



## Article

# Covid-19 Pandemic: Early Implications for North European Manufacturing and Logistics

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**Abstract:** From early 2020 onwards, the world has been going through an unprecedented wave of lockdowns, shutdowns, and preventive measures due to the Covid-19 pandemic. It is evident that these have been harmful for tourism, passenger transport, and the service sector in general. However, less is known regarding the implications for manufacturing and logistics, which is the purpose of this research. We concentrate on reporting survey findings from Northern Europe, and mostly from Finland. Based on trade accounts, it is evident that Covid-19 has had significant impacts on Finnish import and export. However, in survey responses, companies report that they have mostly been able to serve customers in a good fashion, and the pandemic has increased transportation costs only moderately. Inventories might experience an increase due to the virus, however, in the longer term they will likely remain at the earlier levels (or slightly increase). Companies are mostly afraid of the effects of the second wave of the epidemic, and are also already thinking about the long-term issues with transportation modes used together with supply chain dependencies. For example, the Chinese and, in part, Russian, markets are increasingly being served by railways during the current decade. For some companies (especially small and medium-sized ones) and foreign trade markets, however, the epidemic era has been very harmful. Therefore, as a conclusion we argue that the pandemic is causing rather asymmetrical impacts on manufacturing and logistics.

**Keywords:** Covid-19; manufacturing; freight; logistics; Finland; Northern Europe

## 1. Introduction

The world has gone through plagues and pandemics throughout its history. However, for the modern world Coronavirus disease 2019 (Covid-19) is the first real global stopper (or freezer of the entire world economy, as in the famous Vonnegut book about “Ice-9” [1]) and poses economic as well as health challenges [2]. The global economy has been warned several times about a pandemic possibility in the previous two decades (such as diseases called Severe Acute Respiratory Syndrome (SARS), swine flu, Influenza A virus subtype H7N9 (H7N9), etc.), and we already know that even a small number of infections and casualties will lead to devastating effects on an economy. For example, the relatively short-duration SARS outbreak had big effects on tourism in Australia, Malaysia, Canada, Singapore, Hong Kong, and Beijing [3,4]. Actually, the SARS epidemic had a peculiar effect on stock markets; in Taiwan, it was detected that biotech firms benefitted from the epidemic, while the tourism, wholesale,

and retail industries lost their valuations at the exchange [5]. Changes in consumption suddenly take place amid flu epidemics. As an example, during swine flu, pork import and consumption declined (in both China and Russia) [6], and the Corona beer demand declined within the recent Covid-19 crisis [7]. In addition to this, export has been reported to have experienced a severe decline (rubber, −40%) in Libya within the Ebola crisis [6].

The motivation of this research is to examine how North European, and mainly Finnish, manufacturing and logistics firms have experienced the current Covid-19 crisis. As earlier examples have highlighted, manufacturing and logistics should not be the first or worst-performing sectors during pandemics. Travel and tourism are typically the weakest, and, e.g., hotel bookings are a rather good measure to reveal changes [4,6]. However, during the SARS epidemic, China was able to isolate the virus to such an extent that factories were running without major interruptions, and export performance was not hurt [6]. However, trade fairs reported significant order declines during the SARS era [8]. It is also the case that compressing global supply chains, rather than chasing the lowest possible cost, is of major benefit in the current Covid-19 crisis [2]. In this research work, we examine the Finnish trade performance from the early months of the Covid-19 pandemic, and compare the developments to the time before the virus. The main empirical material comes from two surveys—the first one was sent to big corporations and latter was for regional small and medium-sized companies. All these respondents are operating with logistics flows, and often are directly involved with manufacturing or logistics activities. The surveys were completed in June–July 2020, and they illustrate the situation in this branch after the first demand and supply shocks were experienced in February to May 2020. As Handfield et al. [2] illustrate, both shocks were experienced in the early days of Covid-19, and not only negative ones, as some sectors benefitted hugely from the rise of the pandemic. With this in mind, our research questions are as follows: What kind of impact has the Covid-19 pandemic had on the manufacturing and logistics sectors in Northern Europe? Are any major changes going to appear in the incumbent supply chains? It is necessary to understand the initial impact on secondary sectors together with logistics during the virus pandemic outbreaks, as we do not have enough experience of this from earlier epidemics and pandemics? We combine second hand statistics with completed surveys, which together form an innovative approach to analyze the early impacts of pandemics (instead of only using second-hand data).

This manuscript is structured as follows: In Section 2, we review the literature concerning epidemics experienced in previous decades, with an interest in their impacts on the economy in general and on companies and trade. The employed research methodology is introduced in Section 3. The foreign trade performance of Finland is analyzed in Section 4, and it concerns mostly aggregate development until the end of May. Some major trade partners are also analyzed in detail. Empirical data analysis of the two completed surveys follows in Section 5, with an analysis combining two different surveys together, as the same questions were used in both surveys (concerning Covid-19). This research is concluded in Section 6, which also provides future research direction in this area.

## 2. Literature Review: Epidemics and Effects on the Economy and Supply Chains

It is well documented that people and societies overreact to epidemics, since news and media deliver messages about them constantly, and actual epicenters are not so well known (also, people lack first-hand experience). It is well analyzed that the Ebola outbreak in Africa, although in the end a minor event within a limited geographic area, affected mutual fund investor decisions to invest in this large continent, and investment outflows became a reality [9]. In a similar vein, the SARS epidemic in 2003 infected 8096 persons (774 deaths) in 29 countries, but its impact on the global macro-economy was 30–100 billion USD in total or 3–10 million USD per case [4]. It could be due to the SARS experience that the H7N9 epidemic (bird flu) was globally handled very well, with no significant impact on economies. The fatality rate of bird flu was very high, however its confirmed number of cases remained as low [4]. One of the key points in the effective handling of H7N9 was the proper and valid information dissemination about the disease in the global media. It is argued that

people react to dangers based on how easily they receive information about these risks. For example, surveys made for people during the SARS epidemic reported in both Hong Kong and the USA that the inhabitants estimated their probability of catching this disease as rather high, even though in real life the probability of catching it in the place with the worse disease situation, Hong Kong, was well below one percent [10]. It is therefore easier to understand why governments and individuals reacted in such a manner to the Covid-19 outbreak, causing unprecedented impacts and business lost in tertiary sectors (especially travel and tourism). Even poorer Southeast Asian countries were forced to implement lockdowns as the virus spread was suddenly growing, and also to provide economic stimulus and help, in turn leading to higher governmental debt levels [11]. In the “old west”, earlier epidemics had already changed legislations, and the supranational authority of the European Union enabled a quick, strict, and planned process response in Europe [12,13]. However, there is early evidence that prosperous nations in the Covid-19 crisis could have higher mortality rates than poorer ones, leading to the discussion point of whether the old west has responded to and behaved in the crisis well enough to tackle the virus [14]. However, many prosperous nations in the world have a much older and retired population [15,16], which could be one explanation for the higher mortality rates (together with issues raised in [14]).

The economic impacts of a virus can be categorized at a company level—e.g., using the division of businesses in the primary, secondary, and tertiary sectors [6]. In the earlier virus epidemics, it has been common for the tertiary sector, such as travel, tourism, and services, to be hurt. For example, during the SARS epidemic in April 2003, Hong Kong’s air passenger traffic collapsed by 70%, and this further accelerated to a drop of 80% in May [6]. The hotel occupancy rate in Hong Kong during that time was around 20% [6]. Similarly, Singapore was faced with a sudden hotel occupancy rate drop, even if the total amount of SARS cases during the entire epidemic in this city was recorded as 238 [3]. In Taiwan, around 30% of international flights were suspended [17]. Therefore, even in the case of a short-lived virus, implications for the tertiary sector are highly significant, and in many instances turnover volumes just disappear overnight. In Finland and in its leading airport, Helsinki-Vantaa, the passenger numbers declined in March 2020 by 57.2% as compared to the year earlier, and in April–May the decline was more than 90%. The decline in air freight was also steep, but it dropped by a somewhat lower extent by 26.3% in March, 59.3% in April, and 49.4% in May [18]. Of course, these drops are not only due to the psychology of individuals or organizations not willing to travel, but also in this situation the governmental decisions and recommendations to reduce flights played a big role. The freight volumes dropped, as passenger planes typically provide also freight services, which are vital for the profitability of continental flights (e.g., to Japan and China). From the retail sector, we already know that, e.g., fast fashion sales declined significantly—one of the leading retailers, H&M, reported that in the second quarter of 2020 its sales declined to half from the previous year [19]. However, not all retail sales were suffering during the early phases of the Covid-19 pandemic; in research that took place within Finland and the USA, it was found that there was rapidly growing demand for groceries, which took place in a short period of time, and remained at this high level as people stayed more at home [20,21].

The effects on the primary sector have not been reported widely from earlier epidemics. During the Ebola outbreak in Africa, it is known that the harvest did not succeed perfectly within Ghana, as rice production dropped by 20% and coffee production by 50% [6]. Earlier, it was already mentioned that the Libyan rubber export and the consumption and import of pork faced challenges. From the current Covid-19 crisis, we have learnt that mining has been under lockdowns and shutdowns in a number of different countries, and especially silver production has been hurt [22].

There is no evidence of significant negative impacts on the secondary sector during earlier virus epidemics [6]. However, it has been mentioned in earlier research [4] that, during the SARS epidemic, Dongguan in China experienced a local one-third drop in its manufacturing business with Hong Kong. It is typical that changes in investment flows take place or orders drop, but trade has not been impacted so greatly earlier [3,8,9]. In addition, risk premiums for future investments will rise in the worst infected areas [23]. However, in the current Covid-19 pandemic, the secondary sector has been

greatly affected. The virus has exposed weaknesses in global supply chains, originating from the lack of diversification of suppliers, extensive just-in-time strategies which have diminished safety stocks, and inadequate supply chain-wide transparency [24]. Hence, contemporary supply chain scholars highlight the importance of resilience in modern supply chains (e.g., [25,26]). In the latest case studies, suspending production during Covid-19 was an option used as demand declined in a harsh manner, and there were difficulties in the global component supply [2]. In addition, Liao et al. [27] showcase a model which suggests that stockouts can be efficiently withstood with collaboration between competitors in the form of transshipments. However, it should be emphasized that virus epidemics concern entire economies, and especially the tertiary sector. Even the economic simulations from the times of the SARS spread did not find great impacts on trade—only Hong Kong was found to suffer for a short period of time [23].

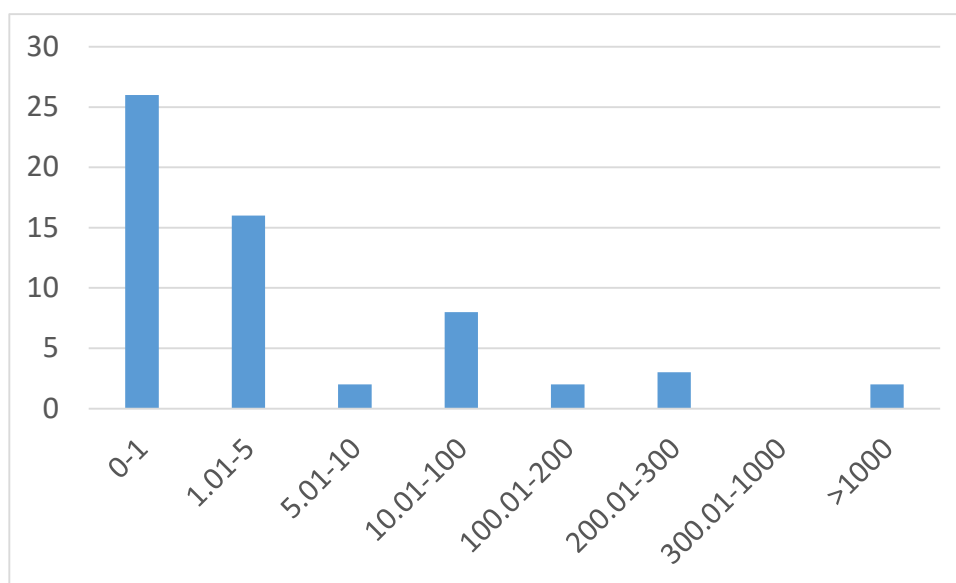
The importance and coping of humanitarian logistics during an epidemic outbreak is a widely researched area (see, e.g., [28–30]). However, knowledge of the effect of an epidemic outbreak on commercial supply chains is rather scarce at the moment, and thus the research objective of this article fills a recognized gap. There are, however, some fresh research articles focusing on the aforementioned research area. Ivanov [31] has made a simulation model which aims to predict the effect of Covid-19 on global supply chains. Furthermore, healthcare supply chain decision-support systems during the Covid-19 epidemic has been a research focus of Govindan et al. [32].

### 3. Research Methodology

The survey presented in this manuscript was completed in June and July 2020, and it mostly concerned Finnish companies. The survey was actually split in two parts, where the first sub-survey concerned the largest companies in Finland, Estonia, Sweden, and Norway (companies with physical material flows, so excluding, e.g., banks, IT, insurance, the service sector, and real estate). This first sub-survey had also other questions apart from those concerning Covid-19's effects (mostly about logistics and supply chains). We justified asking these questions from larger companies, because often their decision-making regarding supply chains control the behavior of smaller actors. This large company survey was sent to "info@..." addresses, and it did not yield very plentiful results. Overall, we sent the questionnaire to 885 companies, of which only 9 responded (response rate of 1%). Most of the responses were from Finland (six answers), followed by Estonia (two answers) and Sweden (one answer). From these larger companies, eight respondents were operating mostly in manufacturing, whereas one respondent was from a logistics branch. A request to respond to the questionnaire was sent in total five times, and the response period was basically the entirety of June 2020. The second sub-survey was targeted at two regions of Finland: Kymenlaakso and South Karelia. These are both located next to the Russian border, in the southeast of Finland. We selected manufacturing and logistics companies as respondents. This sub-survey was sent to 575 companies, and we received a response from 53 companies. Typically, questionnaire contact was made to a CEO or director email address, which we accessed through earlier projects and visiting company websites. The survey was opened on 17 June and it was closed on 17 July (companies were also contacted five times and asked to respond). This second sub-survey only concerned Covid-19-related questions. Both regions are nearly equally represented in this survey, as we received 26 responses from Kymenlaakso and correspondingly 27 from South Karelia. These respondent companies represented nearly equally manufacturing (26 responses) and logistics (27 responses) companies. The response rate for the second sub-survey was fairly high, around 9% overall.

As most of the responses in the completed surveys arise from small and medium-sized companies, it is important for the reliability of the following survey analysis to reveal the revenue and employment amounts of the respondent companies. We used public databases of annual financial data from Estonia, Finland, and Sweden, as well as the annual reports of companies to compile respondent background data. We took the latest annual numbers, which were most often from the years 2018–2019. From some companies, these data were just unavailable, however we were able to get revenue

information from 59 out of 62 companies. The average revenue of the respondent companies was 144.5 mill. EUR, while the median was much lower, at 1.4 mill. EUR. This is due to two very large companies (corporations with revenues of more than 1 bill. EUR) responding (resulting in a bias in the average), and, as Figure 1 illustrates, the respondents mostly have revenues of a maximum of 10 mill. EUR (these three first classes make up to 74.6% of the responses). The situation with employment was rather similar to that of the revenues. We were able to access employment amounts from 52 companies out of 62. The average number of employees was 379.6, while the median number was 14.5. Most of the companies employed from 1 to 100 persons (80.8%).



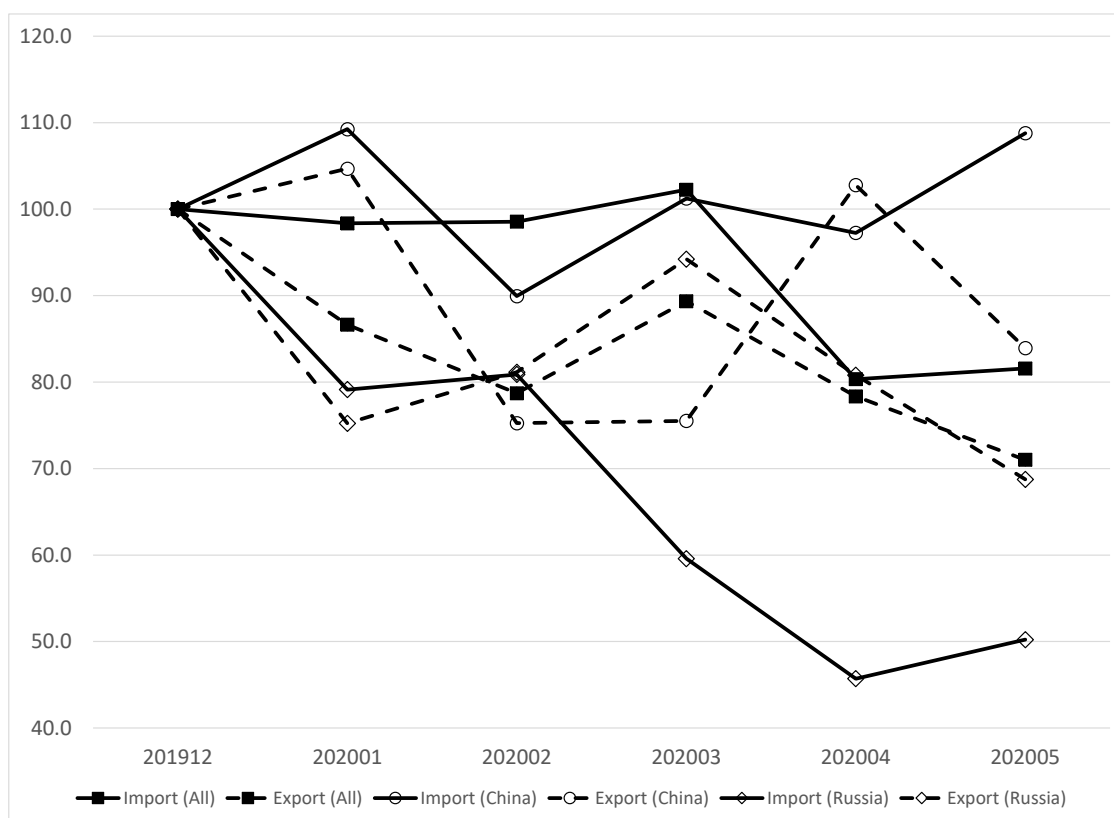
**Figure 1.** Revenue frequency of the respondent companies (in mill. EUR; n = 59).

The survey was designed in a way that the respondents could leave any question(s) unanswered if they wanted to. This was done to achieve the highest possible response rate, and also due to the reason that not all companies necessarily have, e.g., operations in Russia or China. For the survey regarding big companies (the first sub-survey), we asked the respondents what was their position and experience was within the company. Most of the answers came from managers or directors who had more than eight years of working experience. The second sub-survey was mostly targeted directly to CEOs and directors of these local and often smaller companies. Therefore, we can consider these following answers as valuable and having a high quality and credibility.

#### 4. Implications for Foreign Trade in Finland

As the global economy was already experiencing growth challenges before the Covid-19 outbreak, it had an impact on Finnish foreign trade in the pre-pandemic era. As Figure 2 illustrates, Finnish exports were declining from the base month (Dec. 2020) in January and February of 2020 by 21.3%. However, the total imports sustained their level until April 2020 (when a decline of 19.7% was experienced). In May 2020, exports continued to decline, and ended up being 29% lower as compared to the base month. The imports in turn levelled off, and showed a minor growth from April to May (ending in an 18.4% decline vs. the base month). If this change is compared to the Finnish foreign trade performance at the time of the Global Financial Crisis (GFC; 2008–2009), it does not differ that much. Of course, it is difficult to interpret what the exact starting month of the crisis was (e.g., did the Covid-19 crisis start in Dec. 2019 or in March 2020, and when did the GFC take exactly place?). If the Covid-19 examination starts from Dec. 2019 (which is the last month of a normal environment), and the GFC examination starts from Oct. 2008, then the latter (GFC) had a bigger downward impact on trade within the first five months (imports fell 25.9% and exports in turn fell 33.4%).





**Figure 2.** Development of Finnish foreign trade in total (“All”) and with China and Russia (2019 December is indexed as 100, and exports are denoted with a dashed line). Source: Finnish Customs [33].

In this research work, we are interested in two emerging markets—namely, Russia and China. The first mentioned country has always been an important trade partner of Finland (and throughout history numerous times has been the largest trade partner of Finland), while the latter has become increasingly important in the previous two decades. Russian imports have performed poorly in the examination period, and this is mostly due to the price of oil declining (import volumes in weight terms have declined 14.8% in the examined five-month period, whereas in euros those import volumes have nearly halved). Russian exports have declined 31.3% in the examination period, while in weight terms these exports have declined only 3.6%. However, what is surprising is the robustness of Chinese trade. At the end of observation period, it was actually at an 8.8% higher level than in Dec. 2019. Exports of Finland to China have been somewhat weaker, but in April 2020 they were 2.8% higher than in the base month, while in May they faced a decline, with the performance being 16.1% lower than in the base month.

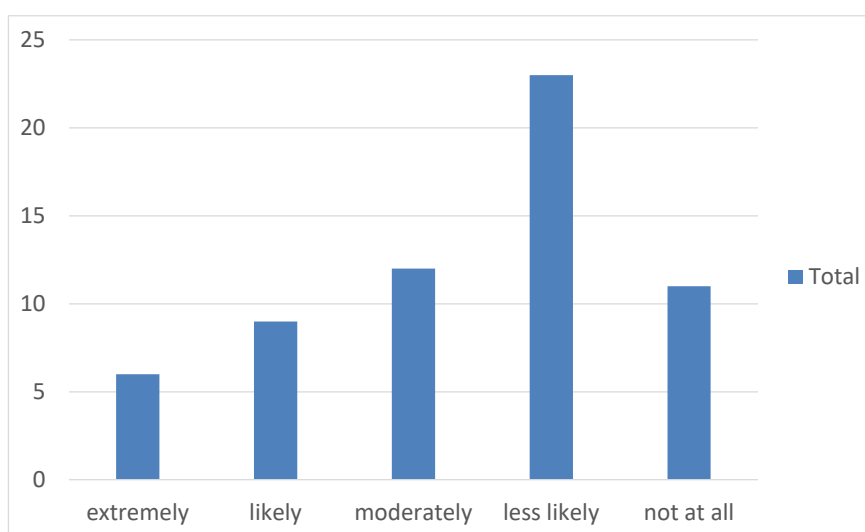
We also did analyze other important trade partners of Finland (in addition to Russia and China), such as Germany (currently the largest), Sweden, Estonia, the USA, and the UK. German trade has, in general, faced around a 20% decline in the examined time period, while Swedish trade in turn showed a 10–15% decline. Interestingly, Estonian trade has sustained its level (and even somewhat grown), while the USA trade showed a decline of 20–30%, as did also the UK trade (with some variation, however imports are clearly declining by 24%).

Therefore, we may conclude that Finnish foreign trade has been hurt due to the Covid-19 pandemic situation. However, some countries (such as China and Estonia) have managed their virus situation very effectively, and these relationships in trade terms have had very little impact (or no impact at all). However, the countries with more challenges in containing the virus are also showing impressive declines in trade terms. Thus, the situation is two-fold, and in comparison to GFC it is even lower in total in its impact. The Covid-19 crisis has been harmful, but in comparison to the previous big crisis it

is not exceptional. The comparison here was made to the base month of December 2019. If we would have chosen this month from the year earlier for comparison, the results would have been similar.

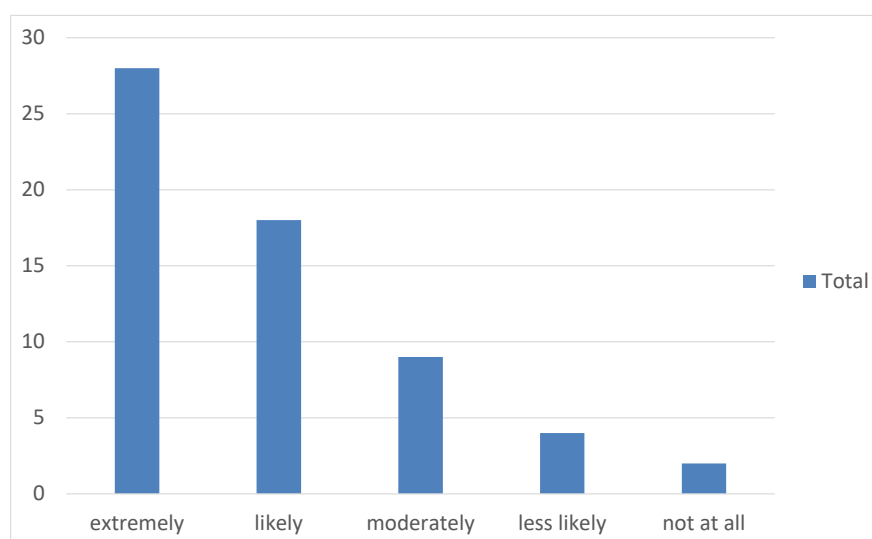
## 5. Survey Findings

Most of the companies responded that the Covid-19 pandemic has not increased, or will increase, their transportation costs (Figure 3). However, it should be noted that, in total, 27 companies (44.3%) responded that their transportation costs shall increase moderately, likely, or extremely. In the survey, we also had a “free comments” space, where the respondents could give their opinions about anything related to the survey topics. Some companies argued that transportation is not the main problem and that related prices will remain as conservative. The closing of supplier factories mattered the most. Another respondent commented that the freight rates of container transport should increase in the forthcoming months. In addition, some argumentation emerged, claiming that lower oil prices increase the pressure for lower transportation costs and larger transportation batches. Thus, regarding transportation costs, the situation is not clear nor consistent. There are numerous factors in the table which give upward price pressure, but also ones that are declining. When we analyzed further companies responding extremely, it was evident that the companies responding so were small or medium-sized, with revenues of less than 20 mill. EUR. The situation remains rather similar in the answer class of likely—two out of nine responses were from larger companies (revenues in hundreds of millions of EUR), while seven responses arose from companies having a revenue of two mill. EUR or less.



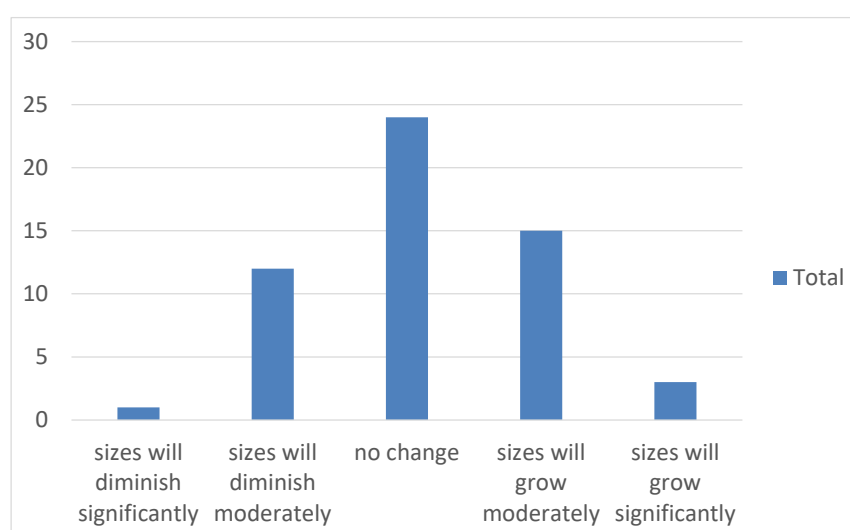
**Figure 3.** How likely is it that the freight transportation cost of your company will increase after the Covid-19 pandemic (n = 61)?

Companies were consistent in their responses regarding meeting customer requirements (Figure 4). In total, 46 companies responded (75.4%) that it was either extremely likely or likely that they met customer requirements. Additionally, in the written free comments within the survey, the companies told us that they had spent time, collaborated, and used technical tools to make deliveries happen for their customers. Some said that logistics routings have been reconsidered, and, in some cases, companies used their Enterprise Resource Planning (ERP) systems to detect deviations and make future demand forecasts. As some respondents commented, their customers were mainly located in Finland or the Baltic states, where the virus has not been that severe a problem, and everything has more or less functioned. Companies responding that they were not at all or less likely to be able to meet customer requirements were representing smaller companies with revenues of less than 10 mill. EUR.



**Figure 4.** How likely is it that your company will be able to meet customer requirements during the Covid-19 pandemic (n = 61)?

In longer-term scenarios, the threat of the virus increasing operating costs or causing other disruptions would lead to higher inventory holdings. As this was asked from the companies concerning their industry (not the company itself) in the next five years', the responses were rather divided (Figure 5). Most of the respondents (24 answers or 43.6%) claimed that there is going to be no change at all. However, quite a few saw inventories either moderately growing (15 answers) or diminishing (12 answers). Only three indicated that inventory holdings shall significantly increase, whereas one said they will do the opposite—significantly diminish. Based on these answers in the longer term, it seems that inventories will not decline on average; however, this outlook contains a lot of industry and company-level variation. Figure 5 could indicate that inventories have a slightly increasing trend. In the free comments of the survey, some companies said that they have increased their buffer inventories due to Covid-19, or that inventories have in general a tendency to increase now.

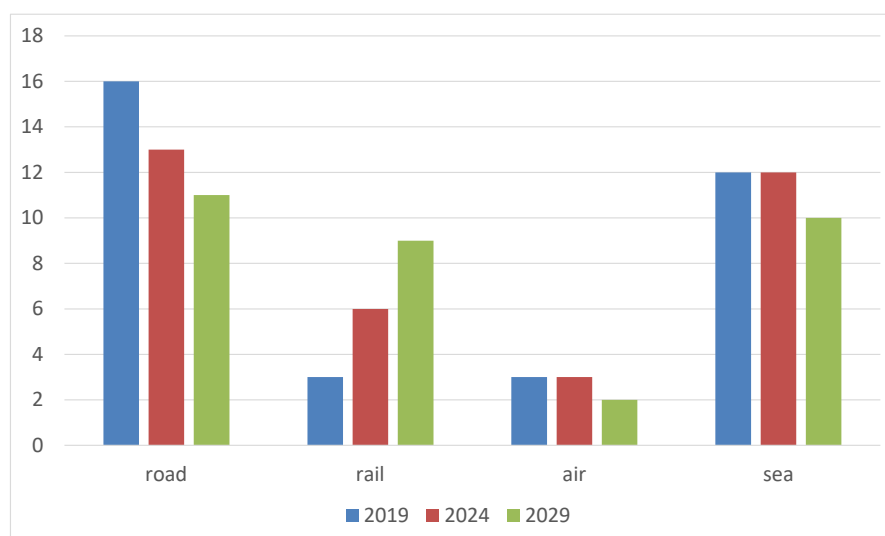


**Figure 5.** Will the inventory sizes change in your industry during the coming five years (n = 55)?

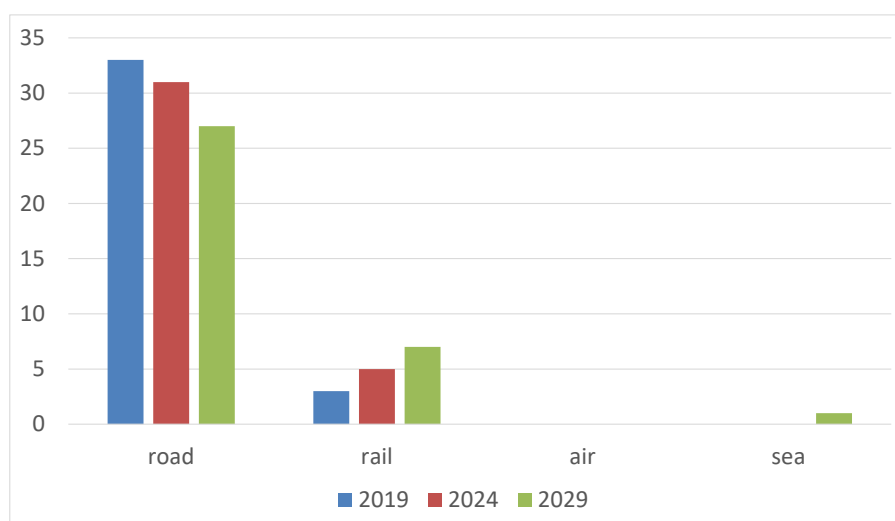
As Finland has land transportation possibilities not only to Russia (by both road and railway), but also to China (mostly railways. with options using only the Trans-Siberian Railway (TSR) and



the route via Mongolia or Kazakhstan), the companies were asked how these might develop in the following decade. For example, changes in the environmental legislation of sea transportation (sulfur, nitrogen, and CO<sub>2</sub> emission prevention costs might increase continental transportation costs) and the current lack of proper air freight connectivity and frequency with increasing prices could change the primary transportation mode to serve Russian and Chinese markets. Indeed, the studied companies indicated that transportation mode changes are taking place with the Chinese (Figure 6) and Russian (Figure 7) markets. There is a clearly identifiable growing trajectory in the Chinese market primary transportation mode—at the end of the current decade, railways should become nearly as important as sea transportation (based on the responses). The One Belt and One Road (OBOR) program container trains have, of course, increased in volume during recent years [34], and especially during the Covid-19 pandemic [35], to connect China with Europe. At least one logistics sector actor is reporting growing their railway container volumes in the aftermath of the Covid-19 crisis within Finland [36].

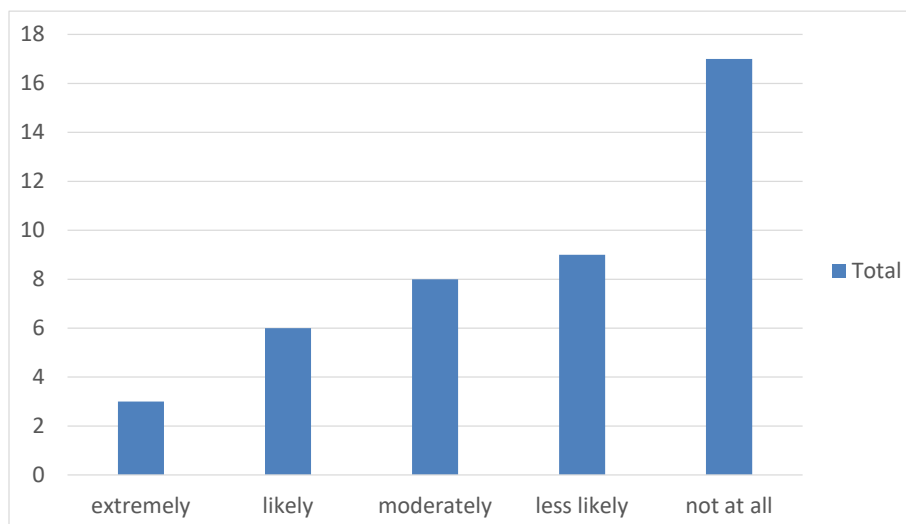


**Figure 6.** What is the primary mode of transportation used in the year 2019, and will be used in the years 2024 and 2029 for the logistics activities of your company in China (n = 34)?

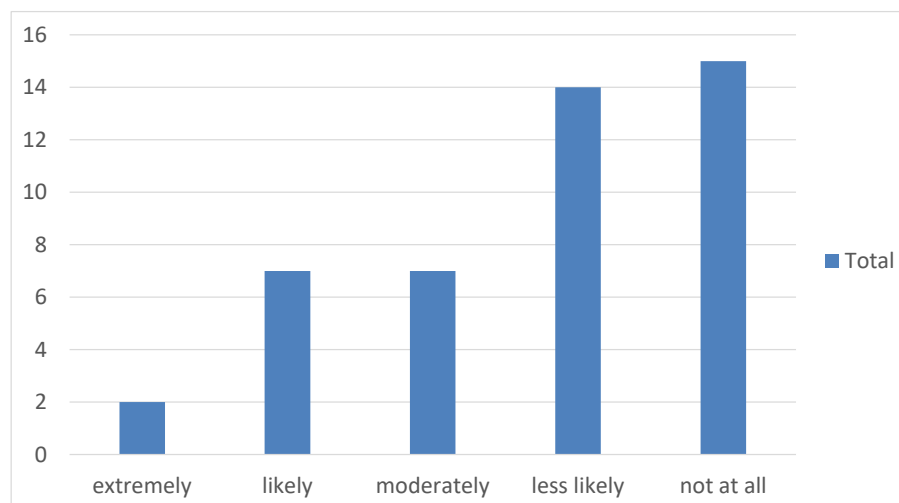


**Figure 7.** What is the primary mode of transportation used in the year 2019, and will be used in the years 2024 and 2029 for the logistics activities of your company in Russia (n = 36)?

Changes in supply chain dependencies was another issue that we asked companies about in order to understand transportation mode changes further. The dependencies on China (Figure 8) and Russia (Figure 9) were examined separately. Most of the companies answered that it is less likely or not at all likely that changes will take place—in the Chinese market, 26 companies answered accordingly (60% of respondents), and in the Russian market 29 companies did so (64%). This could indicate that minimal changes are taking place due to Covid-19. However, nine companies concerning both countries responded that it is likely or extremely likely that changes are taking place (this is 20% of responses concerning Russia and 21% in the case of China). Therefore, it could be the case that in some companies these changes are on the agenda.



**Figure 8.** How likely is it that long-term supply chain dependencies to China will change due to the Covid-19 pandemic (n = 43)?



**Figure 9.** How likely is it that long-term supply chain dependencies to Russia will change due to the Covid-19 pandemic (n = 45)?

In the free answers of the survey, some companies stated that all depends on the second wave of Covid-19, and whether it will appear or not. However, there were also answers claiming that everything will be just like before in 2021, or that Covid-19 has not had that much impact at all or the impacts have been just minor. Some complained about the lack of governmental support in the situation, as their volumes were suddenly disappearing.

## 6. Conclusions

Before Covid-19, the modern and globalized world had only experience of limited (geographical terms) and short-duration viruses [3,4,6,8]. These have had numerous economic implications, however often on earlier occasions it has been the case that the tertiary sector has been affected and the effects on the secondary sector have been limited. In addition, foreign trade has been affected in a rather small fashion. Still, it should be emphasized that this does not mean that earlier viruses would not have had any relation with the secondary sector. They most often have—within virus-infected areas, investment outflows have been experienced [9], the risk margins of investors have risen [23], and orders have been temporarily lost [4,8]. This all has translated to smaller economic, trade, and manufacturing growth in the future. Although these virus-affected areas have been able to grow after, e.g., the SARS epidemic, some economic potential has been lost.

What is new in the Covid-19 virus pandemic is that it is global and it has been rather long in duration (already, if compared to, e.g., SARS). As, in this research, we analyzed the situation in Northern Europe, and mostly Finland, and within the manufacturing and logistics sectors, it is notable that Covid-19 has had implications on this sector. In some respects, the changes have been rather significant—foreign trade has declined under the Covid-19 era by 20–30% from December 2019, and exports have shown a higher downward pressure. In country-level analyses, it was found that not all trade with other countries has suffered in the Covid-19 era—e.g., the Chinese and Estonian trade volumes have been sustained rather well (and in some cases even grown). However, Russian trade has been in free fall, but this is mostly in price terms and not that much due to volumes.

Within the completed survey, the companies in general indicated that they have survived the Covid-19 pandemic rather well so far—their customer requirements have been, in most cases, fulfilled. Transportation costs have not grown significantly, and companies do not see inventories growing in the longer term that much. However, there are exceptions to these on a company level—some companies were indicating and communicating that transportation costs will face increases, and some companies in turn commented that they have increased inventories due to Covid-19. What is consistent in these survey responses is the change in the used transportation modes. Especially for distant markets and operations, like those to China, railways have momentum for volume growth in the following decade. This seems to also be the case in part concerning Russian operations. Entire supply chain dependencies are under some change in these markets too, but not in all respondent companies. Companies are, however, cautious about a possible second wave of Covid-19. This is in line with previous research, where longer-duration implications of the virus on the economy are more apparent, and especially affecting trade and investments for a long time [23]. Additionally, the inactivity of large companies in participating in this survey might be a signal of their cautiousness.

Additionally, within the survey some companies complained about their situation during the pandemic or their responses indicated that they were experiencing troublesome times. As revealed in further analyzing the companies saying that transportation costs increased extremely or that the companies were not able to serve customers well, all these responses were arising from small and medium-sized companies. Therefore, we may conclude that the pandemic effects have not been symmetric, and policy responses should be based on this fact. Providing wide economic support throughout these sectors would most probably be a mistake; however, in some particular cases, it might not. Most probably, smaller companies are in need of aid. This, of course, concerns the first wave of the pandemic; however, in the second wave, the situation could be entirely different, and wider support could be needed as a policy response. In the survey, it was indicated that transportation costs were not a major issue for companies. However, connectivity was felt as an important factor. Therefore, this should gain policy attention from the very beginning of pandemics.

As a further research, we would like to continue the theme of this research, but with company-level interviews using a case study methodology. We would be interested in accumulating knowledge on how prepared companies are for transportation mode changes. Will they use a catalogue of numerous transportation modes as a hedge to reach distant markets and have functional operations under

uncertainty? Or, is this change towards railways going to be rather straight-forward and favoring a single mode? Together with these, we would be eager to study the possible supply chain dependency changes due to the Covid-19 pandemic.

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