity due to sickness and lockdowns (Panwar et al., 2022).

The other major event that occurred just a few weeks after the Covid-19 outbreak is the container ship “Ever Given” was stuck and blocked the passage of the Suez Canal. It was a complete stop, and no vessel could pass through. This led to about 300 vessels was stuck waiting to proceed their journey (Lee & Wong, 2021) within the trade between Asia and Europe. Since all vessels were stuck, their arrival to the destination was accumulated. Everyone wanted to load and unload at the same time after the blockage was cleared. Furthermore, this led to a shortage of containers at the right place at the right time (Lee & Wong, 2021). As we can see in Figure 1 the prices of container shipments were stable from July 2019 until May 2020 and an effect of these events caused the rapid increase.

These events led to major disruptions in the global supply chain network due to a shortage of labor when employees got infected by covid-19 or elongated health checks to minimize infection of others. Long queues to pick up or collect containers were inevitable. The consequence of this was container shortages around the world (Permal & Mahmoud, 2021).

According to Lund et al (2020) who is partners of McKinsey Global Institute (MGI) companies with both global and national trade should be prepared to a “shocking” event every 3,7 year. The event could be cyberattack, terrorism, pandemic or stakeholders’ bankruptcy. This event usually lasts for 1-2 months and will heavily affect their earnings. Furthermore, Lund et al (2020) mentions that companies must be prepared to act quickly with thought of safety stock of key products or components to minimize loss of revenue and sales.

2.5.2 Geopolitics

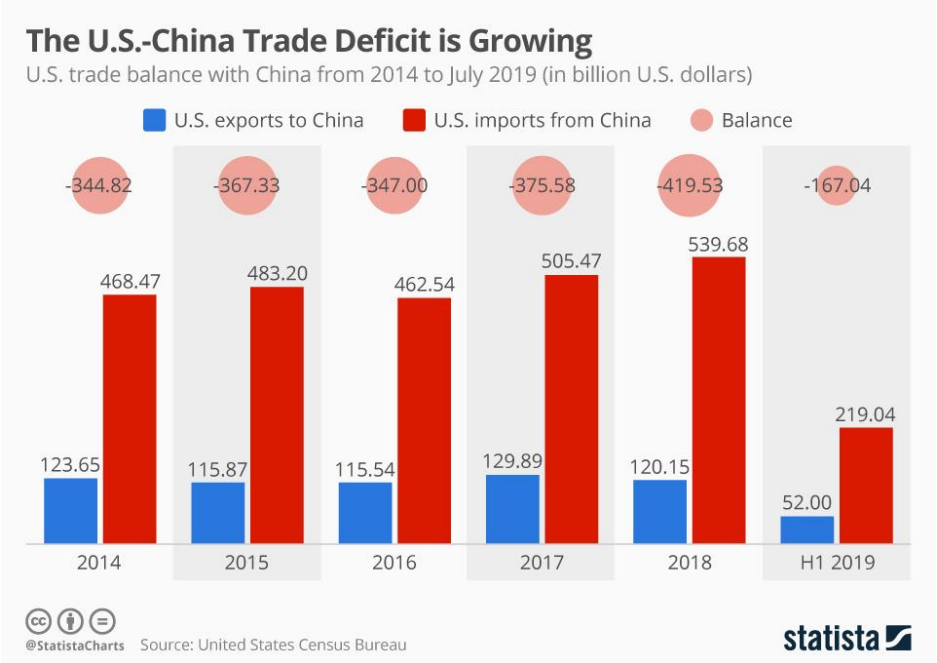
Geopolitics according to Deudney (2019), is the study of the influence and power a country has in international relationships based on their geographical position/location. This term has been used throughout history and is often used to describe the relationship between two or more countries, but it can also be used on different states and provinces within a country.

Geopolitics focuses on the political power one has solely based on the geographic position and the attributes that comes with that position like water territories, natural rescores, climate and land size. Earlier geopolitics has mainly been linked to military dominance over a territory.

2.5.3 Trade war

(Chen, 2019) describes that a trade war is something that can be the result of a conflict between countries where one retaliates against the other by limiting its ability to carry out its trade by for example raising import tariffs or placing other sanctions, charges and/or restrictions on the other countries imports.
Furthermore, Chen (2019) describes that trade war is often a side effect protectionism. Protectionism is a term that describes the will to minimize imports of goods from other countries to promote and help the domestic market to grow instead.
The term trade war has of course been something that has been used throughout history from the opium war between China and the British empire to most recently when Donald Trump, the former president of The United States of America, enforced such actions against among others China. This action was based on the fact that during his running for president in 2016 he promised to bring back jobs of manufacturing that they now relied on other countries to produce.
These actions caused China to retaliate with increased taxes. This went back and forth for a couple of years before on the 15th of January 2020 the countries agreed to a trade deal (Chen, 2019) describes.
Instability in the politics within a region or country but also along the supply chain are exposure to risk and increased costs. It could also lead to late deliveries, more administration or even non deliveries (Vecchi, 2018).

Figure 2. The U.S – China Trade War outcome (Buchholz, 2019).



Note: It is depicted how both import and export between the two countries decreased considerably during 2019 compared to the five years before.

2.5.4 Geopolitical trade war

If Geopolitics and Trade war is combined a phenomenon that has been growing the last couple of years called Geopolitical trade war emerges. The new trend with geopolitics compared to before when it mainly revolved around military power over certain important locations has now been shifted to more of a concept of trade war. Instead of expressing power in military dominance, the power is shown in for example, raised tariffs and economic sanctions (Chen, 2019). The issues with geopolitical trade war appear more clearly today than ever due to the Russian invasion of Ukraine, and the sanctions that followed. Many transport providers terminated their services through and with Russia, causing more disturbances and difficulties for companies with GVC's in the logistics area and their core business.

2.5.5 War

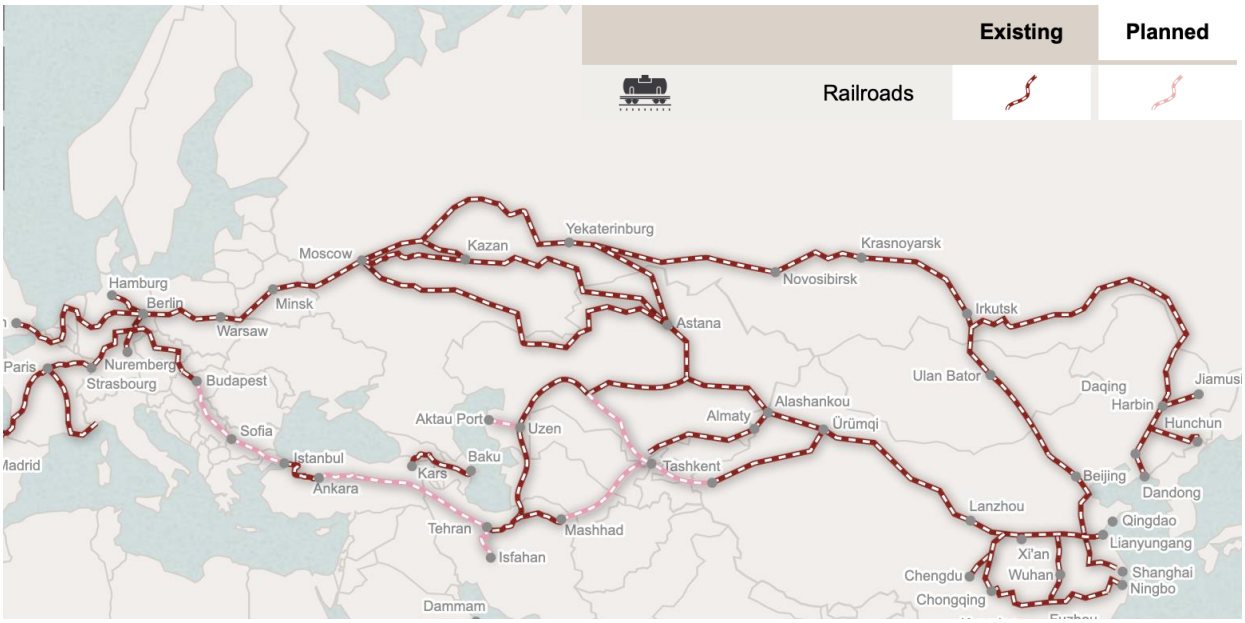
War is something that hasn't really been a present thing in the west for several decades but at the time of writing with the Russian invasion of Ukraine, it has once again become something that has to be taken in consideration when discussing global supply chains and everything surrounding that subject. This ongoing invasion is on a global scale worsening the shipping, truck, rail, and air freight market. The European parliament states has summarized in a short text what kind of implications and difficulties this invasion has and will have on the European transports. Pape, (2022) describes how aviation, rail, road, and maritime sectors has been heavily influenced by the conflict.

2.5.6 Impact of war on different modes of transport

All Russian airplanes, including private jets, has been banned from European air space. This means that routes over these countries can no longer be used, and alternative routes must be considered. Pape (2022) emphasizes that this poses problems for airline carriers in cargo and in passenger transport businesses, the jet fuel prices has gone up and the alternative routes gets longer means that it is not viable for many companies to take either cargo or passengers along these routes for now. Rates for cargo transported by airplane has increased by 120% compared to before the invasion by 7th of march (Pape, 2022).

Pape, (2022) continues to describe how the rail service for cargo transportation also has taken a hard hit as the only way with train from China to Europe goes through Russia. This has caused a lot of forwarders to take an alternative route south to Istanbul where the cargo then gets cross-docked from train and loaded on vessels to be taken the final way to Europe. The following is a map from MERICS (Mercator Institute for China Studies) shows the current network of railway within the Belt and Road initiative from Asia to Europe. The white and red part symbolizes stretches of railway that has been constructed and are currently in use and the pink and white parts are routs that are planned to be built.

Figure 3. Mercator Institute for China Studies (2018).



Mapping the Belt and Road initiative.

Pape, (2022) also describes a troublesome impact on the shipping market as 14,5% of the global shipping workforce is made up of Ukrainians and Russians. The workforce in the freight market has already in recent years taken a big hit from covid-19 and especially when it comes to sailors on board the cargo ships. Pape, (2022) continues to describe how European ship owners express their worries how delayed salaries, closed ports in Ukraine and severe crew shortages can disrupt the already instable supply chains even further. Bartlett, (2022) describes how the bunker price, which is the most used type of fuel, rose by 8% after the Russian troops entered Ukraine and several other types of fuels prices also spiked. Fuel price is a vital part in the shipping market to calculate if a journey is worth taking or not, this global spike of fuel prices in other words has a high impact on the shipping market and its operations (Pape, 2022).

According to the international road transport union (IRU) the war in Ukraine initially caused a lot of problems for around 12000 truck drivers that was stationed there at the time of the invasion.
The invasion, high price of fuel and the pandemic restrictions is said to be likely contributors to further increase the rates of road transport says Pape, (2022).

3. Method

The method chapter describes the methods of data collection, workflow, and method reflection.

Subchapter 3.1 presents an overview of the research process that has been used, explaining all the activities that have been performed during the project. 3.2 describes how the research has been designed and the setup of the interviews and the survey. In subchapter 3.3 the use of literature is described and how it has been chosen based on the relevance, reliability, and credibility. Subchapter 3.4 describes the qualitative and quantitative methods of data collection and presents the interviewees. To further support the data collection, the research quality and ethics are described in subchapter 3.5, this is used in order to find out if the information gathered is useful or not.

3.1 Research process

The initial direction of this thesis was to conduct the research in partnership with a major car manufacturer in Gothenburg. They had questions about reshoring and the current logistics trends, based on the instability that had been seen on the transport market the last couple of years.
Our proposal was to in cooperation with them, investigate these if reshoring was in question for them and trends regarding transportation from Asia to Europe more deeply. The results could lead to an action plan that they later could use as a guide for future decision making.
After some time with designing the study, develop relevant research questions, and how the result should be presented, it turned out that they chose another way. The reason for the decline of our design was that the other research groups had been preparing their studies for a longer time i.e., was further in the research process. We were told that another department was willing to take part in our study, but after several attempts to initiate the study, we could never get in touch with them.

The study was still relevant and although there was no specific case to work on, we thought it could still be possible to conduct. Some changes of the design were done and instead of working towards a case the idea of target companies was developed.

To begin this thesis, the basic problem with the current transport situation needed to be identified, then the process of gathering information could be initiated. Further on, the structure of the research questions commenced, and the first focus was to set up three different research questions. The research questions could help us answer questions about the current situation, future situation and how the future situation will affect the subjects of the thesis. After a review of current literature and previous research, we could determine how the thesis would proceed. The decision to do a literature review, interviews and a survey was based on the missing parts in the literature reviewed initially. The interviews were constructed to help us answer the questions about today and the future. The candidates used in the study are further described below but the thought of interviewing persons with deep knowledge and using open interviews was considered a suitable approach. The survey would then serve as a continuation of the results from the interviews and to find out how the future situation will affect our targets. When reviewing our initial three research questions it was found that if we answer research questions one and two, it would be possible to reach a conclusion based on the collected data and we could remove the third one that was initially included. Further on the survey was compiled to verify how the initial findings could affect the future of the target companies. Although it was difficult to get responses to the survey, it was enough to draw a conclusion.
The data would then be analyzed and viewed from different perspectives to help us understand the issues and to what degree the issues are expanded. While both the interview and survey were compiled, the theory part and method description were written in the report. A structure to report the result was figured out, where the identified findings was presented together with comments from the interviewees. The reason to structure it in this way was mainly to enable the reader to quickly find the relevant discoveries and then gain more knowledge in the other parts of the result.

3.2 Research design

The research design has mainly been divided into three parts, literature study, collection of primary and secondary data through interviews and survey then analysis of interviews and finally discussion.

To be able to answer the research questions, both primary and secondary data will be used. (Wagh, 2020) describes that primary data is data that the researchers have collected themselves through various methods such as interviews, surveys, and experiments. These, in turn, are specifically

designed to best answer research questions. As described before, to answer the RQs both interviews and surveys will be conducted.
The second type of data that will be used is secondary data. This type of data is described by (Wagh, 2020) as data already generated by another party. This can, for example, be compiled by government Institutions and research facilities.
In this case both primary and secondary data will be important as the interviews, surveys and literature study will play a significant role in the result.

The first research question is about identifying important trends, prerequisites, and disruptions in the planning environment regarding the global supply chain of goods from China to Europe. The method used to answer the question and to give the most significant result was the literature study combined with interviews. To support and develop the literature, several interviews with key figures within the relevant markets was conducted.

To then evaluate how the trends affect the target companies, the results from interviews conducted for research question one was compiled into a survey. The survey included a selection of questions revolving around the most relevant and frequent answers and subjects from the interviews. There was also further literature supporting the answers, especially the ones revolving around statistics and/or market outlooks.

To summarize the identified trends, the answers and data collected and found in RQ1 and RQ2 will be presented and mapped out to give support for future decision making for companies thinking of this kind of operational change. The goal is to be able to provide qualified assumptions about what a company would be faced with if such a shift in operational activities were to be implemented.

3.3 Review of literature study

Since the internet has become an important source of information it is important to be careful with the collection of data (Okoli, 2015) and the sources must be reviewed properly. The use of databases and their search functions must be used correctly to find proper literature and material.

To get a deeper understanding of the subject and to be able to answer the RQs properly, we will use search terms and review the sources, check the credibility, and if it has been peer-reviewed by legitimate reviewers. This will help us answer the questions in the most correct and valuable way for the study.

Why the method of literature review is chosen is because it will summarize a lot of facts for others, this is a common method used in universities to save others time when doing research (Okoli, 2015). The interviews will give us further understanding and real-world examples, to both be supported by and compared with the literature.

3.3.1 Selection criteria for sources included in the literature review

The selection of sources will be based on several requirements.

- Research books/method books
- Subjects covered
- Peer-reviewed journals

In addition, sources found by database searches will only be used if there is a credible author as mentioned above, and relevant criteria, including, when it is written, what the method and purpose of

the study are. As important to show what sources will be used in a literature study, the part of excluding is meaningful (Okoli, 2015) and will show how the focus can be changed during the process. Examples could be if the source states information about phenomena outside our scope.

Search terms

- Future of supply chain
- Trends supply chain
- Reshoring
- Production localization
- China Europe Transport
- Drivers supply chain
- Future transport
- Supply chain statistics China
- Supply chain statistics Europe

3.4 Data collection

Qualitative research is described as data that is gathered in real time during the collection method (NE Nationalencyklopedin, 2022). There are several different types of qualitative research methods, this report will include interviews and literature review to help answer the research questions. The interviews will be open and unstructured, this form of interviewing is described by Maria List as forms of interview where the interviewees are encouraged and supposed to speak more freely (Slotte, 2017). In that an open interview does not contain any directly leading question that can otherwise influent the interviewees answers, this style of interviewing has been chosen. It gives the interviewee more freedom in their answers and thereby are more likely to result in more relative information and truthful data. A more thorough description can be found in point 3.5.3 Ethics. In parallel, the literature review will be used to be able to compare the written sources with what the interview candidates say.

Quantitative research is described by the Nationalencyklopedin (NE Nationalencyklopedin, 2021) as data that are collected from various types of methods like observations, surveys, and experiments where the results are then presented in numerical form. For example, could a calculation of the cost of transporting a container of goods from Shanghai, China to Sweden compared with the same container from for example Germany to Sweden be a quantitative method. The survey will consist of several questions with statements where the interviewees will have to answer on a scale from one to five whether they agree with the expression or not.

3.4.1 Method of interviewee selection

The method used in this thesis will be based on previous research and interviews with companies working in the logistic sector or are target companies that works with logistic companies to move their cargo. To find trends within the industry, people in positions with insight in both vessel, air and train transports will be used as candidates to find knowledge and if they have noticed any patterns in these fields.

The category of interviewee described as target companies needs to have knowledge surrounding the whole value chain (VC) from when their cargo leaves the factories to when it arrives at the customer, this to be able to provide valid information to use in the result of this thesis. They will also have to have good knowledge over their own operation, day to day communication with freight forwarders

and shipping lines, and some knowledge of their plans for the future. A complete description of all interviewees is presented below and in Table 2.

Interviewee **A** was chosen because of their position as a CEO of a target company that has made the journey to reshore their production back to Sweden from China. As the CEO of the company, they must have good knowledge in the areas of the operation that this thesis is researching. Being a company that has made the move from China back to Sweden will give good insight in how that operation was made and why it was made.

Interviewee **B** was chosen because of their position as a supply chain innovation manager at a globally operating freight forwarder. As they are like brokers between target companies and shipping lines, this gives them great knowledge about what their customers are asking for and what the shipping lines can provide in categories like environmentally friendly solutions, schedule reliability and much more.

Interviewee **C** was chosen because of their position as the Head of procurement at one of the Nordic region´s largest companies, the company has customers all over the world and therefore must ship its cargo worldwide. This gives them good insight in both the companies' own operations and, among other things, when new freight agreements are negotiated during new periods with shipping lines and freight forwarders. In addition to this, C has also had a long carrier, working at one of the world's largest shipping lines and thereby has good insight and knowledge about that area as well.

Interviewee **D** was chosen because of their position as a commercial manager at on the world's major shipping lines. They have good knowledge in the company's operations, their relations with customers and also of their work to stay relevant in an everchanging world of transport. D can give good insight in their thoughts as a company on how to evolve in order to ensure that customers choses them when shipping their cargo.

As it is clear above, when the interviewees have been described, the different interviewees, they are linked to one another in some way. This was important to get a wide perspective on the whole chain, from producing company to end customer.

Table 2. *Interviewees*

Name and Title	**Industry**	**Date of interview**	**How/Where the interview was conducted**	**Follow-up opportunity Yes or NO**
A - CEO	Target company	28/03-22	Personal communication (Teams)	Yes
B - Supply chain innovation manager	Freight forwarder	28/03-22	Personal communication (Teams)	Yes
C - Head of Procurement	Target company	28/03-22	Personal communication (Teams)	Yes
D - Commercial Manager	Shipping line	04/04-22	Personal communication (Teams)	Yes

3.4.2 Data analysis

All the answers from the interviews have been transcribed and reviewed individually to then be compared with one another. Once similar answers were found to the questions asked, a survey was be designed using the answers. To discover important and useful information from both the interviews and survey, only topics that have been mentioned more than by a single interviewee or that has made a significant impact has been used to determine if the prerequisite, disruption, or trend is meaningful. Data cleaning would be necessary during the interviews due to the form of open interviews where the interviewee would continue to talk about personal experiences which did not touch the subject of the thesis or simply about a specific operation that is out of the scope for the thesis. The survey shows numerical data regarding different statements and further analyzation would not be required since the questions are asked in an agree or disagree form.

3.5 Research quality and ethics

To reach the answer to the questions, as mentioned a series of interviews are going to be conducted. When interviewing people that are working for different companies with different goals it is important to take in consideration the validity and reliability of the interviewees. Annika Lantz (2007) describes validity and reliability as foundering parts to analyze to see if the information gathered is useful or not. (Lantz, 2007, p. 10) A well-conducted interview should enable results that are sufficiently reliable and valid to be useful and useful to others and to be able to benefit others (translated from Swedish).
Annika Lantz (2007) points out that the use of interviews can be a good way to answer research questions if done the right way and if the conclusions are critically examined. The following two sub-headings will address two important aspects, validity and reliability, and how these will be carefully examined to get the best possible result.

3.5.1 Validity

One factor that Lantz (2007) points out as a potential credibility problem with interviews is that the interviewee only gives answers on the questions asked. This in other words means that the interviewee has the power to dictate what is said and therefor also has a great influent on what information that eventually ends up as the building blocks for the analyses and results of the whole study. Lantz (2007) emphasizes the importance of among other things, dissect the questions to leave as little rom as possible for errors in form of misinterpretations, maladaptation and or incorrect wording. Another way of ensuring a good result mentioned by Lantz (2007) is to ask the interview questions in a logical sequence and to summarize but not to draw any conclusions without fact checking with the interviewee. Another way for the result to be as valid as possible is that during the project, patterns will always be searched for. (Lantz 2007) describes how it is important to compile all collected data in such a way that it becomes clear and easy to be able to reflect and abstract around the dimensions of the interviews. She goes on to describe how the interviews are to be broken down into the components to get a clearer picture of the interviewee to then be able to highlight the parts that stand out. After this, it is then easier to search for patterns both within each interview but also between the different interviews, which in turn leads to the possibility of being able to draw conclusions or even reach a new synthesis.

3.5.2 Reliability

Lantz (2007) describes how the used method must result in information that can be considered reliable and useful, not only to the intended report but to anyone researching the same field. The interviewer is usually not always completely objective, Lantz (2007) believes that the interviewer tends to seek support for his own interpretations instead of questioning and examining his interpretations and thereby get as close to the interviewee's truth and mindset as possible. She continues to point out that a well-conducted interview results in data that mirrors the source. To insure this the type of interviews conducted will be a take on open interviews. A series of questions will lie as foundation to the different segments in the interview, but the interviewee will have the chance to speak freely around the questions without interruption to insure a direct answer. Furthermore, to ensure that qualified data is collected all interviewees has been deemed to have good knowledge of the subject.
As a part of the study revolves around the future of transportation some assumptions will be made, and this will off course affect the reliability of the results. As the information we get from the interviewees about the future is also just guesswork, they have all been carefully chosen and are considered qualified to talk about the surrounding future of this market as everyone has a background in the field and works daily with it. In order to be able to strengthen the interviewees' answers and statements, these will be cross validated against each other as well as against relevant literature.

3.5.3 Ethics

When doing research in the form of interviews, it is important that the data collected reflects what the interviewee has said. This is especially important as the interviews will be open (Slotte, 2017). This means that the interview does not follow a precise structure but rather revolves around a genre so that the interviewee can be able to speak freely as possible.
The data that has been collected will then be compiled to a shorter text that the interviewee will take part of and give feedback on to minimize misinterpretations from our part so that the data can be as true and honest as possible.
The interviewees have had the possibility to remain fully anonymous if desired.
Below Table is compiled of the interviewees and related information. To ensure the anonymity of the interviewees we decided to name the participants as A, B, C, D, this to ensure that they answer our questions from their own knowledge, experiences, and thoughts. We decided to keep their working titles to give more weight of their opinions.

4. Result

In this chapter primary data will be presented, this is for example interviews and calculations and other secondary data that has not been brought up previously in the report to aid the result and conclusion.

In 4.1 an initial overview of the questions and the results from the interviews has been presented in table 3 and 4. Subchapter 4.2 is an overview of all the questions and answers from the survey. The research questions are presented once again in subchapter 4.3. In subchapter 4.4 research question 1 will be answered and in subchapter 4.5 research question 2 will be answered.

4.1 Initial overview of the interview result

The interviewees, their occupation and positions are described in Table 1 under heading, Data collection.
In addition, the questions asked during the initial interview is presented below in Table 2. The logistics trends identified in the interviews are presented in the left most column in table 3. The comments from the interviewees about the identified logistics trends are presented in the same row.

Table 3. *Questions asked during the interviews*

1.	At present, freight rates are higher than ever, is this the new normal or will the rates fall back to where they were a couple of years ago?
2.	What does the situation look like today? - Cost / Price for shipping? - Reliable deliveries (schedule and transit times etc.) - Environmental impact - Substitute for ship freight ex. train, truck, plane
3.	How do you see the future and the development around the above points?
4.	Are there any examples of changes / compromises due to price, schedules and / or environmental aspects that you or your customers has made?

Table 4. *Summary of the most valuable takeaways from the interviews*

Trends, prerequisites, disruptions identified	**Interviewee A**	**Interviewee B**	**Interviewee C**	**Interviewee D**
Rates remain at high levels	A slight reduction in 2022 but remains at high levels. Higher transport costs in general.	Will stay at the same level for 3-5 years from now (2022). The reason is higher fuel costs for all modes of transport.	Rates will remain as it is for 2-3 years. Will only reduce when more supply of transports is available.	The new normal is at higher rates than before. The cost to operate vessels and other modes of transport has increased.
Investment in new technology	-	Investing in new truck and vessel technology will not decrease the rates soon.	Capacity will increase by 25% in 2024 due to the building of vessels.	Increased use of LNG fuel and availability to our customers.
Schedule reliability	It is a big issue, forced to use air transport sometimes. Tried to use train but it has been challenging due to	Due to covid, the reliability has been reduced. Lockdowns and an imbalanced container market. No improvement	Reliability is worse than ever, and even train is better than vessel (Until the war in Ukraine). Shipping lines	Sometimes schedule reliability is under 30%. Shipping lines is reducing port calls and finds alternative

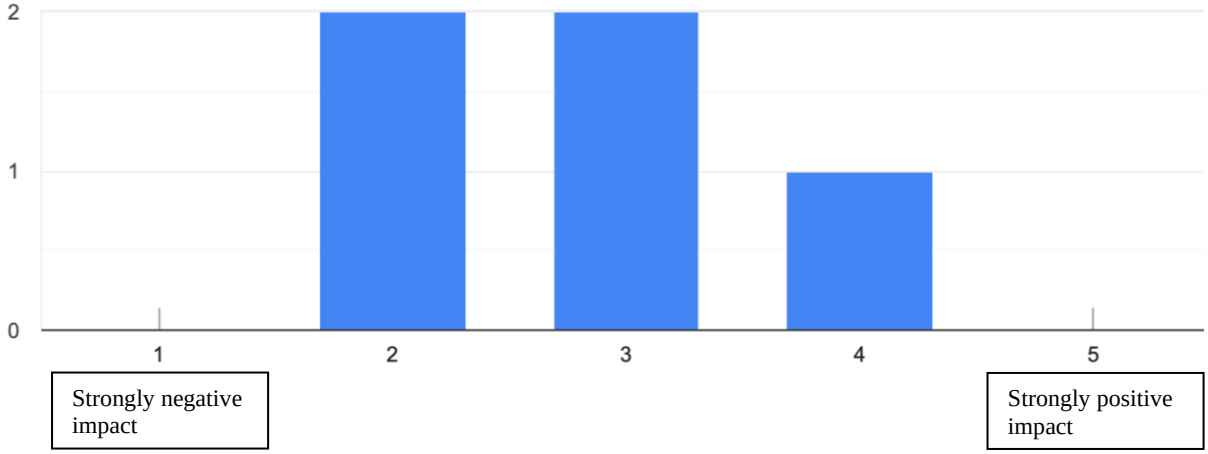
	lead time and reliability.	soon. Some customers have started using train transport instead of air transport, but today this product does not exist anymore due to the conflict between Russia and Ukraine.	must reposition their own equipment without letting customers pay for it.	ports to call, which could improve the reliability.
Future modes of transport	Sea transport will dominate from Asia to Europe. We can see a willingness from shipping lines to improve their operations.	With a lot of focus on rates before, we can see a change of attitude where the environment is now in focus, regardless of the mode of transport.	Shipping has no future if they keep on using dirty fuels. They must find cleaner fuels soon to be sustainable. The trend of Reshoring and producing where products are needed will grow stronger.	No competition with sea transport. Cheapest and most environmentally friendly per ton/km.
Stock, just in time, balance	Extending lead times to customers, and it has been difficult to “full-deliver”. Reducing customer service and increasing costs.	Some routes are always flown, for example from Shanghai to Gothenburg. After that, it is in stock for a month or more. Why do we not take trains? Cheaper and less environmental impact. Those who make changes look at the whole chain. Everyone realized the fact that we need a margin and much more focus on reliability. It is better to know that a shipment will arrive in two weeks sharp than to unsure that it might arrive tomorrow.	To ensure stock and deliveries, Move cargo from container to breakbulk. It is a different market and more expensive, but it is a more reliable product.	It will be required that you do not use “just in time” in all industries. Better inventory planning and accepting higher tied up capital. In the future, there will be more interest in stockkeeping, and you need to accept that you ship several different products at the same time.

4.2 Initial overview of survey result

Below is an overview presented of all the questions and accompanied answers from the survey.

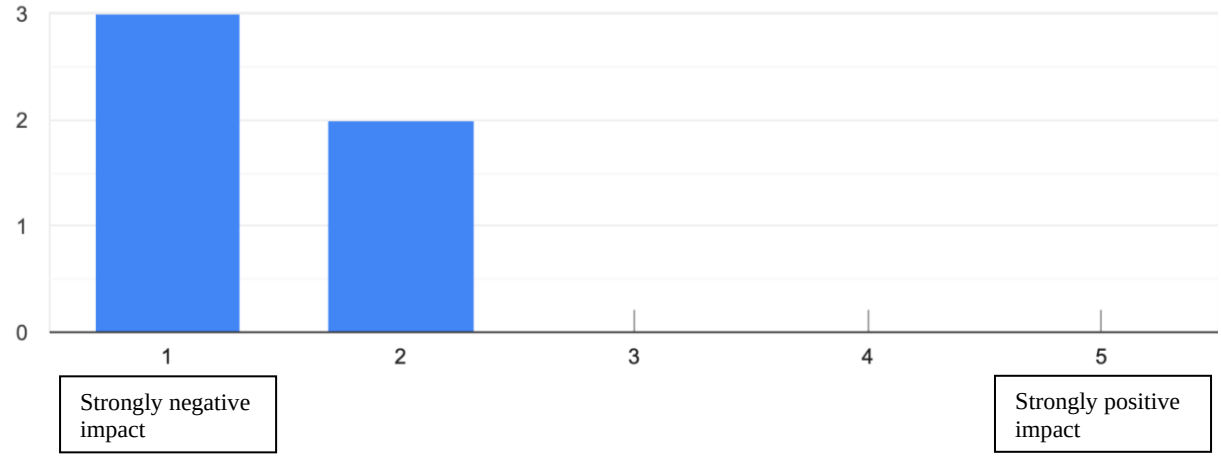
Question 1 - From a planning point of view, how is the business affected by a higher cost situation in the future compared to what it looked like 2-3 years ago, regarding both sea, air, and train transport.

Figure 4. Answers question 1



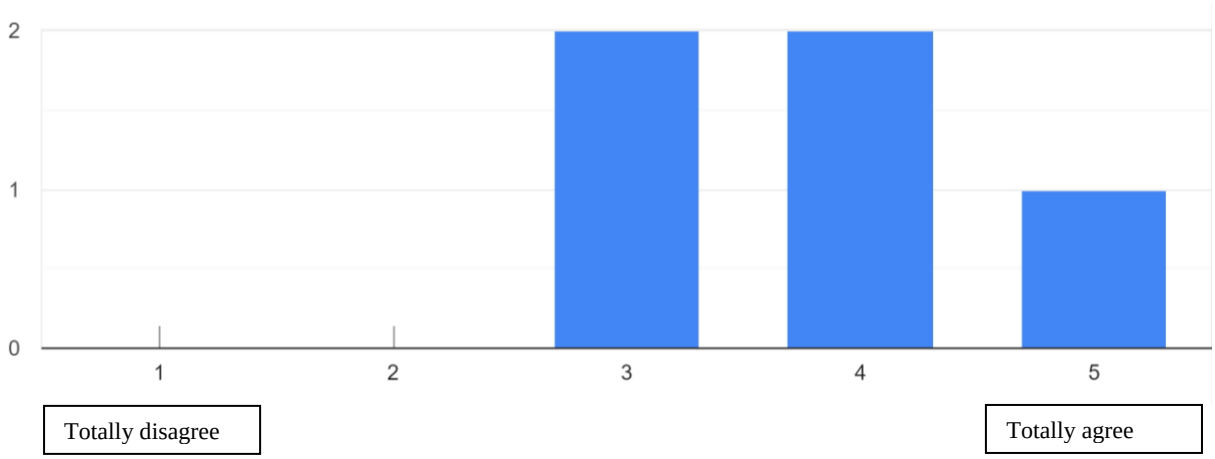
Question 2 - From a planning point of view, the deteriorating reliability of deliveries has ____ on the business.

Figure 5. Answers question 2



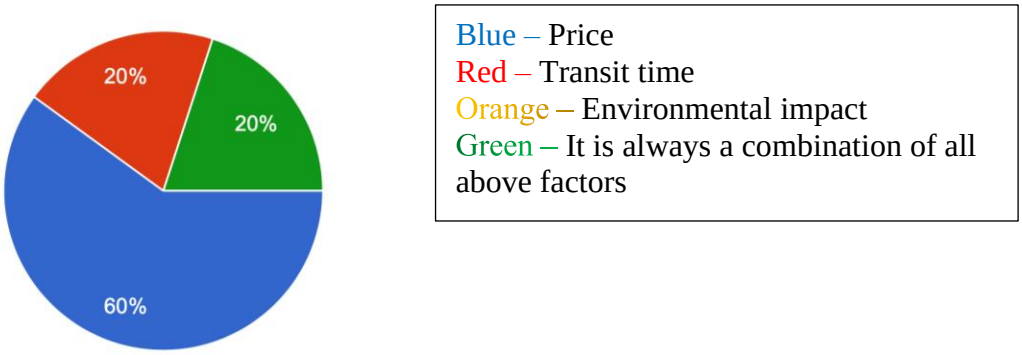
Question 3 - Environmentally friendly transports is a high priority in our business.

Figure 6. Answers question 3



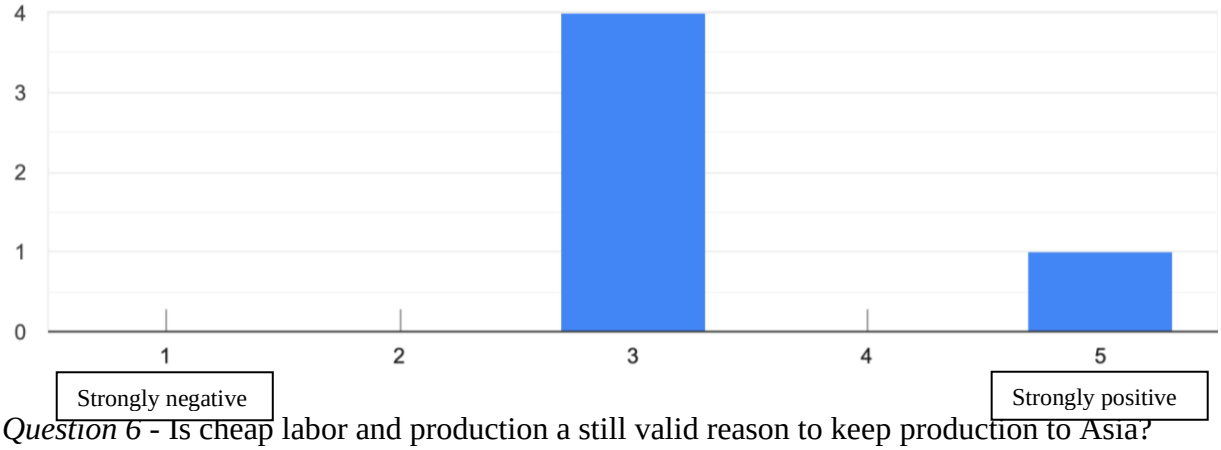
Question 4 - What governs the most when choosing transport?

Figure 7. Answers question 4



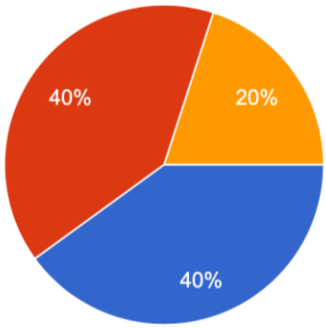
Question 5 - What is your view on Reshoring (moving production home to e.g., Sweden from Asia)?

Figure 8. Answers question 5



Question 6 - Is cheap labor and production a still valid reason to keep production to Asia?

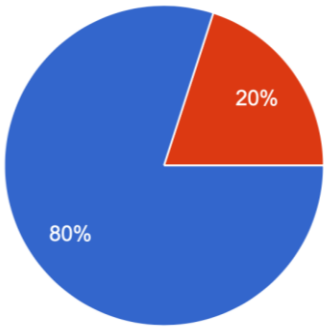
Figure 9. Answers question 6



Blue – Yes
Red – No
Orange – Yes, but less of an issue to "my" company

Question 7 - Has the ongoing invasion of Ukraine affected your supply chain in any way?

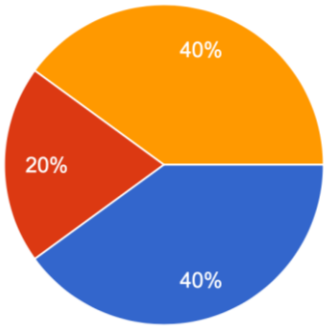
Figure 10. Answers question 7



Blue – Yes
Red – No

Question 8 - Are unpredictable events such as, wars, major lockdowns, natural disasters something you have started to keep in mind when planning?

Figure 11. Answers question 8



Blue – Yes
Red – No
Orange – Already have had in mind when planning

4.3 Research questions

In the results chapter the answers to the research questions are presented. The following are the research questions:

The first step is to identify the relevant logistics trends based on the interviews and literature.

RQ 1: What is the current state of important logistics trends in the planning environment regarding the global supply chain of goods from China to Europe?

The next step is to present and analyze the results from research question 1 (RQ1), how these important logistics trends could affect companies that are considering or are in an early state of moving production from China to Europe. This will be handled in RQ2.

RQ 2: How do these logistics trends identified in RQ1, affect the target companies moving goods from China to Europe?

4.4 Research question 1

In the following subchapters the results to research question 1 will be answered. It will examine how the price on transport can develop during the next couple of years, the reliability on transports and how the environmental question has grown. The changes target companies can to in their operations are also described.

4.4.1 Price on transports

All interviewees agreed on high rates is here to stay for 2-4 years. Based on the market today, the rising costs derives primely from rising fuel prices and increased demand for transports. According to the interviewee D, the high prices are set for a period since the rates to charter a vessel usually is fixed for several years. Interviewee A emphasizes that this is the new normal to them and this is a trend throughout all the interviews as they all agree on that the high rates are here to stay for at least 2 years. However, before the pandemic, the market was used to very low rates, and it has historically been very cheap to transport cargo long distances in containers. This has increased the demand for transport alongside with the globalization. "We plan and work based on a higher cost situation in both long-distance transport from Asia to Europe and within Europe" says A.
Another factor to the continued high rates on transports is the current pricing on fuels. This is mentioned by both Interviewee B and D. The increased price for fuel will drive rates higher and have continued to rise both during the pandemic and at the time of writing, with the conflict between Russia and Ukraine. As an example, the bunker price rose by 8% on the first day of Russia’s invasion.

4.4.2 Reliability

Reliability is a very important note for the interviewed target companies, at the moment all the interviewees agree on that the schedule reliability is worse than ever. Sometimes this can mean a difference between receiving your cargo on time or getting it several months later than initially planned. This is something that target companies has been forced to accept the last years. According to A, they sometimes couldn’t deliver full orders have been forced to use air transport in some cases. This is something that they want to always avoid, since it is much more expensive and more harmful for the environment.

According to B lockdowns and an imbalanced container distribution around the world has a big impact on the schedule reliability and they see no improvement soon. B also explains how some customers that used to transport by air, started to use train as a cheaper and more environmentally friendly alternative. With the improved infrastructure along the BRI the train has quickly become a more used option for transportation from China to Europe than it was just a couple of years ago. With this in mind, B says that the option to use train to transport along this route is impossible due to the sanctions and the fact that currently all BRI railroads goes through Moscow, Russia.

When discussing schedule reliability with interviewee C an interesting topic was brought up. C meant that the issue with reliability and container distribution within the shipping market could be solved by relocating equipment and vessels where it is needed. C continues to describe how the shipping lines are relocating their vessels and equipment to crowded trades between Asia and U.S instead of the Asia to Europe trade, where it is also needed. One of the reasons that shipping lines are focusing on the route between Asia and U.S is that a lot of production and consumption goods are manufactured in Asia and highly demanded in the U.S. This is illustrated in figure 2.
Figure 2 clearly shows the unequal amount of goods being exported comparted to imported from China to U.S. This leads to congested ports in US and Asia where vessels are waiting to unload their cargo in the U.S and waiting to be loaded in China, this strengthens C's statement. Due to the huge demand on transport in this market the shipping lines will earn more by waiting in line to be loaded and unloaded instead of operating around the clock in other markets.

4.4.3 Environment

When discussing what the future modes of transport may be all interviewees agreed on that right now and in the near future, shipping by vessel will be the dominant option between Asia and Europe. With that said interviewee C was quick to point out that if the shipping line does not invest heavily in new technology, better fuels, and more efficient vessels in order to lower their emissions and over all be better for the environment, they have no future at all. C also said that the idea that moving goods by vessel is the most environmentally friendly option seen to the amount of emissions emitted per ton/km is not the right way to look at it. Cargo vessels are for the most part still using fuels that are far worse for the environment compared to all the other types of transportation. Compare this to the answers from D, they are a commercial manager at a major shipping line. They are quick to emphasize that there is no current competition on the market with sea transport, it is not only the cheapest option but also the most environmentally friendly option seen on the amount of emissions per ton /km. But as mentioned before, when discussing new technology, D pointed out that they are investing a lot of resources in the development of new vessels that can run on LNG. As LNG is a more refined type of fuel than compared with for example convectional bunker this can lead to a massive reduction in emissions of nitrogen and Sulphur oxides.
C believes that reshoring is something that will grow in the coming years, they believe that producing the products where they are actually needed is the future for many companies. This thought is backed up by interviewee B, that believes that this trend of reshoring will come with its own freight needs and might play a role in the needs for shipping lines to relocate their resources and/or develop new types of resources.

4.4.4 Changes in operations

A and C as target companies agrees on that the current state in the transportation market forces them to do changes in their daily operations. A exemplifies that they could not fully deliver all their orders and had to split them up in smaller orders. A further describes this as a customer service issue and increased costs as a consequence. C described that they choose to move cargo from container to

break-bulk instead. C describes that this is a different market and also more expensive but with the current state of equipment shortage i.e., container shortage, break-bulk is a more reliable product to use.
The transport providers B and D both agrees on the target companies must accept higher levels of stocks i.e., more tied up capital and not focus as much on just-in-time production to be able to handle the current situation. B means that their customers (Target companies) should see the whole supply chain and make changes overall if they want to keep just-in-time concept and reduce stockkeeping. B exemplifies that some companies always fly their products from Shanghai to Gothenburg and then to put it in a warehouse for one month before using or continues the transport. This could be replanned to be transported by train or vessel where the transport will be cheaper and more environmentally friendly, but with longer transit time. This in term means that goods will spend fewer days in a storage facility and more days in transit.

4.5 Research question 2

The most important and frequent trends, prerequisites and disruptions are now identified, and the following part of the report will present how these affect the target companies who is moving their goods from China to Europe. The results of the survey will serve as the basis for this part.

4.5.1 Rates will remain at high levels

The rates remaining at a high level would not stop shipping from Asia to Europe. The target companies' operations are not affected to the degree that it would have a strongly negative impact on their business. One target company, with both production in Sweden and China, meant that the risen rates is strengthening the cost situation for their production in Sweden and would likely continue to do so. In short term one target company managed to increase sales prices due to the increased shipping costs, but with an increased risk for a potential turn in supply and demand regarding their products.

4.5.2 Schedule reliability

There is a lot of concern about schedule reliability from the target companies. 60% of the target companies report that it has a strong negatively impact on their business. 40% report it negatively impacts their business. The reduced schedule reliability with both sea and train transports could lead to using other modes of transport like air or truck transport and therefore higher costs and increased air emissions. The increased unavailability of equipment and space on vessels is also concerning. In addition, re-planning orders and informing customers takes more time, time that could be spent on their core business.

4.5.3 Environmentally friendly transports

A question about how the target companies view and prioritize environmentally friendly transport was asked and the results showed that 40% of the target companies neither agreed nor disagreed that it was prioritized. 40% of the asked companies agreed, and the last 20% agreed and strongly agreed that it was prioritized. One target company mention that they have "green transports" as an addition when delivering to customers, although no further explanation about what it means.
As a following question in the survey the target companies were asked: "What is the most influential factor regarding the choice of transport?"
The result showed that 60% reported price to be the most influential factor and 20% lead time, the last 20% said that – "It is always a combination of the factors". None stated environment. A

comment to the answer from one target company states that – “Price is often the most prioritized factor when buying transports, but factors as lead time and environmental impact are taken into account”.

4.5.4 Reshoring

In the survey, 20% of the target companies reported a strongly positive attitude to moving production from Asia to Europe or Sweden. The other 80% neither had a positive or negative attitude. The following question that was asked examined if todays’ situation regarding transports would bring incentives to move production from Asia to Europe or Sweden, one of the companies said No. The competition is in the same situation and does not evaluate the decision of reshoring. The evaluation is more towards transport options and strategy instead of production and location strategy. Although some challenges with todays’ situation was brought up and showed that the price development was concerning to the degree that they could consider reshoring, but not enough to fully take a decision just based on the transport situation.

5. Discussion

In this chapter more interesting thoughts surrounding the RQs, and the result will be presented. In subchapter 5.1 initial thoughts and overall discussion about the global trading market at present, how this can affect target companies in different ways. 5.2 revolves around which operational changes companies will have to do and some possible future alternative solutions for today’s problems. Subchapter 5.3 discusses different thoughts and issues when it comes to the location of production of products and the reshoring possibility. Finally, subchapter 5.4 will give the final thoughts and recommendations of productions localization in China-Europe supply chain based on the results from this study.

5.1 Global trade

From the result and theory, it is clear that due to the situation in the China to US trade, the reliability on the Asia to Europe market will not improve until the shipping lines distribute their resources to all markets and not only the ones that are the most profitable for them. The reliability is also a concern for all interviewees, it is worse than ever. To summarize the interviewees answers, most of the problem is local shutdowns and increased demand for transport and now also with the war. The consequences are more harmful when transporting from Asia to Europe than intra Europe because of the long transit times. A delay of 1-2 weeks or even more is not unusual between Asia and Europe but within Europe the delay could be 1-3 days to be recognized as an influential delay. Another thing that must be considered when planning routes and schedules is the risk of congestions, reliability, and vulnerability of bottlenecks, one perfect example of this is the Suez Canal disaster. The canal is not only expensive to pass but also riskfull as we have learnt.

The impact on the global trade caused by the logistics trends identified is already causing an imbalance on the global trade, the pandemic caused an increase of demand of transports due to the limited possibility to travel. The pandemic also forced people to stay at home resulting in an increased demand of products to peoples’ home. Electronics and furniture have been highly demanded during the last couple of years. These shortages are primely not caused by the transport situation but more of a decrease in workforce and raw material availability. Although even if the shortages of these products are not derived from the transport situation, they are increasing the

demand of transports from where these products are produced while there is no increase of transport where they are delivered. This results in an imbalanced market.

5.2 Change in operations

The planning will be key in the future of production and transport due to todays' market situation. As seen in the result, the transport providers suggest that the future might see less "just in time" operations and instead larger safety stocks on important components. This will lead to a higher tied up capital but also a lower risk when supply chains fail. Although the tied-up capital increase could be partly solved by planning the transports' better with a view of the whole chain.

A key takeaway from the interviews, it is that the environmental issue and with that the debate on how to solve it, only grows and grows and those who do not keep up with transition will sooner or later be pushed away from the market by those who are ready to make a change and eventually be forgotten. This result was not something that came a shock to us, the environmental question has been a theme throughout our education at Chalmers and the market in general.

These logistical trends that has been the focus of this thesis might only be a problem and talking point for the near future. The environmental question with dirty fuels might be solved in the coming years by simply changing to a better solution, this might be a new type of fuel that has a net zero impact on the environment or even using renewable energy sources like solar energy or more likely wind power with the help of sails. An example of concept where this might happen is the Oceanbird concept from Wallenius Marine, where the target is to lower emissions by 90% by using wind power and large sails.

The thought of a complex supply chain can be frightening for a lot of producing companies, but a strong logistics department can be used a tool to improve the competitiveness today. From own experience, the shipping lines and freight forwarders are very helpful and supportive, and a company could arrange their transports on their own with a strong local logistic department. The need for outsource this operation would then disappear.

5.3 Location of production

To begin with, a relocalization would reduce the risk of extended lead times due to delays and local shutdowns in both the producing and receiving country. A concern about the unreliable schedules is expressed as a worrying factor according to the survey results and would not be remediated soon. A decision to reshore only based on this would not be valid due to all the other factors that could influence the decision, as availability to raw materials, competent workforce or similar.

By studying the EU-report and in particular Figure 2 under the heading, reshoring, a lot of interesting conclusions can be drawn. For example, the most obvious categories of GVCs that are prone to move across borders are the GVCs of chemicals, pharmaceuticals, aerospace, automotive, communication equipment, semiconductors and components, and medical devices. This conclusion can be drawn even though the economic and political factors differ. These are feasible for a geographical move more based on the political aspects rather than the economic. On the other hand, the following GVCs, transportation equipment, electrical equipment, machinery and equipment, and computers and electronics, decisions of reshoring are mainly based on the economic factors, as seen in the table. The labor intensive and some regional processing GVCs are described as very feasible for a

geographical shift due to economic reasons. From this we can draw the conclusion that this will not affect Europe because of the high labor costs here, but rather another cheaper Asian country when the wages are rising in China. The Final category of GVCs is the Resource intensive GVCs. This category is not likely to shift geographical location, this because the access to the resources is key for the operation and in many cases, it is impossible to move the resources to another place, for example mining, petroleum products and raw metal/ore.

To summarize, the decision of reshoring is highly governed by the type of product that is being produced. A clear example of product which cannot be reshored is mining or ore production. They are limited due to the nature of the product and raw material.
Another thought is to reshore critical products, as medicines, food supply or communication equipment, this due to the extreme demand in critical situations. This is based on non-economic factors and do often require incentives from governments to be reshored. To bring this together with the thesis topic, the transport itself is not a problem when there is a balanced demand of the products, but when a significant increase of demand of a certain product it will quickly create imbalances in the transportation market.

5.4 Recommendations for production localization in China-Europe supply chains based on this study

The recommendations this study suggest is to look deeply into the planning environment. Use the key takeaways as continued high prices on transport, no improvement of schedule reliability and a slow development of new sustainable technology and transport modes. All results are showing that the rates will remain at a high level for an extended period. The planning should be based on a higher cost situation for at least 2-4 years from the time published. The results regarding schedule reliability shows that the planning should be performed with this issue in mind. Not until a decreased profitability and demand between the Asia to US trade is indicated, there will be no improvement. The environmentally connected issues will only bring the rates upwards due to investments in new technology from both shipping lines and freight forwarders. There will, according to the results be an unpredictable major event causing issues to the supply chain every 3,7 years. As this is only the transport factors that could impact the GVC, it must be investigated if the production itself is suitable to be moved. As reviewed in chapter 5.4, some products are more suitable than others. If a producer can argue that there would be no issue with moving the production facilities or develop new ones in a country closer to their customers there would mean several gains.

6. Conclusions

The main purpose of this thesis is to improve the understanding of the effects that logistics trends have on production localization in China-Europe supply chains. To study this, both interviews and a survey was conducted. Both target companies, shipping lines and freight forwarders were participating in the study.

The conclusions on whether it is a good choice to reshore production differs depending on the category of GVC in question. Some companies can benefit greatly from relocating production back home and for other markets reshoring may not even be possible.

The answers to the first research question shows that today, the current logistical market is characterized by bad and unreliable schedules, which is the result of, among other things, wars, global pandemics, but also of the planning and strategic localization of ships by the shipping companies. We see a fragile market that can be hugely disrupted by for example, a single ship blocking the path through the Suez Canal.

The conclusion to the second research question is that the target companies are not affected to the degree that only the transport situation would make them consider reshoring. There must be other incentives or even more unreliability or increased rates to make them consider reshoring.

As mentioned, reshoring is not only governed by economic gain but can also be governed by political forces. An increasing trend like this can be seen within GVCs that handle the production of vital products for the country's own population. When moving the production closer to the end customer the amount of tied up capital, depending on the value of the products, can be lowered considerably.

6.1 Future work

The future will be an interesting time and it would be interesting to see what the interviewees would answer on the same questions in 2-3 years' time. If the situation would be worse or better than it is today, it would be interesting to do a replicate of the study and find out how the answers would differ. Reshoring might not be tool to reduce emissions or streamline the supply chains if new technology could do it instead. New technology could be zero emission fuels, a more open freight market where rates are compared, and schedules are more reliable and could be tracked live. And further on, a company can connect their supply chain globally and with the transportation companies. There is some development of this by the company called Adnavem, and it will be an interesting time to see if it can help to reduce the individual company issues.

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