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**HOW COVID-19 AFFECTED CONTAINER LINE
SHIPPING COMPANIES IN GREECE**

‘Αννινου Ουρανία

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The Committee's members were as follows:

1. DIONYSIOS POLEMIS
2. VASILIOS NAOUM
3. JOHN LAGOUDIS

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ABSTRACT

The Covid-19 pandemic has had a significant impact on the strategic decisions of companies in the global economy and supply chains. That is why this study studies the impact of the shortage of ship containers caused by the Covid-19 pandemic on maritime transport and international trade, as well as the importance of risk management strategies to better prepare and conduct research for future supply shortages and disruptions. The research methodology consists of four stages aimed at collecting qualitative and quantitative data and prioritizing research work. As a result, it analyses the impact of the Covid-19 pandemic-induced shortage of ship containers on maritime transport and international trade, and the impact of Covid-19 on the company's strategic management, resilience and preparedness. Finally, all stakeholders interested in international trade, maritime freight transportation and risk management will benefit from value-added knowledge and high-quality documentation, which contributes to a review of the current literature in the field of study.

Keywords: COVID-19, International trade, Maritime Industry, Container line, Shipping companies

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INTRODUCTION

For the past two years, the COVID-19 disease has dominated the headlines of all the media as a global health and economic crisis, which has caused serious upheavals and setbacks in almost every area of life. The COVID-19 crisis has spread at lightning speed around the world due to the interconnectedness of today's societies and economies. However, the impact has been extremely uneven between developed and less protected countries.

In particular, at the beginning of the pandemic the huge disruptions to trade and investment were a testament to this. Nevertheless, the COVID-19 pandemic is no longer a mainstream topic, as the world's attention has turned, particularly to the war in Ukraine with its numerous devastating consequences. To examine the economic impact of both the pandemic and the war, the reports of various organizations such as the OECD, the World Trade Organization,

the World Bank, the IMF and UNCTAD were used. This report aims to assess the changes that the pandemic and war have caused to the global economy and international trade.

The transport of goods and passengers, as analyzed in the study of I.O.B.E. Coastal transport and its development entails significant benefits for the domestic economy and social progress. Due to the pandemic, there were liners in many ports of the country that did not operate the scheduled domestic itineraries. This has resulted both in the loss of jobs of their employees and in the need for shipowners to seek subsidies from the state in order to cope with the loss of revenue resulting from this suspension of services. Freight traffic fell significantly, resulting in lower freight rates, while tourism suffered a significant blow.

The largest shipping companies active in the transport of dry bulk cargo (e.g. iron ore, coal, grain) suffered significant losses and containerships, with the closure of factories and borders, remained trapped in warehouses in various ports, the smooth movement of ships, due to the restrictions imposed on the movements of both passengers and crew members (mainly passenger ships), Difficulties in approaching ports in dangerous areas, strict controls in ports and, above all, measures of various states that restricted economic activity, resulting in further restrictions on international trade and additional charges due to the reorientation of goods to alternative destinations.

The purpose of this thesis is through the literature review to determine whether the shipping industry has been affected by the negative disruptions caused by the Covid-19 pandemic and especially the case of container shipping companies.

The methodology to be used is the critical review of the literature. Bibliographic reviews are secondary publications and aim to present already published data in aggregate, in order to investigate an object from different perspectives, to compare and group the results of different researches and to highlight this topic in all its dimensions, according to the international bibliography.

CHAPTER 1: LITERATURE REVIEW

1.1. International Maritime Trade

1.1.1 General transport

The history of transport is directly linked to the existence of human life. Man from the primordial era moved, walking various routes either in search of food, or in search of his natural environment, or in need of a shelter (shelter, cave) to guard him from possible dangers of nature. But he soon realized that his physical endurance to travel long distances, let alone carrying weights, was limited.

The lack of physical strength led man to discover various means of transport, both for himself and for his various objects and goods. Initially, it started with the use of animals on land and then through the use of the canon in rivers and lakes it expanded to the sea. So gradually it moved from the wheel, paddle, sail and steam to modern and technologically advanced means of transport.

The role of transport is a vital part of the economic and social course of a state. Transport is not an end in itself, but provides its service for other sectors of the economy, such as industry, agriculture, commerce, tourism, etc. The production process of a country is directly dependent on transport, through which its goods are transported and exchanged with other countries.

Consequently, transport has a strong influence on the economic and social development of a country and the link between them is international trade transactions. The significance per type of transport is usually not the same in all countries and the choice of the most appropriate form is based on the best coverage and satisfaction of the interests of each country.

The forms of transport are divided into:

- Road
- Rail
- Aerial
- Sea

The national security and economic development provided by maritime transport differs from country to country depending on its economic, social and political level but also on various criteria, such as the existence of their own cargoes, merchant fleets, etc. The choice for the appropriate form of transport of each country is directly influenced by many factors, as Papagiannoulis (2002) states, it is:

- The geographical position of the country as well as the morphology of its terrain
- the extent of inland waterways;
- the economic and technological situation of the country
- the type and form of the country's internal market;

- the direction of the bulk of international trade
- even the mentality and psychosynthesis of the country's nationals

Several attempts have been made to define transport economics in a general way. One such definition is "*Transport Economics is that branch of Economics whose object is the study of the optimization of the distribution of wealth-producing resources on the one hand between transport industries and on the other hand between the transport sector as a whole and other sector of economic activity*" (Sambrakos, 2018).

At this point it should be noted that transport economics is not a separate branch of economics, although until the mid-1970s the application of economic theories in the transport sector was quite limited, over time as knowledge increases it becomes more and more difficult for economists to follow developments in their field and therefore requires further specialization.

The most important "tools" used by transport economists are based on microeconomic theory. However, with the passage of time the economic instruments used by transport economists have changed. Initially, they focused on issues of competition, organization and pricing, and then focused on the effects of transport services on economic activity.

1.1.2 The origins of maritime trade

The history of maritime trade is divided into three phases. Initially, it started in the Mediterranean and spread through Greece, Rome and Venice to Amsterdam, London and Antwerp. During this phase, a global trade network developed between the three largest population centers, India, China and Europe. In the beginning, trade was carried out by land and was expensive and slow, but at the end of the 15th century, with the opening of sea routes, trade volumes increased and transport costs decreased.

The second phase was caused by the industrial revolution in the late 18th century. Pioneering changes in ship design, shipbuilding and global communications made it possible to transform shipping from local to global, first through the London Freight Exchange and then through reliable steamships and technological innovations such as the Suez Canal. During the next century, trade developed rapidly, while the context of maritime trade changed completely.

Finally, in the second half of the 20th century the intensity of technological and economic changes was created by the dissolution of colonial empires, which through Bretton-Woods agreements were replaced by a framework of free economy and trade. During this last phase we

experienced the development of bulk carrier markets, the conduct of specialized transport operations and the use of containers. A great point of this revolution was that shipping moved away from nation states with the use of flags of convenience. This brought economies of scale and changed the economic context of the industry.

The conclusion is that shipping is a business activity that has developed with the global economy and is constantly changing. Today we refer to a global business community, based on free trade and communication. Perhaps this will change. However, according to Adam Smith despite the prevailing conditions, *"such are the advantages of transportation by sea that... The convenience they create gives the whole world access to products of all forms of work."*

1.1.3 The contribution of shipping

Shipping is defined as the set of human activities necessary to carry out the maritime transport of things and persons (Mylonopoulos, 2004, p.27). Shipping contributes to the economic development of states, as:

- Serves maritime trade
- It connects the ports of a country or states
- It contributes to the increase of national income through the inflow of maritime currency.
- It provides jobs to the country's workforce and several times to the workforce of foreign countries.
- It creates additional economic activities (direct and indirect) such as production of marine equipment, insurance, shipbuilding, etc.

In addition, shipping contributes to the cultural evolution of peoples, with the main component being the ship and its people, through which ideas and customs are disseminated during a voyage by ship with their arrival in ports of various countries. In this way, crew and passengers come into contact with various peoples and thus develop a two-way cultural relationship, which shapes new forms of relations between cultures.

1.1.4 Pros and cons of maritime transport

It is an undeniable fact that shipping is a pillar of today's economy internationally as it covers 80-85% of international trade conducted by ships (wikipedia.org.,2020). The role of

Greek-owned shipping is decisive, which holds the first place worldwide and according to a recent UNCTAD report represents 17.64% of the world fleet in terms of tonnage (Maritime Years, 2021). However, despite the importance of maritime transport, there are also some negative points, as in all transport sectors, which we will mention along with the positives below. According to Eurosender they are:

Advantages of maritime transport

- There is the possibility of transporting a variety of products, with the existence of many different ships and routes.
- They are the most environmentally friendly mode of transport compared to fuel consumption per weight transported.
- Large quantities of maritime cargo transport alongside long distances have a low-price advantage.
- Regarding maintenance, maritime transport has lower costs than others such as rail or road transport.
- The maritime transport industry is the safest mode of international transport.
- It is possible to transport dangerous goods safely, which is not possible by other transport services.

Disadvantages of maritime transport

- Sea transport is not recommended for products that are time-sensitive as they are very slow.
- Financially they are not profitable for short-haul freight shipments.
- Further internal transport procedures are needed after their origin in port in order to reach their final destination.
- Vulnerable to weather conditions such as storms and drought.
- It is demanding to monitor sea cargo.
- The biggest fear for maritime transport is the phenomenon of piracy

1.2. Ship

1.2.1 Evolution of the ship

In the old days, when people referred to ships, they simply meant the ability to transport people and things through the water element (sea, river, lake) and nothing more. Over the centuries, however, the need to separate, initially on the same ship, the space for transporting things from the space for transporting people began to become apparent. Until the beginning of the last century, technological developments were faint and were mainly located in the various variations of motive power and craft. During the 19th century, two important changes played a role in the field of shipbuilding (Mylonopoulos, 2004):

- i. The propulsion force through the use of steam became mechanical.
- ii. As far as the construction material is concerned, iron and other metals were used in the construction of ships.

Over time, the division of ships into passenger and cargo ships began and the trend was formed for the construction of special ships for the transport of specific cargoes. This development for the creation of specialized ships stems from the need for more efficient, economical and faster cargo transport (Cai & Hayakawa, 2020).

The new views that prevailed in shipping wanted the ship to have a strong construction to travel dangerous sea routes and not be forced to go off course until the weather conditions improve, to have speed to minimize the travel time and to have such layout and equipment the ship, so that loading and unloading is carried out quickly in ports with the least possible time spent in them. Therefore, the purpose of each shipping company during the year was to pursue the best economic result, i.e., the largest possible cargo transport in the minimum time and at the lowest possible cost (Cai & Hayakawa, 2020).

1.2.2 Post-war developments

In the effort to fulfill the above goal, the following trends are formed after the war: (Mylonopoulos, 2004)

1. Tendency to gigantism of ships
2. Trend towards specialisation of ship-based transport
3. Trend towards standardisation of ships
4. Tendency for automation of the movement of ships and the conduct of work on them.

More specifically about these trends we have:

1. Tendency towards gigantism: The trend towards the construction of a large tonnage ship aims at the maximum exploitation of the main advantage of the ship over other means of transport (plane, train, car) which lies in the low cost of the unit weight or volume of cargo carried.

The following contributed to the encouragement of the construction of ships with large tonnage:

- Intense competition in the international transport race between consignees, shippers and shipowners.
- The continuous pursuit of the wider international shipping industry to replace its older ships.
- The increase of the production capacity of the shipyards.
- The improvement of technical methods of improvement.

2. Trend towards specialization of transport and ships: The specialization in maritime transport falls on the one hand on the increase in the transport of goods by sea, on the other hand on the continuous growth of trade. In addition, it is due to the technological reorganizations that occurred in the post-war period and were related to the layout of ship hulls and the means of loading and unloading them and ports.

With the specialization of the ships, the following were achieved:

- The transport of cargoes that need special treatment.
- The fulfillment of the needs of modern industry in a more economical, faster and safer way.
- The reduction of the time spent in the port for loading and unloading and the reduction of the duration of transportation due to the high speed of the ship.

3. Trend towards standardization of ships: The formation of this trend started in Japan but received general acceptance and is one of the peculiarities of post-war shipping. The reasons that contributed to the mass production of standard ships are the following:

- a) The effort of shipyards at international level to increase their production.
- b) The strong desire to offer ships to the market with better quality and lower cost by the shipyard owners.

The advantages presented by the standardization of ships are:

- Fluency and speed
- Reduced shipbuilding costs
- Speed of construction and delivery
- Specialization of crews on ships of the same type that enabled ship owners to move crews between ships.

4. Tendency for automation in the movement of ships and in carrying out work on them:
Automation on ships is due to:

- a) The need to reduce the workforce of ships.
- b) The need to avoid human error.

In modern ships, automatic indication, remote control and recording of data and anomalies in the operation of machinery are used in a wide range. Observing the historical evolution of the ship in maritime transport, we realize that its course followed the flow of general evolution, improved and adapted with technology to better satisfy human needs.

It should also be noted that the form, size and special equipment are the most important "points" on which the main changes over time and not are based. Also, the same elements are what distinguish the type or category of ship which we will analyze in the next section.

1.2.3 Ship categories

Ships can be categorized into four different groups depending on the type of transport they perform, their material of construction, the sea area they sail through and the means of propulsion. Categorizations:

1. Ships depending on the type of transport they perform
 - ❖ Cargo ships
 - ❖ Passenger ships
 - ❖ Special purpose ships
 - ❖ Auxiliary ships
2. Ships depending on the water area they sail through
 - ❖ Ocean-going or seagoing vessels

- ❖ Ships operating in smaller seas
 - ❖ Ferry coasters
 - ❖ Inland waterway vessels
3. Ships according to their material of construction
 - ❖ Wooden ships
 - ❖ Metal ships
 - ❖ Ships of mixed construction
 4. Ships depending on the means of propulsion
 - ❖ Rowing
 - ❖ Sailboats
 - ❖ Motor ships

More specifically, as far as ships are concerned, depending on their type of transport, we have cargo ships, which carry all kinds of cargo and are divided into dry cargo cargo ships, liquid cargo ships and combined cargo ships. Passenger ships carrying passengers and conditionally cargoes and vehicles. Such ships are coastal passenger ships, cruise ships and ocean liners. Special purpose ships are ships created because of the need for fast transport or because of the development of technology which has forced us to build these ships. Special purpose vessels are refrigerated vessels, fishing vessels, oceanographic vessels, training vessels, etc. Auxiliary shipping ships are ships that do not carry cargo or people but ensure and facilitate other ships for their movement by sea.

Regarding the ships and the sea area they sail in, we have ocean-going or ocean-going vessels, these ships cross oceans safely transporting cargo and passengers to all parts of the world. Ships operating in smaller seas are those that have smaller dimensions compared to the previous ones. Ferry ships move either between island and mainland areas, or between ports of a country, carrying people and things. Inland waterway vessels, which carry passengers and cargo from rivers or lakes to offshore ports.

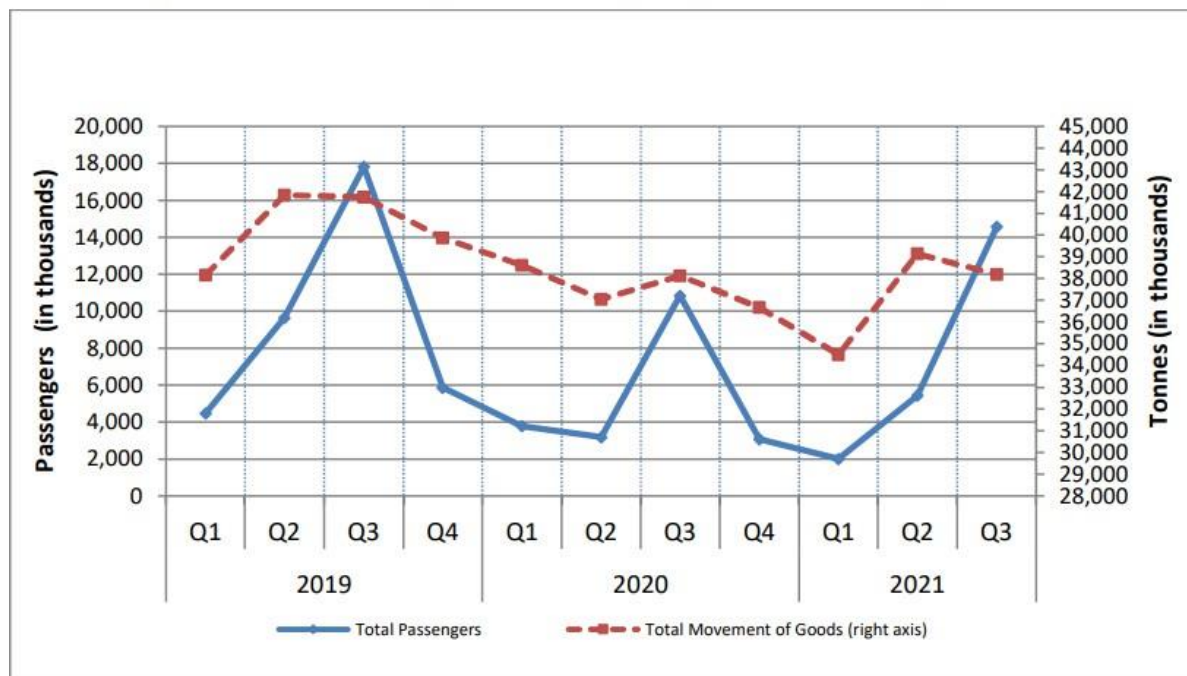
Regarding the construction material of ships, we have wooden ships whose construction material is wood. Metal ships, which are made of metal, and mixed construction ships, which combine wood and metal together for their construction.

The last category refers to ships depending on the means of propulsion. Here we have the rowers, which are the oldest in the history of shipping and are powered by the use of oars.

Sailboats are ships that move with the help of sails (sails) and motor ships, which are driven through a mechanical propulsion system.

We will focus on the first category which refers to the type of transport of ships and then we will make a distinction of cargoes. Below we will present diagrammatically the movement of passengers and goods from the first quarter of 2019 to the third quarter of 2021 according to the Hellenic Statistical Authority (ELSTAT).

Graph 1. Traffic of Passengers and Goods, 1st Quarter 2019 – 3rd Quarter 2021



Source: ELSTAT

In Figure 1 we have a complete picture of passenger and freight transport in the years 2019 to 2021. We observe that since the middle of the third quarter of 2019 we have a downward trend of passengers and goods, which recovered briefly in the third quarter of 2020 and is declining again. It is evident that passenger growth in the third quarter was more pronounced than freight. It makes sense as this quarter represents the summer months during which most people go on holiday to various islands by sea.

1.3. The impact of Covid-19 at European and International Level

The impact of the pandemic on the shipping sector has significantly changed the behavior of European and international shipping and the overall global market landscape, and is now impacting shipping and similar businesses with a focus on Asia. The European shipping industry is at a critical stage as shipping companies, ship owners, charters and sailors face many

challenges, and globally, the shipping industry is documenting increasing challenges not only in the activities of shipyards and other shipping partners but also in personnel changes, inspection, repair issues.

According to a study by the Greek Chamber of Commerce, the shipment of goods from China to ports in Europe and the United States has dropped from 20% to 70%. China, the world's largest export economy, saw a 17% drop in port exports in January and February 2020, and port traffic has fallen by 40%-50% in recent years, even after the situation normalizes and more shipping workers gradually return to work.

In particular, especially in the first months of the pandemic, the movement of goods reached 50%-70%, mainly at many European ports. In April 2020, the European Community Ship Owners' Association (ECSA) conducted a survey on the economic impact of the pandemic on the 15 shipping industry, reviewed the support measures taken by EU countries, and concluded that boats, cruise ships and car carriers were the worst hit, reducing revenue by more than 60%. This was followed by container ships and dry bulkers.

Moreover, at the European level, due to the large number of cases in Italy and the rapid spread of the virus, merchant ships have been banned from Italian ports, and a total of 21 countries in Europe and Asia (France, Spain, Cyprus, the Netherlands, Saudi Arabia and Iraq) have refused to transport goods to Italian ports. For a fortnight their ships were not allowed to be called to other ports. In addition, the port of Rotterdam carries about 470,000,000 tons of cargo annually, most of which come from China and have a volume of 14.5 million pieces. Ship arrivals from TEU, China have fallen by 20% in a week.

Moreover, travel restrictions such as the suspension of international flights and the ban on crew changes at most ports around the world have made it impossible for shipping companies to replace sailors whose employment contracts have expired.

This created hurdles for the renewal of STCW certificates and the approval of stcw certificates of a third country that has expired or expired. "The coronavirus outbreak has shown how dependent the ship is on China's economy," said Peter Sand, senior analyst at BIMCO. If a significant portion of China's labor force is quarantined, the merchant maritime department will be trapped in a dark zone.

According to Alpha Liner, unofficial reports show that about 1.7 million TEU export capacity to China has been cancelled since the end of January 2020 and many of the remaining

vessels are operating below full capacity. Shipping agencies and carriers say truck shortage is a serious factor, with BIMCO19 finding that two-thirds of workers in some states are not attending work. Amid the lifting of US sanctions on Cosco Dalian and the impact of the coronavirus, tanker freight rates have fallen from \$100,000 a day in December to \$18,000 a day in January, so for tankers, essentially damaged, and the impact on Chinese shipyards in terms of shipping profitability is one of the few positive effects. The supply of new shipments has been temporarily limited due to quarantine measures, which will help support freight market rates.

1.3.1 The COVID-19 pandemic versus the 2008-2009 economic crisis

The Covid-19 pandemic has taken the world by surprise and is one of the most serious crises of our time. At first, it was seen as a problem of China and later of Southeast Asia. Around the world, decision-makers thought the disease could be controlled within the region, but due to a few different political, physical and regulatory factors, the epidemic spread rapidly to different parts of the world, and on March 11, 2020, the World Health Organization (WHO) declared Covid-19 a pandemic.

Along the way, to delay the spread of the coronavirus, several countries had imposed a kind of restriction on businesses and people. Other countries had also banned entry to foreigners. The first wave of the pandemic, i.e., the second quarter of 2020, saw strict restrictions and then most countries started lifting these restrictions. As a result, economies started to grow again, for example in the third quarter GDP recorded a positive trend in some countries, such as China (Cai and Hayakawa, 2020).

Although the second wave damaged Western countries in the third quarter, the experience of the first shock helped to better sustain people's economic and social activities during the upcoming pandemic period. Every crisis reveals the weak points of a system and tests its resilience. After the 2008-2009 financial crisis, which led to recession in all OECD countries, the COVID-19 pandemic caused the second global crisis. According to Notteboom, Pallis & Rodrigue (2021), who dealt with the temporal and spatial sequences of the supply and demand shocks of Covid 19 in container ports and the container shipping industry compared to the economic crisis of 2008-2009 they came to some conclusions.

The purpose of this comparison is to understand whether the Covid 19 pandemic and its effects may differ from those of other similar large shocks, to examine the reasons for any different scenarios and to assess whether shipping industries have gained resilience and are now comparatively better able to cope with demand shocks, supply and distribution. A crisis expresses

an event that causes great stress with sudden adjustments in expectations, which the shipping industry is facing. Resilience to shock remains a major challenge for the port industry and global shipping, and every crisis is an opportunity to test their resilience to rapidly changing conditions.

The main difference between the economic crisis of 2008-2009 and the Covid-19 pandemic lies in the externality of the causal factors of the former. The financial crisis stemmed from weakness within the financial system, mainly poor investments and rising assets. The Covid-19 pandemic was an external shock with few warning signs, abruptly affecting trade, supply chains and shipping through forward and backward correction mechanisms.

According to the study by Notteboom et al. (2021), several differences were observed in the adjustment mechanisms that the shipping industry has used to adapt to shocks. During the two crises, capacity management in container shipping has very different results.

Unlike the financial crisis, where shipping companies were unable to properly manage their total tonnage, resulting in poor levels of vessel utilization, noticeable corrosion and rescue programs, Covid-19 redefined shipping companies' bargaining power and market position, pushing up freight rates and creating a positive impact on financial results. Shipping with its relatively inelastic demand has traditionally been a major problem for the economic performance of liners operating commercial lines with container ships.

After the financial crisis of 2008-2009, container shipping entered a period of reduced freight rates and low or even negative operating margins, created, in part, by the market's overcapacity compared to demand. As reported in a recent survey by The Maritime Economist (ME-MAG), an initiative of the International Association of Maritime Economists, the upheavals over strategic alliances and a major wave of consolidation in 2014-2017 initially did not bring about significant changes. The Covid-19 pandemic seems to be playing a key role for the liner shipping industry.

The key lesson is that proper capacity management is an important resilience strategy to mitigate disruptions in the shipping industry. Shipping companies have reviewed their capacity management strategies in the face of reduced demand. The result of efficient capacity management by carriers was that fares were not reduced in the first half of 2020. The volume of shipments increased from summer 2020 onwards, on the one hand due to the increase in consumer demand created by the increased number of vaccinated people of the general population and on the other hand due to the need to replenish stocks.

The continued increase in demand has led to a shortage of capacity on both vessels in terms of boxes and containers, resulting in sudden increases in both freight rates and profits for carriers. For example, the Container Index (SFCI) reached a record 4,100 units at the end of July 2021, while in the period 2016-2019 the index fluctuated between +5%/-10% (Proto Thema, 2021). The Covid-19 pandemic is a good opportunity for shipping companies to do a comprehensive rethink of how they operate and their business at all levels. Also, high fares can incentivise service companies and new entrants to consider their involvement in container transport.

Specifically, he mentioned that:

1) ships in the USA in order to be served by the ports and continue their journeys required 10-70 days.

2) Due to the excessive demand for services, ships cannot be served in European ports, resulting in 383 suspensions since July. *"Cumulatively: the port industry and transport chains are unable to serve the increased demand (we are in the 3rd phase of response after the pandemic – "demand growth") and create fertile ground for the rise of prices"* and adds: *"In conclusion, the problem lies rather in the functionality of the transport chain and the disruption caused by the pandemic, and much less in the "alliances" of shipping companies (and the European/international institutional framework of the which allows them).*

The confirmation of the analyses will only take place when the new (post-Covid-19) "normality" is restored." In addition, global terminal operators adapted well in advance to the demands brought about by the two economic shocks. Operators of the terminals and financial institutions a decade ago reconsidered ownership of the terminals and even continued operations due to the high cost of entering the container market.

Nevertheless, global operators not only financially outperformed container lines, but also managed during the economic crisis and the COVID-19 pandemic to maintain positive EBITDA margins. In part this is the result of a range of rationalisation strategies, including intensified risk, postponement or cancellation of terminal or construction projects, and market risk sharing. Ports continue to be considered long-term investments, and the COVID-19 pandemic bears no influence on this assessment.

It should also be noted that port and terminal operators in times of lower, and sometimes non-existent, demand and disruption of economic activity have demonstrated remarkable

operational adaptability to events. However, ports have had to handle fewer ships without the sharp drop in calls since the latest economic shock.

Compared to the crisis of 2008-2009, the levels of use of container ships have increased this time. Although new work protocols (health needs, social distancing, teleworking of administrative staff, shortage of dockers) force them to adopt new operating principles, the operational challenges created by larger and more used ships were effectively addressed.

According to research by Notteboom et al. (2021) no correlation was found between traffic changes that occurred during the 2008–2009 financial crisis and those that took place in the first half of 2020, either regionally or globally. This makes us hesitant to take into account the dynamic container traffic seen during the economic crisis as a predictor of the potential impact of COVID 19 on ports.

At the same time, the effects of COVID 19 have been different by region and by port (size of ships deployed, container throughput, total developing capacity). The great diversity in traffic patterns and connectivity levels between ports means the vulnerability of ports largely depends on carriers' cargo mix, port call options, and the port's position in the global maritime network and its hinterland (Notteboom et al., 2021).

In their study, they also examined the short-term impact of COVID-19 compared to that of the 2008-2009 financial crisis, revealing the peculiar effects of each crisis on maritime supply chains. They also revealed the admirable and increased resilience of shipping companies, terminal operators and ports, partly due to the risk rediscovered after the 2008-2009 financial crisis and partly due to organisational changes in these industries. While research into the long-term effects of the pandemic will be conducted in due course, their findings confirm that every crisis is also a backdrop for structural change and opportunities for improvement.

1.3.2 Economic forecasts

The Covid-19 pandemic has taken the world by surprise and is one of the most serious crises of our time. At first, it was seen as a problem of China and later of Southeast Asia. Around the world, decision-makers thought the disease could be controlled within the region, but due to a few different political, physical and regulatory factors, the epidemic spread rapidly to different parts of the world, and on March 11, 2020, the World Health Organization (WHO) declared Covid-19 a pandemic. Along the way, to delay the spread of the coronavirus, several countries

had imposed a kind of restriction on businesses and people. Other countries had also banned entry to foreigners.

The first wave of the pandemic, i.e., the second quarter of 2020, saw strict restrictions and then most countries started lifting these restrictions. As a result, economies started to grow again, for example in the third quarter GDP recorded a positive trend in some countries, such as China (Cai & Hayakawa, 2020). Although the second wave damaged Western countries in the third quarter, the experience of the first shock helped to better sustain people's economic and social activities during the upcoming pandemic period.

Every crisis reveals the weak points of a system and tests its resilience. After the 2008-2009 financial crisis, which led to recession in all OECD countries, the COVID-19 pandemic caused the second global crisis. According to Notteboom, Pallis & Rodrigue (2021), who dealt with the temporal and spatial sequences of the supply and demand shocks of Covid 19 in container ports and the container shipping industry compared to the economic crisis of 2008-2009 they came to some conclusions. The purpose of this comparison is to understand whether the Covid 19 pandemic and its effects may differ from those of other similar large shocks, to examine the reasons for any different scenarios and to assess whether shipping industries have gained resilience and are now comparatively better able to cope with demand shocks, supply and distribution.

A crisis expresses an event that causes great stress with sudden adjustments in expectations, which the shipping industry is facing. Resilience to shock remains a major challenge for the port industry and global shipping, and every crisis is an opportunity to test their resilience to rapidly changing conditions. The main difference between the economic crisis of 2008-2009 and the Covid-19 pandemic lies in the externality of the causal factors of the former. The financial crisis stemmed from weakness within the financial system, mainly poor investments and rising assets. The Covid-19 pandemic was an external shock with few warning signs, abruptly affecting trade, supply chains and shipping through forward and backward correction mechanisms.

According to the study by Notteboom et al. (2021), several differences were observed in the adjustment mechanisms that the shipping industry has used to adapt to shocks. During the two crises, capacity management in container shipping has very different results. Unlike the financial crisis, where shipping companies were unable to properly manage their total tonnage, resulting in poor levels of vessel utilization, noticeable corrosion and rescue programs, Covid-

19 redefined shipping companies' bargaining power and market position, pushing up freight rates and creating a positive impact on financial results.

Shipping with its relatively inelastic demand has traditionally been a major problem for the economic performance of liners operating commercial lines with container ships. Following the economic crisis of 2008-2009, container shipping entered a period of reduced freight rates and low or even negative operating margins, created, in part, by market overcapacity compared to demand. As reported in a recent survey by The Maritime Economist (ME-MAG), an initiative of the International Association of Maritime Economists, the upheavals over strategic alliances and a major wave of consolidation in 2014-2017 initially did not bring about significant changes. The Covid-19 pandemic seems to be playing a key role for the liner shipping industry.

The key lesson is that proper capacity management is an important resilience strategy to mitigate disruptions in the shipping industry. Shipping companies have reviewed their capacity management strategies in the face of reduced demand. The result of efficient capacity management by carriers was that fares were not reduced in the first half of 2020. The volume of shipments increased from summer 2020 onwards, on the one hand due to the increase in consumer demand created by the increased number of vaccinated people of the general population and on the other hand due to the need to replenish stocks. The continued increase in demand has led to a shortage of capacity on both vessels in terms of boxes and containers, resulting in sudden increases in both freight rates and profits for carriers. For example, the Container Index (SFCI) reached a record 4,100 units at the end of July 2021, while in the period 2016-2019 the index fluctuated between +5%/-10% (Notteboom et al., 2021).

The Covid-19 pandemic is a good opportunity for shipping companies to do a comprehensive rethink of how they operate and their business at all levels. Also, high fares can incentivise service companies and new entrants to consider their involvement in container transport. University of the Aegean professor Thanos Pallis (2021) commented on the increases in container shipping prices, concluding that "the problem lies rather in the functionality of the transport chain and the disruption caused by the pandemic, and much less in the "alliances" of shipping companies".

Specifically, he stated that:

1) Ships in the USA in order to be served from the ports and continue their journeys required 10-70 days.

2) Due to the excessive demand for services, ships cannot be served in European ports, resulting in 383 suspensions since July.

"Cumulatively: the port industry and transport chains are unable to serve the increased demand (we are in the 3rd phase of response after the pandemic – "demand growth") and create fertile ground for rising prices" and adds:

"In conclusion, the problem lies rather in the functionality of the transport chain and the disruption caused by the pandemic, and much less in the "alliances" of shipping companies (and the European/international institutional framework that allows them). The confirmation of the analyses will only take place when the new (post-Covid-19) "normality" is restored."

In addition, global terminal operators adapted well in advance to the demands brought about by the two economic shocks. Operators of the terminals and financial institutions a decade ago reconsidered ownership of the terminals and even continued operations due to the high cost of entering the container market. Nevertheless, global operators not only financially outperformed container lines, but also managed during the economic crisis and the COVID-19 pandemic to maintain positive EBITDA margins.

In part this is the result of a range of rationalisation strategies, including intensified risk, postponement or cancellation of terminal or construction projects, and market risk sharing. Ports continue to be considered long-term investments, and the COVID-19 pandemic bears no influence on this assessment.

It should also be noted that port and terminal operators in times of lower, and sometimes non-existent, demand and disruption of economic activity have demonstrated remarkable operational adaptability to events. However, ports have had to handle fewer ships without the sharp drop in calls since the latest economic shock. Compared to the crisis of 2008-2009, the levels of use of container ships have increased this time. Although new work protocols (health needs, social distancing, teleworking of administrative staff, shortage of dockers) force them to adopt new operating principles, the operational challenges created by larger and more used ships were effectively addressed.

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1.3.3 Shanghai Port

Following the zero-Covid strategy, China imposed a harsh lockdown, aimed at limiting the transmission of the Omicron variant of the coronavirus, significantly damaged the port of Shanghai. Considering this particular case is essential as it has a huge impact both globally and on China's economy (Lifo, 2022, April 18).

After the initial outbreak of the coronavirus in Wuhan and the huge economic contraction that China's economy suffered in 2020, recording the smallest economic growth at -6.8% in the first quarter of 2020 for over 40 years, the Chinese economy has been recording gigantic growth since the very first quarter of 2021.

Since the end of 2021, the country's economy has been going downhill again, reaching a dramatic state in the second quarter of 2022 with the strict lockdown imposed by China, which was a severe blow to the port of Shanghai. Strict restrictions in Shanghai aimed at preventing the spread of the Omicron variant have brought about significant changes and unrest.

One of the world's largest shipping companies, A.P. Moller-Maersk A/S, also known simply as Maersk, halted refrigerated container contracts in Shanghai due to the strict lockdown that prevented products such as seafood and frozen meat from being transported from the port to the city (newmoney, April 14, 2022). In a briefing note, Ocean Network Express emphasizes that due to the strong pressure on the supply chain from the lockdown, it is causing a build-up of containers at the port of Shanghai. As a result, the electronic infrastructure of the port was not

enough to meet the increased needs of the operation of refrigerators. All this has led Maersk to halt all new deliveries of frozen products to Shanghai until further notice.

Increasing delays in shipping due to the situation in Shanghai, which has the world's largest container port, have put more pressure on global supply chains. Zvi Schreiber, CEO of Hong Kong-based freight booking platform Freightos, said the shutdown affects supply chains in many ways, including a slowdown in port operations, factory shutdowns and a shortage of truck drivers (CNN Business, April 8, 2022).

Moreover, the lockdown in Shanghai imposed by the Chinese authorities has caused significant problems for both exports and the global economy in general. Vincent Starmer, an economist from the Kiel Institute of World Economy, said in a Deutsche Welle report that exports from the port of Shanghai have fallen by 1/3, corresponding to a 30% drop in exports to the rest of the world. The German economist predicted that prices of consumer goods will rise this summer, noting that Germany could be one of the countries most affected by delays, as almost 1/3 of seaborne trade between Europe's largest economy and China moves through the port of Shanghai. Maximilian Butek, Germany's economic representative in China agreed with this view (Kathimerini, April 28, 2022).

Analysts are sounding the code of risk about the global economic consequences of partial or total lockdowns in Chinese cities due to the coronavirus. For example, Lu Ting, Nomura's chief China economist and partner, said "global markets may still be underestimating the impact because much attention remains focused on the Russia-Ukraine conflict and the Federal Reserve's interest rate hikes." Michael Hirson, head of China and Northeast Asia at Eurasia Group, said: "The impact on China is significant and the impact on the global economy is quite significant," adding, "I think we've been facing more instability and economic and social disruption for at least the next six months." On April 13, 2022, Iris Pang, China's chief economist, warned that the Covid crisis in China could have a serious impact on the global economy (economic times, April 14, 2022).

The most extreme and worrisome scenario would be an indefinite lockdown in Shanghai, a city with a population of 25 million and one of China's major production and export hubs. The port of Shanghai, which handled more than 20% of Chinese freight traffic in 2021, is in a situation with no way out. The food supplies stuck there rot as they lack refrigeration. According to a supply chain monitoring platform, there is a reduction in the residence time of exports, and

this is likely because there are no new containers being sent to the docks from warehouses (news 247, April 17, 2022).

In addition to logistics and trade, production and technology were also hit hard by the widespread lockdown in Shanghai. Many cities located in the greater Shanghai area form a huge manufacturing hub with a wealth of options, from automobile manufacturing industries to semiconductors.

In Shanghai, in addition to Tesla's famed Giga factory, General Motors, Ford, Volkswagen (VLKAF) and SAIC Motor (Chinese cars) also have factories in the area. However, strict zero-Covid restrictions have forced many factories to temporarily shut down, causing severe disruptions to key supply chains in the electronics sector and the global automotive industry.

Some such examples are Pegatron, Apple's main supplier, Taiwan's Unimicron Technology, which is Apple's printed circuit board supplier, suspended production until further notice, yet Tesla and Volkswagen factories remain closed for weeks (Lifo, April 18, 2022). The city's industrial production in April 2022 contracted by 61.5% from last year (economic times, May 20, 2022).

China appears to be gradually easing the lockdown in Shanghai, without bringing immediate relief to supply chain congestion. Jeremy Nixon, chief executive of Ocean Network Express Pte, said worker shortages at ports, railroads and trucks in China and the U .S. have caused several ship delays at major ports around the world. This prompted the Biden administration to intervene (economic time, May 20, 2022). While the Port of Shanghai has almost recovered from the effects of the Covid-19 pandemic lockdown with the help of day-to-day operations, this does not seem to mean an end to the shipping crisis.

After the huge drop in the number of containers in February 2020 at the port of Shanghai due to the onset of the COVID-19 pandemic, the trend was mainly upward with faint ups and downs over the months. The next lowest percentage appears in April 2022, recording 17% fewer containers compared to April 2021 and this was caused by the prolonged lockdown imposed by the Chinese authorities.

1.3.4 Commodity prices

The COVID-19 outbreak has played a major role in demand and supply disruptions in commodity markets, causing great volatility in the prices of various commodities. Regarding the functioning of commodity markets, Marshall in 1890 describes how supply and demand determine price, with sellers and buyers as key factors, and how the market demand curve is determined by consumer demand curves. Pindyck (2004) also mentions how commodity markets tend to experience high levels of volatility, which exerts a great influence on investors for their trading strategies.

Erdem and Ünalımsı (2016) write that while from the 1960s to the early 2000s the majority of raw material prices had followed a downward trend, between 2002 and before the 2007 crisis, prices tripled. As a consequence of the crisis, there has been a fall in prices, with a recovery in 2011 and a further decline in 2015. Also, Jacks and Stuermer (2020) report that, after peaking in 2008, prices moved in the opposite direction, losing about 50% of their value. In the last two years with the pandemic, the evolution of things in food prices has followed the same direction as international trade.

CHAPTER 2: CRITICAL ANALYSIS

2.1. Impact of the pandemic on coastal shipping and tourism

As already mentioned above, the pandemic has had a major impact on the coastal shipping and cruise industry, i.e. passenger transportation, which will significantly affect nationally and primarily globally. It is predicted that passenger traffic, not freight traffic, will make the expectations of recovery even more promising. The pandemic caused a "giant wave" in 2020, resulting in a loss of 120 million euros in the sector. In fact, at the national level, where a large number of sailors work on coastal vessels, the blow is very large considering that many jobs depend on this sector for the manpower needed to provide the needs and activities of ships on land.

The pandemic has dealt a particularly severe blow to maritime transport and the domestic economy through expansion. The sector generates 13 billion euros annually and offsets the current account deficit with tourism. The Baltic dry index, which hit an all-time low due to a fall in freight rates in early 2016 and repair delays at China's shipyards, caused further damage to shipping companies.

As far as the cruise industry is concerned, according to the International Cruise Lines Association (CLIA) in 2019, 30 million people traveled worldwide, and the port of Piraeus serves 20 million passengers annually. The cruises are currently being carried out on modern large ships with a capacity of 5,500 passengers, which in many cases has led to the uncontrolled spread of the virus.

The use of common areas and overcrowding on the ship led to the spread with a typical case of the "Diamond Princess", in which 712 coronavirus cases appeared, of which 14 people died. The cruise ship, operated by Princess Cruise Lines, departed from Yokohama on February 4 for a round trip cruise. On January 20, 2020, an 80-year-old passenger from Hong Kong boarded Yokohama and landed in Hong Kong on January 25.

He visited a hospital in Hong Kong on February 1, six days after landing, and tested positive for Covid-19. The ship was scheduled to leave Yokohama for its next cruise on February 4, but announced that it would be postponed the same day to allow Japanese authorities to test passengers and crew still on board.

On February 4, authorities announced that 10 people on board the plane had tested positive for SARS-CoV-2, cancelled cruises and quarantined ships. By the end of March, about 712 (19%) of the 3,711 people on board the Diamond Princess had been infected with Covid-19. Australia has banned cruise ships from foreign ports since March 15. However, four ships that had already sailed in Australia were exempted from stopping and unloading passengers.

On March 19, one of the four exempted ships sailed to New Zealand and landed in Sydney. The cruise ship had to return to Sydney after a passenger reported breathing difficulties. Subsequently, many countries in Southeast Asia banned cruise ships from unloading passengers, fearing that the virus would be introduced through infected passengers and crew.

And even today, cruise ships carrying passengers and crew infected with Covid-19 are looking for safe harbors. It is difficult to find countries and ports where these ships can accommodate and land passengers. Any country can set conditions for entering its ports, and many countries do not allow these ships to enter their ports in search of a safe harbour. These events involving cruise ships raise questions about whether the cruise industry can survive or recover from the effects of the pandemic.

Cruise ships are often registered under the flag of convenience, such as Panama, the Bahamas, and other countries selected for low wages, low wages, and generous health and safety

regulations. The above cases, combined with international bans and restrictions, have led to a continuous decline in demand for coastal vessels and cruises. As a result, cruise line's share price has fallen by 80% since January 2020.

2.2. Impact of the pandemic on marine insurance

Due to the pandemic, the consequences for marine insurance are significant, as costs have skyrocketed to high levels⁶. The disruption of shipping activity to a large extent and the irregularities caused, among others, by the pandemic in the supply chain, resulted in the review and disruption of some insurance clauses and the increase in the cost of marine insurance. The majority of insurance contracts relating to the carriage of goods cover loss or damage caused solely by delay.

The restrictions and measures imposed during the pandemic caused the existence of additional charges for the charterer, due to the need to store or transport the cargoes to an alternative destination. Thus, parties directly and intermediating in maritime transport, such as owners of goods, importers, exporters and insurers, must now take into account factors such as cargo storage, the delay clause for reasons of disruption or interruption of maritime transport, the compensation clause and/or the reasons constituting force majeure allowing the maximum delay; As vulnerable and perishable products, which must be handled according to a strict schedule, now require special and additional insurance.

Thus, the reduced availability of labor that usually occurs with the reduced rate of cargo-cargo handling capacity, now creates the possibility of longer storage time and subsequently the increased number of stored cargoes in a limited space and finally the significant delay in future cargo movements. Finally, in many countries the health control of crews in ports causes additional delays resulting in a burden on the shipowner and not on the charterer.

2.3. Preventing crew changes, traffic restrictions and humanitarian crisis

Internationally, more than 5.3 million confirmed cases and more than 342,000 deaths have been observed so far, with the United States, the United Kingdom and Italy among the countries with the highest number of fatalities from the virus. The direct impact of the virus outbreak is that, by preventing crew shifts, it also affects the daily lives of sailors, who get stuck on ships and are unable to return to their loved ones. Germany, France and the United States are worsening the economic outlook as restrictions, including widespread shutdowns and temporary

restrictions on the free movement of people, remain in place in an effort to reduce the number of new coronavirus cases.

In particular, according to the International Chamber of Shipping (ICS), more than 100,000 sailors have to change ships each month to comply with safety regulations. In particular, travel restrictions imposed by some countries on the movement of ship crews have made it impossible to change crews, especially sailors whose employment contracts have expired, for months in many cases, making it impossible to send them home, exacerbating a humanitarian crisis and increasing risks to the safety of sailors. This results in a health crisis and consequently an economic crisis as well as a humanitarian crisis.

According to the International Chamber of Shipping (ICS), "With more than 1.6 million workers working at sea, sailors are the soul and body of the shipping industry and have not stopped working at most ports internationally despite the mental exhaustion and accumulated stress caused by restrictions and strict regulations. Furthermore, the World Maritime Organization (IMO) states that "personnel rotation is critical to prevent fatigue and protect the health, safety and well-being of sailors, thereby ensuring the safe operation of maritime trade.

The length of the sailor's contract varies, but it usually operates between four and six months on the ship, followed by the period of leave. When you're at sea, you often work 10-12 hours shifts, seven days a week, doing tasks that require constant professional attention. Sailors who spend long hours on board the ship are at risk of negative health consequences, including physical and mental health issues. Thousands of sailors stranded on ships have already complained of fatigue, fatigue, anxiety and mental stress. And sailors who are physically and mentally exhausted are at a higher risk of getting involved in maritime accidents.

After all, crew replacement is required to comply with international maritime regulations relating to safety, health and well-being of sailors and employment. According to the ILO Maritime Labour Convention 2006 (MLC), the maximum continuous period for a sailor to work on a ship without a licence is 11 months. This period may be exceeded in case of "forced majeure", but the extension should be accompanied by appropriate safeguards to prevent abuse and protect the rights of sailors.

According to the IOC, millions of sailors had to stay on board the ship for up to 11 months. In some cases, sailors were not allowed to return home for up to 18 months. In addition, in order to complete the purchase and sale of the ship, a physical delivery of the ship is required, which is carried out by the buyer's staff after completion. However, due to the pandemic response

measures, the buyer's crew is unable or unable to travel to some countries around the world, especially the Far East, where it is customary for most ship deliveries to take place in order to receive the ship, so that the crew of the suppliers face similar difficulties and long delays when returning home. In most cases, they are trapped for at least two weeks before returning.

Moreover, problems arise from the fact that the government of the country of origin must allow incoming flights and, of course, flights to the country can be made from the ship's delivery point to the country, which does not happen frequently, as many countries have restricted incoming flights, so that, apart from direct travel and connecting flights, it has a limit on the number of passengers who can enter 'free' countries and member states. Get entry and part-time residence permits.

In the Far East, personnel rotation is becoming difficult in Japan, South Korea, Vietnam and Singapore, but with the announcement of the latest adoption and tougher measures, in many cases this process is no longer possible, and other countries do not provide fertile ground for its implementation.

2.4. The impact of the pandemic on the logistics industry

The COVID-19 pandemic has also dealt a severe blow to the sector of unhindered distribution of raw materials⁸ by sea⁹, which has manifested itself in huge delays in the supply of Chinese-produced products to international markets. Indicatively, at German logistics company Kühne & Nagel, the decrease in the volume of shipments for transport to and from China decreased in the first quarter of 2020 to double digits.

Furthermore, there have been huge losses in shipping as many ports worldwide are underperforming either due to the new strict standards due to the pandemic or due to lack of sufficient human resources. In general, shipping companies in Europe have halved their capacity in order to balance supply and demand, while in particular, according to a survey conducted by the Association of German Shipowners, the turnover of the German shipping industry fell in March and April by 30-40%.

There has also been a dramatic decline in the US economy and, as the head of the German Association for Transport and Product Distribution in South America, Frank Huster, says: *"Companies operating in this region in the air and maritime transport sector should expect a drastic reduction in their turnover."* *"The blow to the logistics industry in general is huge," says Robert Felkl, director of the Bremen Freight Forwarders' Association, but "the crisis is not*

affecting all hauliers equally... Anyone who works for the car industry has lost almost 100 percent of turnover" and "things are going well in the field of product storage," said Frank Houster, head of the German Association for Transport and Product Distribution.

2.5. Impact of the pandemic on container shipping

First, since the beginning of the COVID-19 crisis, the need for freight and transportation services (e.g., loading and unloading of goods, storage and handling, patrolling and emergency response vessels and towing services, pilots, lasers, etc.) has been a critical factor in the resilience and capacity of goods.

Due to circumstances such as the Covid-19 pandemic, widespread lockdowns and increased restrictions on movement and travel, making the port operational was considered necessary and immediate. These measures are aimed at reducing the pandemic, protecting the health and safety of the port community, and supporting port operations and business continuity. As a result, the port has strengthened its collaboration with the external environment (stakeholders), including coordinating its activities and revising its governance and communication practices while ensuring a coordinated response.

Port services are undoubtedly within the ambit of basic services, as a result of which businesses will be able to operate despite the closure of the country's economy. Employees were also considered necessary as space had to be guaranteed for employed workers to participate in the day-to-day operations of the port.

It should be noted that while the measures imposed to manage the pandemic have allowed the port to operate at full capacity, the measures taken against the port have led to a slight decline in productivity levels in the first few weeks until the new procedures and protocols are defined as the "new normal". The first adjustment was to prioritize "major port activities" to protect processes related to cargo and supply chains and to ensure the delivery of goods deemed necessary to control the pandemic.

"Fast tracks" have been created for medical goods and food and other types of basic services (such as oil production and fuel management). The usefulness of the express lane is that it gives priority to a series of ships, ensuring the availability of pilots and tugs along with the challenge of ensuring cargo and truck handling services.

In addition, this lane provided express licenses for trucks departing (or going) from the port to deliver goods. These special processes have been extended to other types of goods such

as 'non-essential consumer goods'. When applied to the entire port supply chain, it has been observed that the use of "fast tracks" is particularly effective.

To reduce the risk of the pandemic and ensure that there are no disruptions to cargo operations, some ports have temporarily suspended processing of grids of non-essential services. Instead, it focused and ensured the continuation of important port activities such as sea access, mooring and cargo operations. In some cases, port operations have been adapted to new conditions in more adaptive conditions. For example, bunker services have been implemented in mooring areas to reduce the need for mooring.

The implementation of mandatory social distancing and hygiene protocols has affected port operations such as the use of masks. Several port terminal operators have adjusted their working conditions to allow more time while changing shifts due to the measures to be taken to ensure social distancing and the need for cleaning equipment for essential operating vehicles (ship-shore cranes, trucks, side and front loaders) used by workers before each shift change. Although it is common for the size of the port and the type of cargo handled to have a significant impact on the organization of the operation team, most ports have formed teams that do not communicate physically and then use a rotating work system.

These groups usually rotate once a week. Furthermore, it has been observed that in other large port and/or terminal establishments, the number of two-team shifters decreases and the third group is withheld. However, it has been noted that some ports have not made any changes to their operating staff, while at the same time faithfully following protocol implementation measures to protect their employees.

For example, Antwerp has reduced the number of workers in shifts, including adding another group of standby workers. In the same way, Hamburg formed standby teams to limit the number of shifts. Marseille limited its workers to traffic towers, but as a result, limited ships parked in the port to a maximum of three maneuvers at the same time. Busan formed a group of alternative workers consisting of pensioners and others.

Gothenburg has implemented a periodic program in which individuals work in complete isolation in order to prevent the spread of the infection as much as possible. This ensured that critical knowledge was always available and made the freight center move smoothly. On the other side of the Atlantic, in the American port of Houston, a network of activities known as logistics services and management was created according to the "business as usual" model. From a maritime perspective, there has been an increase in the number of ships parked at some ports

(e.g., container trade) or a decrease in coast-based storage capacity (e.g., tanker trade). In response to this, the port once again reviewed its plans to find the appropriate use of existing mooring areas and explored viable options for additional temporary mooring space to achieve maximum service as demand increased.

Overall, the disruption caused by the Covid-19 pandemic did not cause any significant additional delays. Only minor delays (i.e., up to 6 hours) were recorded at the port, and the port adjusted its operations according to the conditions. In the second quarter of 2020, when port operations in many parts of the world had to join the "new normal", operational and labor adjustments did not lead to any new significant delays.

However, some limited delays were inevitable. These delays, for example, can be analyzed as ferry vehicles due to delays related to the loading and unloading of trailers that are not accompanied by Ro/Ro cargo ships and the displacement of workers. In addition, ports have reported greater use of technology as a means of solving problems.

As a result, most ports have been able to avoid major disruptions in cargo operations. The decline in the number of calling vessels in all kinds of maritime trade and the reduction in cargo flow helped avoid major disruptions to cargo operations. However, as container shipping calls for larger vessels loading or unloading more cargo to ports are decreasing, port authorities, terminal and dock operators are under pressure to signal to transporters and carriers that they are "ready for larger ships" and increase productivity so that ports can continue to serve more large container ships.

As demand for goods increases, global supply chains are moving more and more containers around the world. Ports offer a significant incentive to shipping companies to use their facilities compared to their competitors. Major shipping companies such as Maersk, MSC, Cosco and One are the main customers of the port, looking for the most efficient port logistics for loading and unloading. For example, the ports of Long Beach, Los Angeles and San Diego are quite close to each other and account for 40% of US imports (Bloom Global, 2022).

Cargo ships can carry up to 24,000 containers, and they can take up to 4-5 days to land, so saving a few percent efficiency can make a big difference in your operations. All of this leads to a change in plans and a change in priorities, which means companies need to adapt (Bloom Global, 2022).

At this point, enterprises can mitigate some of these port and operator performance issues by: with an in-depth analysis of how ports handle business transportation, as well as with the support of forecast forecasting and modeling, companies can make various proactive changes related to fleet operations, so that fleet operations can be improved (Bloom Global, 2022).

In addition, shipping companies can create their communications with the support of logistics service providers (LSPs) and shipping routes, with the ultimate goal of maximizing visibility to potential delays to overcome these port and carrier performance issues (Bloom Global, 2022).

Some of the aforementioned problems can be minimized through integration with lower-level suppliers, allowing transportation operators to quickly inform suppliers when they expect to receive their goods. Additionally, these problems can be controlled through in-depth reports about the movement of goods, allowing potential problems to be identified and resolved quickly (Blume Global, 2022).

2.6. The costs of shipping companies

2.6.1. Cost categories

To maintain their long-term viability, shipping businesses must ensure that their operating costs do not exceed the revenues they earn from their vessel operations. This chapter will attempt to analyse the nature of shipping companies' costs in terms of their formal cost-benefit ratio in terms of their viability. The costs arise from the operations and activities of the shipping business.

Therefore, understanding the structure and nature of the costs incurred by the shipping business can provide an understanding of the effectiveness of managing its use. Initially, different types of costs for the shipping business will be distinguished. In general analysis, the operating costs of the enterprise can be distinguished as follows (Metaxas, 1968):

- Office expenses
- Cost of capital
- Cost for commissions
- Labour costs
- Other operating costs

If a more professional distinction is attempted, the expenses of shipping companies are divided into capital expenses, operating expenses and travel expenses (Tolofari, 1986). The cost of capital is the cost incurred in acquiring the ship, including the depreciation of the ship during its economic life, as well as the repayment of loans and interest on the acquisition.

Operating costs refer to costs arising from the business activities of the shipping business, where they are often referred to as the operating costs of the business. Operating costs are related to vessel maintenance, labor costs, supplies and vessel safety. Travel expenses are expenses incurred on charter voyages and are usually related to fuel, port dues and costs incurred during loading, unloading and use of the ship in port and port facilities. The cost of travel varies greatly depending on the type of vessel and the voyage and varies greatly depending on the market in which each vessel is located. All of the above include the total costs of a shipping business (Prokop, 2014)

At this point, an additional distinction must be made regarding the cost of transport work. This distinction relates to the time horizon for cost changes. Therefore, the cost of an enterprise is divided into variable costs and fixed costs. Fixed costs remain unchanged, while variable costs are considered costs that change over time. The sum of variable costs and fixed costs shall constitute the total cost. Under this distinction, variable and fixed costs for shipping companies can be considered as follows (Prokop, 2014):

- Variable costs
 - ✓ cargo-related costs
 - ✓ navigation costs
 - ✓ Fuel cost
- Fixed cost
 - ✓ expenses of the ship
 - ✓ salaries / staff expenses
 - ✓ Depreciation
 - ✓ Loan payment

In this chapter, however, costs will be analysed in terms of discrimination provided by business activities. Therefore, in the following sections, costs will be grouped and then analyzed according to the following categories (Prokop, 2014):

- Cost of capital

- Operating costs
- Travel cost

2.6.1.1. Cost of capital

The cost of capital is related to the ship itself. The cost of capital usually represents 40-45% of the total cost of a vessel and is considered a fixed cost because it is an investment. In particular, it relates to the cost of acquiring the ship and other costs associated with the ship as a "fixed asset". Therefore, the cost of capital includes the following categories of expenses (Prokop, 2014):

- Acquisition of a ship

Capital costs refer to the costs incurred to acquire a vessel, including a category of costs associated with the acquisition. The cost of capital varies depending on how the purchase of the vessel is financed, whether it is financed from equity, through borrowing or a combination of both.

- Borrowing costs

Borrowing costs are related to the cost of buying a ship. The cost of borrowing depends on the loan amount, the interest rate amount and the general repayment terms.

- Depreciation

Depreciation is part of the cost of capital. Depreciation is the reduction in the value of a ship due to its use. Basically, through the fixed depreciation method, depreciation is distributed over the life of the ship. Depreciation is the product of the current period of purchases of ships made in the previous year and continues to contribute revenues to shipping companies. Depreciation is not always a fixed expense in shipping activity.

If there are factors, such as damage to the ship's hull or engine, as well as changes in demand conditions, the value of the ship quickly decreases, and the amount of depreciation increases with the prolongation of the economic life of the ship. Changes in future demand do not necessarily mean that a ship's economic life is coming to an end, but the condition of the ship is deteriorating, which is a factor accelerating depreciation.

2.6.1.2. Operating costs

Operating costs are at the heart of a shipping company's costs, as they relate to its core business, namely the operation of a ship. Operating costs are often referred to as a company's

current costs. Essentially, operating costs reflect the day-to-day costs incurred by a shipping company due to ship operations, including certain cyclical costs related to its maintenance.

In summary, the categories of costs involved in operating a ship are as follows (Stopford, 2013):

- Cost of manning a ship

This category refers to expenses related to employees and crew of the company. The cost of manning ships includes wages and salaries, employee insurance and compensation. The number of employees and the company's employment policy are the main factors affecting employee costs. These costs include staff training costs, pensions and union payments. As described in this cost section, the number of employees and staff a company employs has a significant impact on it. Their number is determined by the relevant legislation, which determines the minimum number of crew members depending on the flag to which each ship belongs.

- Repair and maintenance costs

This category lists all the costs required to operate the ship. This is the second largest category of costs after the cost of operating a ship. It includes all the measures that the company must take to place the ship in accordance with the minimum requirements established by the classification and international safety regulations. The costs of this category include standard ship maintenance procedures and related costs, as well as special ship inspections and shipyard tank inspections. The cost of maintenance and repair of a boat depends on the type of boat, its age and general condition. In addition, the area and cost of ship maintenance is determined by the ship's owner's safety framework and international legislation of policy.

In particular, the cost of repairing and maintaining a vessel depends on external and internal factors, in particular, the condition of the ship, market conditions and the technical equipment for its maintenance. In particular, this work must be carried out on a regular basis, as this is a way of checking the airworthiness of a ship. It is worth mentioning that international conventions, such as MARPOL and SOLAS, have always set standards for the airworthiness of ships based on safety and protection of the environment in which the ship operates.

Therefore, ship owners must ensure that the vessel maintains its class in order to maintain buoyancy through regular inspections. The amount of maintenance depends on the level of repairs and maintenance as determined by Class 36 of the vessel. As mentioned earlier, the cost depends on the maintenance policy adopted by the owner company.

In short, the way a company operates its ships (such as loading and unloading flammable cargoes that can damage ship components) and a company's experience with ship repairs, especially in times of downturn in the freight market, have a significant impact on determining the amount of repair costs. In addition, frequent regular maintenance can significantly reduce repair costs.

- Cost of commissions

Ships often require supplies during their voyage at sea, both to meet the needs of the crew and to maintain them. Shipping companies regularly provide the crew with the necessities for accommodation and entertainment on board during the voyage. In addition to food, drinking water and other consumer goods, maintenance and repair of shipboard components often requires supplies and spare parts. All of the above constitute the ship's supplies. In addition, the cost of supply, while part of which is usually included in the category of fuel by ship owners, includes the supply of lubricants for the main and auxiliary engines of the ship.

These supplies cover a variety of consumer goods required to operate the ship. The procurement cost also includes the crew/catering/entertainment (C/V/E) communication costs. Of course, the cost of onboard supplies varies depending on its type and size. The supply also includes marine fuel.

- Cost of insurance

It is well known that a ship can face a number of maritime hazards while sailing. Companies usually insure their ships against these risks. Ship owners must take out insurance for their ship and its machinery (hull and machinery insurance), which covers the company against all or part of the risk of losing the ship.

Another type of compulsory insurance is protection and indemnity insurance (P&I insurance), which protects ship owners from third-party rights and covers lawsuits against third parties (usually for loss or damage to goods). In addition to these two types of insurance, a ship-owning company can insure its ship against risks such as loss of profit, strikes, currency fluctuations, and piracy.

- Administrative costs

Administrative expenses are defined as all general expenses of the company related to its administrative and executive functions. This category usually includes the salaries of employees

located at the company's headquarters or onshore subsidiaries and also includes management fees paid to companies that can operate their ships, as well as fees for all its administrative functions.

It includes crew selection or maintenance inspections. Administrative costs vary from company to company due to the different accounting systems used by each company, as well as their composition, fleet size and management policies. To sum up, it is clear that the ship-owning company can choose whether to manage these management functions itself or to entrust them to a management company, thus adjusting its management costs accordingly.

2.6.1.3. Travel costs

The cost of a trip is a variable cost for the company because it varies with each trip. The cost of the trip includes refueling and lubrication, travel through canals such as Suez and Panama, and port fees. In this section, each of these categories will be examined in order to analyse the structure of costs and the factors that change them. First of all, it should be emphasized that travel costs refer to the number of days the ship is chartered and also includes the number of days the ship is in port waiting for cargo and refueling (Stopford, 2013):

- Fuel costs

The cost of refueling a ship can be most of the variable cost during a voyage. Fuel costs include the ship's consumption at sea and while waiting at port facilities, with its engines running during loading and unloading while maneuvering in port. The amount of fuel costs is determined by the market price.

However, shipping companies can control these costs by influencing the cost/fuel ratio, either by supplying ships with inferior quality fuel, a move that carries the risk of maintaining the ship's mechanical components used by the manufacturer to specific specifications, or by operating at an economical speed.

Costs can also be reduced if companies order large quantities of fuel. As a result, favorable prices are achieved, and therefore this helps to reduce costs. However, it should be stressed at this point that the factors that have the greatest impact on fuel costs are distances travelled and the number of days at sea, especially in relation to diesel consumption.

- Channel transportation costs

This category includes a broad category of costs associated with ships in transit, such as the Suez and Panama Canals. This category includes one-off payments made by ship-owning companies to the Suez Canal Authority for the passage of the canal. This fee is paid regardless of whether the ship passes loaded or empty (ballast) and is a relatively significant cost for companies. Therefore, border crossings through different channels are usually counted in determining the fare. This fee varies depending on the type of vessel and is calculated on the basis of the gross tonnage of the vessel.

- Port cost

Port costs include all costs that a company has to pay when calling at a port. Specifically, these fees, often referred to as port dues, vary depending on the type of vessel and its size. These fees generally relate to the ship's use of port facilities, as well as pilot user fees and various other categories of fees that vary from country to country. The time of arrival at the port and the type of cargo carried by the ship will also modify these charges. Fees vary for each port and depend on each country's legislation and other factors.

However, it often happens that various ship-related costs are borne by the ship owner, while other cargo-related costs are borne by the charterer. In addition, there are costs associated with handling cargo at the port, including loading and unloading and cargo stowage. Regular ferries that often call at the same ports are charged higher than these fees, and therefore regular service companies often make special offers that offer them some kind of discount at one of the ports.

Shipping companies, however, can avoid trading with ports described as "expensive" to avoid such charges, especially when it comes to low-freight cargoes. We should mention at this point that ships of the same capacity are charged the same at the port. However, these costs are borne by the owner only when the ship is chartered to sail.

2.7. The impact of the pandemic on shipping at national level

The COVID-19 pandemic has undoubtedly posed an asymmetric threat to Shipping and Tourism in Greece and has caused irregularities in the operation of the country's major ports. Tourism, shipping, manufacturing and import and export trade with China have been irreparably affected by the pandemic in the Asian economy, with an unknown blow in terms of its strength and duration. Indicatively, China and Greece signed a memorandum of cooperation under the "One Belt, One Road" initiative in 2018, while in April 2019 Greece became a full member of

the 17+1 Initiative, a mechanism for the cooperation of Central and Eastern European countries with China (Georgas, 2020).

These two cover a wide range of partnerships in trade, investment, infrastructure, agriculture, science and technology, finance, shipping, people-to-people exchanges, etc. None of this will remain unscathed. Already the first unsafe estimates speak of losses of up to EUR 1 billion. euros for the country's economy. According to executives of Greek shipping, which make up 51% of the European and 20% of the world, Greek shipping has been significantly affected by the pandemic. Initially, the pandemic at national level had an impact on ports with main routes, such as Piraeus and secondarily on supply ports, such as Thessaloniki.

2.7.1. The port of Piraeus

According to EBEP statistics, the pandemic hit the port of Costco in Piraeus, the No. 1 port in the Mediterranean and the 4th port in Europe in terms of container traffic. Notably, the pandemic has led to a 46% sharp drop in shipping and cargo entry. Despite strict health and safety measures, preventive checks, most trucks and containers carrying goods coming from China could not move from the port due to the transportation ban during the pandemic, and in January and February 2020, in Pier II and III, operated by Cosco's subsidiaries, SEP handled a total of 838,000 containers. Compared to February 2020, the increase was 415,000, which was 4.8% year-on-year, no more than 2.2% in February 2019.

2.7.2. The port of Thessaloniki

The port of Thessaloniki, the country's second-largest port, has seen a relative reduction of about 3.5% in container traffic compared to Piraeus, which is mainly a supply port. Even today, when the impact of the pandemic becomes normal in China, the movement of goods at Greek ports is not expected to return at the same pace, at least for the time being. Since recovery preceded the pandemic, which is now operational and is associated with the epicenter of the pandemic remaining in Europe, recovery and return to the rhythm of the past is directly related to the "cascading effect" phenomenon. However, once the pandemic ends, Greek ports, especially the port of Piraeus, will be able to receive more Mediterranean cargo than Italian and Spanish ports, and sea freight traffic is likely to increase significantly.

2.8. Impact of International Conventions on the Operating Costs of Shipping Companies

2.8.1. General

Many people with vested interests in international ships see maritime control as an interference and obstacle to the development of shipping activities. Undoubtedly, maritime regulations affect costs, especially for ship owners and shipping companies. On the other hand, regulations are necessary for ship managers and are considered "in the general interest of the shipping community". Due to the lack of general apathy to ship control, there are certain rules that are "implemented in a simple way" (Ma, 1999). Therefore, this chapter presents and analyzes the impact of international treaties on the cost and quality of shipping companies. First, it conducts an analysis of the general economics of shipping laws and traditions and presents the perspectives of government and shipping companies. After that, it analyzes the cost of compliance and compliance of shipping companies to international rules and conventions.

2.8.2. The Economics of Maritime Regulations

According to Ma (1999), economic activity is by its very nature human interference in the natural environment. Therefore, an international ship means that it is human interference in the marine environment. The effects of sea use are more clearly explained whenever there is ocean loss leading to loss of life and pollution of the marine environment. The only guaranteed way to get rid of these problems is not to engage in such transportation activities or to reduce these activities to a very low level. Such an approach is irrational and unrealistic.

International shipping creates a number of benefits to the national economy of any country and to the international community as a whole. Therefore, it is widely accepted that these benefits outweigh the risks. Careful management, characterized by the implementation and enforcement of appropriate international rules and standards, is an important way to ensure sustainable international transport safety and prevent marine pollution. This management ensures that the risk of marine accidents is reduced and negative consequences are controlled (Ma, 1999).

However, in reality, the situation is not so clear. Now guavas are in abundance. Therefore, the government and ship owners need to analyse and address several issues. Firstly, how to prevent "unscrupulous" ship owners from non-compliance and maintain unsafe and environmentally friendly practices, and secondly, how to provide incentives and alternatives to compliant ship owners who adhere to quality ship management practices.

The answer is as follows (Ma, 1999).

- Charge administrative fees for non-compliance.

- Imposition of criminal and corrective costs, i.e., penalties and damages for financial violations of applicable rules and standards.
- Implement preventive costs for building support infrastructure, such as shore-based housing facilities for waste generated by ships or additional guarantees against potential economic violations.

Cost-benefit analysis is becoming an increasingly important tool to avoid economic futility and widespread apathy to maritime regulation.

2.8.3. The government's perspective

Government intervention on ships involves three important factors: political, economic and social. At the national or international level, the programme focuses on the protection of national maritime interests. The natural tendency of all countries is to look at ships from their own perspective and look for ways to get the most out of it (Farthing and Brownrig, 1997). Of course, national regulations are generally aimed at protecting and promoting the survival of the country's merchant navy, but are aimed at regulating the operation of domestic and foreign vessels to ensure maximum safety and minimum pollution.

Therefore, the government must build the necessary support infrastructure, implement appropriate maritime laws, and provide maritime services for shipping (Farthing, 1993). The extent to which individual countries meet these requirements reflects the quality of their navies and their ability to manage maritime affairs. However, this quality comes at a cost in terms of implementing and maintaining standards, conditions and regulations. The government is aware of this, so it uses various economic methods to ensure quality. When it comes to developing, implementing and enforcing the best maritime controls, flexibility and discretion are universal requirements.

At the same time, the government uses a combination of economic and legislative preventive measures and a system of cost recovery. Each of these protects profits from improper ship operations, encourages ship owners to behave cautiously, and offsets the cost of providing services (Farthing, 1993). Administrative and relief costs act as deterrents. The favorable tax and fee regime offered to prudent and compliant ship owners acts as an incentive. And special charges for calling vessels at ports and offshore facilities will help offset the cost of providing the service. In order to achieve optimized control and maritime activities, ship owners must be provided with adequate knowledge about the competitive governance of the flags and ports of other countries, as well as the cost burden imposed on ship owners.

2.8.4. The Maritime Industry Outlook

The international shipping industry has consistently emphasized the relationship between cost-absorptive capacity and economic viability, which is related to ship management and corporate compliance. If profitability is low and daily maintenance costs can be offset to some extent, the temptation to ignore ship maintenance and regulatory requirements grows. As a result, a regulatory regime that is impractical and not based on careful analysis of all relevant issues fails to ensure compliance across the shipping industry.

These updated regulatory regimes will inevitably disrupt ship operations, leading to conflict and regulatory confusion. The shipping industry has been severely criticized for its reactionary and politically motivated regulatory regime and unilateral state actions. The regressive measures taken by the authorities always impose a restrictive and financial burden on the sector. The industry argues that these measures are not only a burden, but also do not have to address the issue and lead to differences between countries, especially in the case of unilateral actions.

Since shipping is an international activity, the additional financial and other burdens caused by the disparity of rules between countries and local borders can be very challenging. This is exemplified in the US Petroleum Pollution Act 1990 (OPA 90), which came into force after the Exxon Valdez accident in Alaska in 1989. According to Farthing and Brownrig (1997), "This bill, which has little respect for IMO conventions, has had a significant impact on the ship, and some shipping companies are no longer willing to take risks associated with trade within the United States. No one questions the goal, only the methods used. The cost to the shipping community over time has been enormous and is a monument to unilateral action that is unacceptable to the shipping industry.

More recently, the Erica disaster in late 1999 and the subsequent pollution of the French coast have caused much controversy about the possibility of unilateral action by the European Union, which has caused much concern in the industry. However, despite these concerns, the industry continues to actively seek solutions to the problem. An example of this is the International Chamber of Shipping/International Maritime Federation (ICS/ISF) Code of Good Management Practice. It provides a framework for the development and continuous review of safety and environmental management standards and practices.

In fact, this initiative fundamentally laid the foundation for the development of IMO, which led to the destruction of a highly defined and internationally applicable quality

management framework, the International Safety Management Code (ISM Code), the Herald of free enterprise. Therefore, the perspective of the shipping industry is very important. Prudent and effective maritime control cannot be developed separately from the shipping industry. Their concerns and sustainability must be reflected, otherwise there will be regulatory confusion, lack of trust and widespread compliance (Farthing and Brownrig, 1997).

2.8.4. Compliance costs

The costs associated with international shipping regulation can be quite high, especially those related to ensuring safety, 38 efficiency and environmental protection for a quality shipping business (Drury Shipping Consultants, 1998). The cost of controlling shipping, i.e. the cost of quality in international shipping, can be divided into:

- Prevention and evaluation costs

Expenses related to design, inspection, training, audit, quality planning, preventive activities and equipment, quality measurement and qualification, testing and inspection activities and equipment.

Costs associated with design changes, customer refusal, shipping, fault detection, insurance warranties and loss of consumables. Without quality investment in prevention and evaluation measures, the cost of failure has increased. On the other hand, more initial investment and evaluation is required to reduce the cost of failure to an acceptable level.

An appropriate level of both costs is achieved when the total cost is minimal. When analyzed in terms of cumulative profits, early, high-quality investments lead to short-term profit reduction and implementation failures. However, after this implementation phase, the quality cost is constantly decreasing, the cost of failure is steadily decreasing, and profitability improves, leading to positive growth. Therefore, investing in quality is a long-term goal and the essence of sustainable development (Ma, 1999).

According to Ma (1999), the application of ISM codes to some shipping companies can reach up to \$400,000, and the annual recurring cost is about \$25,000. The actual level of cost depends on the extent of the quality system in place at the time of implementation and how it is implemented. Other specific examples of how international contracts affect costs for 39 shipping companies include personnel issues. The cost of maintaining the workforce is currently around 50% of the operating cost.

The mid-2000s caused a global seafarer shortage of 4%, as ship owners steadily reduced the number of sailors on their ships to cut costs. This deficit is expected to increase to around 12% by 2020. At the same time, the IMO revised the International Convention on Training, Certification and Monitoring Standards for Sailors (STCW, 78) in 1978, taking into account the large proportion (about 80%) of human error in all marine accidents.

The 2010 amendment (STCW Manila 2010) calls for a higher level of capacity and quality assurance mechanisms for maritime training and certification. Therefore, given the current shortage of competent executives and the renewed demand for high quality across the shipping industry, an increase in labor costs is also inevitable.

Similarly, it is worth considering the contractual issues related to pollution prevention and their impact on costs. First, opa 90 stipulated that only double-hull tankers could be traded in the US, and when it was first introduced, there was a difference of about \$10 million in construction/purchase price compared to new single-hull vessels. This price difference has steadily decreased as double-hull tanker construction is more common. However, the additional maintenance and safety costs of these vessels are about \$500,000 per year. Additionally, depending on status and previous management standards, additional costs to include advanced surveys and follow-up work can range from \$300,000 – \$500,000 per year.

2.8.5. Costs of non-compliance

In view of these enormous costs, as a direct result of international treaties and regulations, some ship owners have chosen to comply with minimum rules, although they are likely to incur costs due to non-compliance. These costs of compliance are much lower than the costs that would have arisen if regulatory requirements had been implemented. In fact, depending on the trade area of the ship, the laws of the country may unfortunately be inadequate. Therefore, these ship owners do not face any legislative action to operate their vessels (Drury Shipping Consultants, 1998).

In addition, ship owners have the advantage of limiting their liability to third-party rights arising in relation to the operation of the ship. These limitations can be recognized worldwide, for example, under the 1992 International Convention on Civil Liability for Oil Pollution Damage (CLC 92) or under international conventions under the 1976 Convention on the Limitation of Liability for Marine Rights (LLMC 76). Ship owners who decide not to comply are fully aware of applicable international rules and standards, the liability limit regime, and the

regulatory and legislative standards of the areas in which the ship operates (Drury Shipping Consultants, 1998).

In fact, they conduct their own cost-benefit analysis and formulate their ship operations so that they can choose the minimum amount of compliance at the lowest possible cost. If they are responsible for the poor condition of the ship, they have already received sufficient financial benefits from the ship to offset the cost of compliance or to abandon the ship (Drury Shipping Consultants, 1998).

CHAPTER 3: METHODOLOGY

Introduction

This section of this description represents the identification of the impact of the Covid-19 pandemic on Greek shipping companies specializing in the transportation of goods. In addition to the research area of the research question to be presented, ethical considerations of study design, research methodology, research population, sample and sample size, data collection, validity and reliability, data analysis, and research work are presented.

Selection of the area of study

The impact of the COVID-19 pandemic on Greek freight companies has been selected as a research area. The big problems that have arisen in both maritime freight transportation and international trade in general have led many experts, researchers and governments to invest in a series of risk management strategies of Greek shipping companies based on international factors.

Research question

This description seeks to answer questions about the ship's impact due to the Covid-19 pandemic on marine cargo transportation and Greek companies. While trying to better understand and appreciate the current perspective of marine freight transportation and the importance of its risks. This can affect the impact of fuel on the transportation of goods and on the company's management strategy, preparedness and resilience in general, allowing it to be better prepared for future shortages and disruptions. In this preparation, we already consider the increase in fuel as an adverse factor.

In view of these enormous costs, as a direct result of international treaties and regulations, some ship owners have chosen to comply with minimum rules, although they are likely to incur costs due to non-compliance. These costs of compliance are much lower than the costs that would

have arisen if regulatory requirements had been implemented. In fact, depending on the trade area of the ship, the laws of the country may unfortunately be inadequate. As a result, these ship owners face little or no legislative action to operate their vessels (Drury Shipping Consultants, 1998).

Research design

In this description, in relation to the field of study, which includes complex crises related to the global economy, highly dynamic industries, health and global populations, mixed methods have been used to analyze and understand all the constraints such as energy costs, ocean freight transportation and international trade in the post-pandemic era. For this reason, in the above description, a search was conducted on the impact of the pandemic on Greece's shipping sector, providing basic knowledge to help the study compare and present several outcomes that could be used. The design of the questionnaire took into account both the theoretical part of the study, the purpose of the study, the research questions, and the survey of foreign languages. Therefore, the questionnaire is divided into two parts, the first part of which consists of 6 questions about the demographic characteristics of the respondents, and specifically 6 questions in the qualitative short answer type and 2 questions in the manipulative type. Then the second part, the second part, is about business data and consists of seven qualitative questions. Finally, there are 7 operating questions on the 5th Likert scale and another on the 7th Likert scale. The form of the survey conducted above concluded that we used a questionnaire tool. In other words, a quantitative survey was conducted through a questionnaire.

Research approach

This survey was conducted between September and October 2023. It concerns a post-pandemic period during which businesses in general are experiencing strong scars, but more specifically businesses in the shipping sector of Greece. It is a current crisis limited by multifactorial and dynamic changes. In order to achieve a perspective of the study area and answer the research questions, a holistic approach was posed, due to the nature of the elaboration, which proceeds to the analysis of qualitative characteristics and quantitative characteristics, divided into four areas. The first area of study contains a wealth of primary form data for the research question. Continuing, a qualitative form of data collection is applied, concretizing some case studies as well as a number of observations and notes.

Also, some analyses of the International Monetary Fund and the statistics of some national databases with data were used to successfully answer the research questions posed above. In the

third section, there is a questionnaire which employees in various sectors of the maritime sector were asked to answer.

There are several analyses from statistics from the International Monetary Fund (IMF) and the country's databases, all of which have been reviewed to ensure that all results are well documented. That's why we've added new insights, experiences, and perspectives to our existing data through structured Microsoft questionnaires previously emailed to employees of selected companies. In the fourth and final step, we took a quantitative approach to supplement this research by adding quantitatively measurable information to confirm and complete previous non-numerical assumptions and theories with accurate data.

The main reason for doing qualitative and quantitative research methods is to give value to non-statistical insights and personal experience. Based on this understanding, we created a conceptual framework for the impact of ship container shortages caused by Covid-19 on marine freight transportation and international trade, highlighting the importance of risk management strategies, preparedness and resilience for businesses to better prepare for future shortages and disruptions. Finally, contributions to the current literature will be combined with a research competition.

In early 2020, when the Covid-19 virus began to spread in China, it locked down the region and was committed to managing the crisis before the rest of the country. So, while China was almost eliminating this, the rest of the world was making some effort to gain knowledge about it and prepare for it. All this puts them in a situation where pressure is put on global trade and countries have to play the role of buyers or sellers.

In a typical risk response, risk avoidance helps to eliminate the possibility that the threat may become a reality, and is a way of accepting the risk if the results are small or do not affect your company's plans. However, risk mitigation is a good practice, as it can compromise business performance and become costly. Then, in mitigation strategy, it is actually the identification of risks, the evaluation of possible solutions, the planning of objectives, the actions to be taken and the continuous review of the consequences. Sometimes, like any high-risk attack business, transferring the risk to another party or expert may be the best option.

CHAPTER 4: FINDINGS

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	23	56,1	57,5	57,5
	female	17	41,5	42,5	100,0
	Total	40	97,6	100,0	
Missing	System	1	2,4		
Total		41	100,0		

The above table lists the results given by the respondents, as it seems that men briefly outnumber women with a percentage of 57%.

Which of the following age groups do you belong to?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-30	9	22,5	22,5	22,5
	31-40	16	40,0	40,0	62,5
	41-50	7	17,5	17,5	80,0
	51+	8	20,0	20,0	100,0
	Total	40	100,0	100,0	

It is obvious that the age group that occupies the largest percentage is the group aged between 30-40 with a percentage of 40%, followed by the age groups with people under 30 with a percentage of 22.5% and respectively the over 40s with 17% and 20%.

What is your level of academic qualifications?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Gymnasium	2	5,0	5,0	5,0
	Bachelor's Degree	28	70,0	70,0	75,0
	Master	7	17,5	17,5	92,5
	phd	3	7,5	7,5	100,0
	Total	40	100,0	100,0	

In the above table, the largest percentage of respondents are holders of a university degree, with a percentage of 70%, followed by respondents who also hold a postgraduate degree with a percentage of 17%, while the percentages are low for those who hold a doctorate or hold only a high school.

Which of the categories below best describes your current position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CEO	3	7,5	7,5	7,5
	CFO (administration, document dept, purchase department)	3	7,5	7,5	15,0
	Sales and marketing	5	12,5	12,5	27,5
	Warehouse service	11	27,5	27,5	55,0
	Houman resources	6	15,0	15,0	70,0
	Transportation service	7	17,5	17,5	87,5
	Customer service	2	5,0	5,0	92,5
	Operation	3	7,5	7,5	100,0
	Total	40	100,0	100,0	

In the above table, respondents stated the following: Warehouse service 27.5%, transportation service 17.5%, houman resources 15%, sales and marketing 12.5%, CEO, CFO and operation categories have the same percentage of 7.5% and finally customer service 5%.

How many years of experience does you have?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	12,5	12,5	12,5
	2-4	7	17,5	17,5	30,0
	5-10	12	30,0	30,0	60,0
	10+	16	40,0	40,0	100,0
	Total	40	100,0	100,0	

From the results we distinguish from the above table, we observe that a greater percentage of respondents are experienced in the field of shipping with several years of experience.

Knowledge-Ability to use a computer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Short	3	7,5	7,5	7,5
	Sufficient	18	45,0	45,0	52,5
	Very good	12	30,0	30,0	82,5
	Excellent	7	17,5	17,5	100,0
	Total	40	100,0	100,0	

Respondents stated that computer knowledge is sufficient at 45%, very good at 30%, while few said that they have minimal contact with computers at 7.5%.

Has COVID-19 negatively impacted your company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	23	57,5	57,5	57,5
	no	6	15,0	15,0	72,5
	do not know	11	27,5	27,5	100,0
	Total	40	100,0	100,0	

In the above table, the vast majority replied that the pandemic had a negative impact on the shipping company, with an overwhelming percentage reaching 57.5%, followed by respondents who are not in a position to recognize the negative impact with a percentage of 27.5% and those who answered negatively with a percentage of 15%.

Indicate the type of impact that your company experienced due to COVID-19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Market Share	2	5,0	5,0	5,0
	Competitiveness	3	7,5	7,5	12,5
	Profitability	18	45,0	45,0	57,5
	Use of technology	16	40,0	40,0	97,5
	Labour force	1	2,5	2,5	100,0
	Total	40	100,0	100,0	

Respondents said companies' biggest problem after the pandemic is profitability, but technology comes second by a slight margin. One could say that the participants were divided into two major categories as their difference is negligible.

Please state which of the following initiatives your company has taken to reduce the effects of the COVID-19 crisis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Operational adjustments	5	12,5	12,5	12,5
	Financial adjustments	3	7,5	7,5	20,0
	Contingency plans	12	30,0	30,0	50,0
	Stakeholder's adjustments	4	10,0	10,0	60,0
	Greater use of technology tools	8	20,0	20,0	80,0
	Prioritization in the purchase of raw materials	6	15,0	15,0	95,0
	Other	2	5,0	5,0	100,0
	Total	40	100,0	100,0	

The respondents stated the following: the company resorted to a contingency plan with a percentage of 30%, use of better technology with a percentage of 20%, selection of specific raw materials with a percentage of 15%, followed by changes in operation with 12.5%.

Indicate the level of sensitiveness of the supply chain industry to

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Political factors	6	15,0	15,0	15,0
	Economic factors	17	42,5	42,5	57,5
	Environmental factors	2	5,0	5,0	62,5
	Technological factors	7	17,5	17,5	80,0
	Price competition	8	20,0	20,0	100,0
	Total	40	100,0	100,0	

In the above table, respondents agree that weaknesses are created and the supply chain is affected by economic factors with 42.5%, followed by competition from companies with 20%, political factors with 15%, and finally the environmental factor with 5%.

Please rate the success of the measures taken in reaction to the COVID- 19 disruption's effects on your company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very effective	3	7,5	7,5	7,5
	Somewhat effective	13	32,5	32,5	40,0
	Neither effective nor ineffective	5	12,5	12,5	52,5
	Somewhat ineffective	4	10,0	10,0	62,5
	Very ineffective	9	22,5	22,5	85,0
	Do not know	6	15,0	15,0	100,0
	Total	40	100,0	100,0	

As the above table reveals, respondents largely agree with each other on the question, with the second answer occupying the largest percentage of 32.5%, the next are those who believe that the measures did not work with a percentage of 22.5%, followed by those who do not know with a percentage of 15% and finally the neutral views with percentages of 12.5% and 10%.

Has COVID-19 resulted in any positive benefits or opportunities for your company?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	6	15,0	15,0	15,0
	no	31	77,5	77,5	92,5
	do not know	3	7,5	7,5	100,0
	Total	40	100,0	100,0	

To this question, respondents are clear and unanimously answer that the pandemic has negatively affected the business with a percentage of 77.5%.

To what extent have fuel cost increases negatively impacted the business you work for?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very effective	33	82,5	82,5	82,5
	Somewhat effective	1	2,5	2,5	85,0
	Neither effective nor ineffective	1	2,5	2,5	87,5
	Somewhat ineffective	2	5,0	5,0	92,5
	Very ineffective	2	5,0	5,0	97,5
	Do not know	1	2,5	2,5	100,0
	Total	40	100,0	100,0	

In the above table and to the question how fuel costs negatively affected the business, everyone answers that they have affected and to a large extent with a percentage of 82.5%.

What extent do you think the increase in fuel costs has affected the enterprise-wide strategies;

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very effective	24	60,0	60,0	60,0
	Somewhat effective	5	12,5	12,5	72,5
	Neither effective nor ineffective	4	10,0	10,0	82,5
	Somewhat ineffective	2	5,0	5,0	87,5
	Very ineffective	4	10,0	10,0	97,5
	Do not know	1	2,5	2,5	100,0
	Total	40	100,0	100,0	

Respondents to it asked again unanimously and concluded that business plans were heavily influenced by fuel costs at a rate of 60%.

Looking ahead, how important do you think that is to invest in risk and crisis management strategies to face future disruptions?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely important	27	67,5	67,5	67,5
	Somewhat important	4	10,0	10,0	77,5
	Neutral	3	7,5	7,5	85,0
	Somewhat not important	3	7,5	7,5	92,5
	Extremely not important	2	5,0	5,0	97,5
	6,00	1	2,5	2,5	100,0
	Total	40	100,0	100,0	

In the table above, respondents agree that investments should be made in strategies that address future disruptions with a percentage of 67.5%.

Indicate the areas that require strengthening for your company to be more resilient to crisis and disruptions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Risk Management	8	20,0	20,0	20,0
	Communication strategies	2	5,0	5,0	25,0
	Identifying Good practices in crisis and disruptions management	13	32,5	32,5	57,5
	Digital tools	11	27,5	27,5	85,0
	Investment strategies	4	10,0	10,0	95,0
	Other	2	5,0	5,0	100,0
	Total	40	100,0	100,0	

In the above table, respondents agree on finding good practices in times of crisis with a percentage of 32.5%, followed by digital technology with a percentage of 27.5%, risk management with a percentage of 20%, Investment strategies with a percentage of 10% and finally others with a percentage of 5%.

To what extent do you think the company can make redundancies with aim to reduce operating costs due to cost increases Fuel?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Undecided	1	2,5	2,5	2,5
	Disagree	7	17,5	17,5	20,0
	I totally disagree	32	80,0	80,0	100,0
	Total	40	100,0	100,0	

To the above question, respondents answered unanimously and overwhelmingly that layoffs of staff are not a good tactic, almost 97% disagreeing with the above question.

Check the box if your company has a specific plan to mitigate or to face

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Natural disasters	1	2,5	2,5	2,5
	Pandemics/sanitary emergencies	13	32,5	32,5	35,0
	Economic fluctuations	22	55,0	55,0	90,0
	None of them	4	10,0	10,0	100,0
	Total	40	100,0	100,0	

Respondents answered the above question as follows: economic fluctuations of 55%, pandemics 32.5%, none of the above 10% and 2.5% natural disasters.

It is believed that covid 19 has decisively and irreversibly changed the freight line of shipping companies in Greece?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Totally Agree	18	45,0	45,0	45,0
	I agree	9	22,5	22,5	67,5
	Undecided	6	15,0	15,0	82,5
	Disagree	5	12,5	12,5	95,0
	I totally disagree	2	5,0	5,0	100,0
	Total	40	100,0	100,0	

Respondents agree on the above question whether the pandemic has changed the freight line of shipping companies in Greece by a percentage of 67%. There are, however, and those who do not fully agree with an overall percentage of 17%.

It is believed that the questions asked in the above questionnaire are representative?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Totally Agree	23	57,5	57,5	57,5
	I agree	9	22,5	22,5	80,0
	Undecided	3	7,5	7,5	87,5
	Disagree	2	5,0	5,0	92,5
	I totally disagree	3	7,5	7,5	100,0
	Total	40	100,0	100,0	

Finally, when asked if the questions were representative, participants largely agreed that they were 80%.

CONCLUSIONS

The pandemic has impacted global economic activity in a variety of ways. Given that about 90% of global trade is done via ships, the shipping industry has been hit harder by the COVID-19 pandemic domestically and globally than most sectors of economic activity. As the pandemic continues to plague the world, the magnitude of the overall impact on shipping is still unknown as the duration of this crisis is unknown, but some of the impacts are obvious and have caused a global recession that will need to be addressed drastically.

Conversely, while other impacts are still unpredictable, the shocks that countries will have to manage in the post-COVID-19 era should highlight their dependence on certain regions for supply and serve as a springboard for the redesign of the shipping industry and the restructuring of supply chains, which first appeared in the U.S.-China trade confrontation before the onset of the health crisis.

Moreover, the pandemic has led to a humanitarian crisis, including the suspension of seafarers' exit permits, as revealed in the study conducted above, which has had a significant impact on seafarers' mental health, and forcing them to extend their employment contracts against their will is a violation of human rights and an issue that needs to be addressed, given that seafarers need to take stricter protective measures. Flag of the ship.

In addition, given that the health of seafarers is more fragile than ever due to the pandemic, it has become clear that proper training of seafarers through STCW and their rights under MLC regulations can effectively protect seafarers. In addition, one of the collateral consequences of the pandemic for the shipping industry is the difficulty in renewing certificate verification for cargo ships that require dry docking and repair of ships in Chinese ports. This comes at a time when more than 200 vessels are in China for planned repair work, which is not going according to schedule, causing delays to multiply.

To address these challenges, countries should focus on getting a competitive edge in the new reality by investing in smart technologies for cargo transportation, port automation, efficiency and capacity management. At the national level, the Piraeus Chamber of Commerce and Industry has taken a stand on the issue of using all financial instruments to support the sector, moving in the same direction as the Association of Passenger Shipping Companies (SEN) in the wake of a recently published IOBE study on coastal ships.

Moreover, due to the pandemic, volatility levels and low levels of trade and commodity rates have diverted the attention of all stakeholders to rethink strategies in the areas of operations where finance is central. In fact, with oil prices falling over the past few months and concerns growing about the impact of the Covid-19 pandemic, financiers and shipowners have felt an urgent need to review their loan agreements and the impact the pandemic may have on them.

This need is all the more urgent when we consider that the challenges faced by the shipping industry before the pandemic are the adoption of the shipping industry to IMO 2020, the need for new environmental investments in ships, and the early conclusion of debt agreements (challenges) added by the Covid-19 pandemic and the parallel disruption of oil prices. Therefore, financial institutions, especially banks, need to consider digital transformation strategies as they expect further mergers, revisit existing business models and invest in new solutions in the shipping industry in various sectors. Once this is achieved, we can expect the development of the shipping industry, which will affect other Asian firms, which will play an important role in shipping finance.

Most shipping company operating costs absorb fuel costs. For this reason, companies have been buying fuel some time in advance to take advantage of the current prices. Regular navigational schedules on these ships make it easier to carry out planning ahead of a particular ship. If we take into account the part of the study that conducted the preliminary study with the questionnaire, we can confirm the results of the theoretical part, especially the cost of fuel, which

is an important factor in the total cost of shipping companies. Furthermore, most of the employees surveyed said that the increase in fuel costs that occurred in 2022 had a significant negative impact on the shipping business. Another important conclusion is that the cost of fuel has a significant impact on the procurement, technical and operational departments of shipping companies, followed by charter departments.

Many people engaged in maritime trade and transport have been affected by the recent economic slowdown and new regulations on Covid-19, high fuel prices and gas emissions. As a result, it became clear that ships should become more environmentally friendly and cheaper to build and use. Some shipbuilding companies have already started building experimental vessels, while others have proposed plans to build ships using new technologies as a driving tool. To be more economical and environmentally friendly, new engine and fuel proposals are decided on a need basis. All new ideas also use some kind of renewable energy technology.

Furthermore, most of the employees surveyed said that the increase in fuel costs that occurred in 2022 had a significant negative impact on the shipping business. Another important conclusion is that the cost of fuel has a significant impact on the procurement, technical and operational departments of shipping companies, followed by charter departments.

Based on the research questions of this study, the impact of the Covid-19 pandemic on Greek shipping companies in the container transportation sector was analyzed and the impact was identified, measured and explained through the method and analysis applied. Furthermore, in this description, respondents stated their opinions and knowledge about their companies' strategies to prevent or limit similar crises. So, if we check the above results, we can see:

The pandemic has had a huge impact very quickly and catalytically and it has affected the global economy and the Greek economy we are studying. Greek freight forwarders had to face critical problems such as rapid fuel increases, and companies had to deal with them through price cuts, profitability. This led to a race to introduce new technologies. Distribution restrictions caused a lot of problems in the process of producing goods, and at the same time, the demand for goods showed an upward trend, which led to greater inequality in world trade, which led to an increase in commodity prices.

This requires the use of a series of contingency projects and a series of technologies that reduce the economic impact of shipping companies. Increases the competitiveness and profitability of enterprises. Moreover, the importance of digital devices, communication

techniques, best practices for crisis disruption, investments, risk forecasting and management strategies can prepare for future shocks and increase resilience.

As crises like COVID-19 suddenly crash, it is essential to assess and prepare future barriers to mitigate negative impacts and reduce logistical failures that delay improvements in maritime logistics systems. As Tom Soderstrom once said, "When you take a risk and solve it, you create a new feature you've never seen before." So far, risk management strategies identified by freight forwarders since the beginning of the Covid-19 pandemic include risk identification, data analysis, risk forecasting, risk assessment, early warning systems, contingency planning, best practice utilization, risk mitigation studies, product development, strategic investments and support supply chain networks.

Limitations & Future directions

The ability of maritime transport to carry food, fuel and medical supplies across continents without interruption will undoubtedly play a crucial role in tackling the pandemic, playing an important role in growth and sustainable development, and shipping companies and lenders will have to adapt to this changing situation by focusing on building effective strategies. Moreover, the experience and lessons learned from the pandemic in the maritime sector should be encouraged to prepare for similar situations in the future.

While this study has achieved its objectives, the shortage of ship containers caused by the COVID-19 pandemic is a current crisis constrained by multiple and dynamic changes. Furthermore, there is a lack of previous academic research on this particular topic that can simultaneously address the impact of ship shortages caused by the Covid-19 pandemic on marine freight transportation and international trade, as well as the importance of risk management strategies, preparedness and resilience for businesses to better prepare for future supply shortages and disruptions that can be addressed simultaneously.

When it comes to the methods and techniques used to collect data, a wide range of reports and data cover the same phenomenon using different perspectives and measurement techniques. Quantitative data and statistics can vary from study to study and may be difficult to synthesize and store. In addition, access to certain individuals within the organization was restricted, which led to the reorganization of the investigation. Then, in the future, if you include a large number of observations, interview perspectives, and questions, you can add more data to help add missing variables.

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Questionnaire

A1. Gender

- male
- female

A2. Which of the following age groups do you belong to?

- 20-30
- 31-40
- 41-50
- 51+

A.3 What is your level of academic qualifications?

- Gymnasium
- Bachelor's Degree
- Master
- PhD

A.4 Which of the categories below best describes your current position?

- CEO
- CFO (administration, document dept, purchase department)
- Sales and marketing
- Warehouse service

- Human resources
- Transportation service
- Customer service
- Operation

A.5 How many years of experience do you have?

- 1
- 2-4
- 5-10
- >10

A.6 .Knowledge-Ability to use a computer

- Short
- Sufficient
- Very good
- Excellent

B.1 Has COVID-19 negatively impacted your company?

- Yes
- No
- Do not know

B.2 Indicate the type of impact that your company experienced due to COVID-19

- Market Share
- Competitiveness
- Profitability
- Use of technology
- Labour force

B.3 Please state which of the following initiatives your company has taken to reduce the effects of the COVID-19 crisis

- Operational adjustments
- Labor adjustments

- Financial adjustments
- Contingency plans
- Stakeholder's adjustments
- Greater use of technology tools
- Improvements in communication strategies
- Prioritization in the purchase of raw materials
- Follow government decisions
- None of the above
- Other

B.4 Indicate the level of sensitiveness of the supply chain industry to:

- Political factors
- Economic factors
- Environmental factors
- Technological factors
- Legal factors
- Price competition

B.5 Please rate the success of the measures taken in reaction to the COVID- 19 disruption's effects on your company

- Very effective
- Somewhat effective
- Neither effective nor ineffective
- Somewhat ineffective
- Very ineffective
- Do not know

B.6 Has COVID-19 resulted in any positive benefits or opportunities for your company?

- Yes
- No
- Do not know

B.7 To what extent have fuel cost increases negatively impacted the business you work for?

- Very effective
- Somewhat effective
- Neither effective nor ineffective
- Somewhat ineffective
- Very ineffective
- Do not know

B.8 What extent do you think the increase in fuel costs has affected the enterprise-wide strategies?

- Very effective
- Somewhat effective
- Neither effective nor ineffective
- Somewhat ineffective
- Very ineffective
- Do not know

B.9 Looking ahead, how important do you think that is to invest in risk and crisis management strategies to face future disruptions?

- Extremely important
- Somewhat important
- Neutral
- Somewhat not important
- Extremely not important

B.10 Indicate the areas that require strengthening for your company to be more resilient to crisis and disruptions

- Risk forecasting
- Risk Management
- Communication strategies
- Identifying Good practices in crisis and disruptions management
- Digital tools
- Investment strategies

- Other

B.11 To what extent do you think the company can make redundancies with aim to reduce operating costs due to cost increases Fuel?

- Totally Agree
- I agree
- Undecided
- Disagree
- I totally disagree

B.12 Check the box if your company has a specific plan to mitigate or to face:

- Natural disasters
- Pandemics/sanitary emergencies
- Economic fluctuations
- Climate changes
- None of them
- Other

B.13 It is believed that covid 19 has decisively and irreversibly changed the freight line of shipping companies in Greece?

- Totally Agree
- I agree
- Undecided
- Disagree
- I totally disagree

B.14 It is believed that the questions asked in the above questionnaire are representative?

- Totally Agree
- I agree
- Undecided

- Disagree
- I totally disagree