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The impact of the Covid-19 pandemic on the profitability of the air cargo industry and Strategic advice for a future vision

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Overview of the report

The following paper is structured as follows: Section 2 provides an extensive literature review that analyses the impact of the pandemic on the global economy. Next, an overview is conducted, introducing the most important factors that affected the air cargo industry during the pandemic. These factors are the difficulties that the shipping industry experienced, the rise of e-commerce and the transport of pharmaceuticals, while also an explanation of the capacity and demand imbalance that launched during the pandemic is presented. Section 3 includes the research questions and hypotheses, while in Section 4 is presented an analysis f the methodology and scope of the report. Section 5 analyses data related to the impact of the pandemic on the global aviation industry, with a particular focus on the cargo sector. This section explores the development of e-commerce and the collapse of the shipping industry, and their influence on the air cargo sector. It also examines the strategies adopted by airlines to deal with these challenges. Furthermore, this section investigates the influence of pharmaceuticals on the air cargo industry and analyses the risks and challenges faced by the industry during the pandemic. Section 6 focuses on the performance of six randomly chosen airlines during the pandemic, with a detailed analysis of their revenues and tons of cargo transported. In addition, a comparison of the cargo fleet size and the network of these airlines is analysed to provide a more detailed analysis of the revenue growth. In Section 7, are presented, the most important results of the interviews that took place with people related to the industry. Finally, Sections 8 and 9 present the conclusions and discussion of the findings, including limitations and recommendations for future studies. Sections 10 and 11 provide the References and the Appendixes, respectively.

1. Introduction

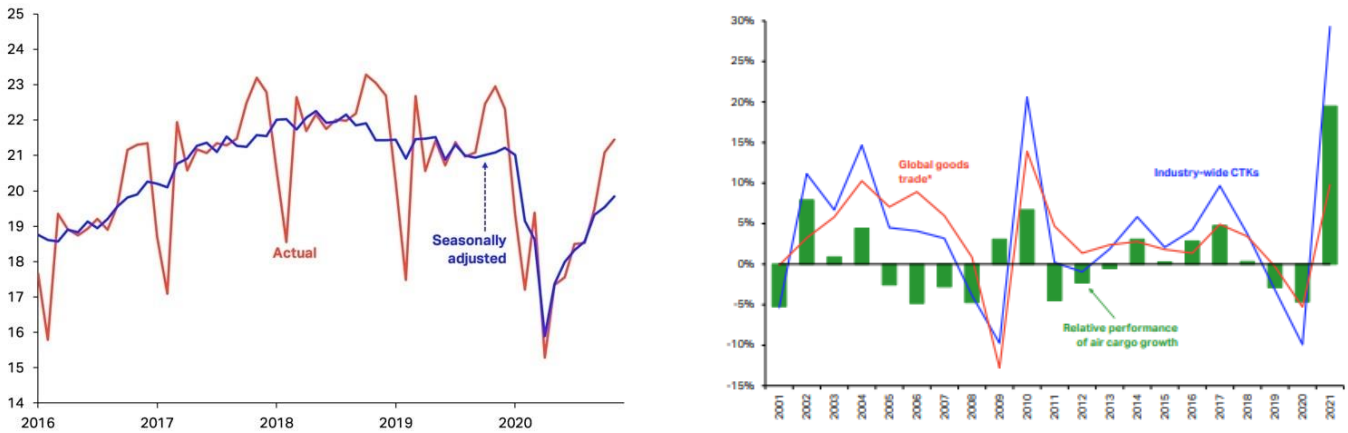
In December 2019, some cases of an unknown disease, causing pneumonia were first detected in China. One month later, the virus named "2019-nCoV", had spread worldwide, prompting the World Health Organization (WHO) to set an alarm. By March 2020, the WHO had declared the outbreak a pandemic, as the cases continued increasing, and Europe was struggling to control the virus (WHO, 2022). Covid-19 is one of the most powerful shocks in the history of the global economy with virtually every economic sector experiencing a significant downturn. Global supply chains, aviation, and shipping were collapsing rapidly, tourism and traveling were entirely ground to a halt, while small businesses worldwide were bankrupting and closing their doors. (Siddiqui, 2020). More specifically the impact of the pandemic on the global economy was devastating. In 2020 the most important economies accounted for a loss up to 3.4% of their total Gross Domestic Product (GDP), while in terms of the global GDP, the pandemic resulted in a loss of USD 2.96 trillion, representing a reduction of 4.5% approximately (Szmigiera, 2022). Despite the pandemic's devastating impact, few industries experienced significant growth during this period. Notably, big pharma companies benefited from the development and distribution of Covid-19 vaccines (Hoffman, 2022). From the second half of 2020 through the end of 2021, the pharmaceutical industry saw a considerable increase in profits and revenues, while e-commerce also did experience a significant development during the pandemic. Furthermore, retail shopping, food services, and grocery online sales saw extremely high increases (OECD, 2020). In fact, a significant proportion of consumers avoided in-person shopping and instead preferred to shop online to maintain social distancing (Bhatti et.al, 2020). Between 2019 and 2020, retail shopping increased by 4.4%, with a predicted increase of 8% by 2024 (International Trade Administration, 2020). The pandemic did significantly affect the e-commerce and retail sales, while it is predicted that the e-commerce sale will launch to USD 6.5 trillion in sales by 2023 (Jones, 2021).

On the other hand, travel restrictions created difficulties and challenges for the aviation industry, resulting in a significant decline in passenger traffic, and making it the most severe crisis in its history. In 2020, there was a significant drop of 60% compared to the previous year, resulting in a massive loss of USD 372 billion in total airline revenue. As a result, governments had to act and provide financial support to prevent airlines from failing due to Covid-19 pandemic (Hasegawa, 2020). By the end of 2021, airlines received over USD 243

billion in financial assistance (IATA, 2021). While the passenger airline industry experienced a severe downturn, the air cargo industry emerged from the recession quickly and started growing. One of the reasons of this growth was the container crisis caused by the virus outbreak. Operations in ports with huge importance for global trade became extremely difficult at certain times, resulting in high sea cargo charges. Additionally, limited mobility and national border restrictions created supply chain difficulties worldwide (Turkish Airlines, 2021).

Despite all the operational and capacity issues, the air cargo industry stepped up its own activities to respond to the outbreak. Being the only fast, secure, and efficient mode of transportation of goods during the pandemic, air cargo experienced the highest development in its history. Although the air cargo market declined by 20% in the first 11 months of 2020, loading rates recovered by the end of the year, with volumes exceeding those of 2019 (Turkish Airlines, 2020). The air cargo industry proved to be resilient to the pandemic's impact. While the demand for passenger flights decreased, it created an opportunity for air cargo. Likewise, many players who underestimated the air cargo industry before the pandemic, they are now investing on it (Hakes & Beiersdorf, 2022). Figure 1, presents the growth of the air cargo industry from 2001 until 2021 and the transported cargo tonnes per kilometer from 2016 to 2020. It is evident that in 2020, when the pandemic reached its peak, cargo levels significantly decreased, while in 2021 the industry began to recover and develop.

Figure 1. CTK* Levels, actual and seasonally adjusted, Growth in global goods and trade TCKs



Sources: IATA Economics 2022, CTK*: Cargo Tonne Kilometres

2. Literature review

This section provides an analysis of previous research and studies related to the main topics that affected positively or negatively the air cargo industry. To begin, a review of the existing literature regarding the impact of the pandemic on the supply chain industry and aviation was done. Even though, Covid-19 has had a detrimental effect on several industries, such as passenger aviation and shipping, some industries such as air cargo have seen positive impacts. These impacts have two sources of explanation. First, from the demand side, e-commerce and pharmaceutical goods were two of the main topics that had a key role for this industry. Second, from the supply side, the grounding of passenger aircrafts, and the disruption in shipping industry, resulted in a capacity imbalance for air cargo with important effects for the industry. These topics will be comprehensively discussed and analyzed individually, providing a more detailed overview.

2.1 Effect of the pandemic on the economy

The recovery of the economy started very slowly after the financial crisis of 2008-2009. In the meantime another fact came to challenge and reduce the growth pace of the global economy. That, was the tensions between major economic powers such as Europe and China, US and China which created challenges and had a negative impact on the international trade. Due to these tensions many countries imposed additional tariffs and trade restrictions, which consequently paused the growth of the global economy. Later, the outbreak of Covid-19 had one of the worst negative impacts in history in the global economy. Following millions of infections, numerous countries-imposed restrictions on people's daily lives including travel limitations, store closures, event cancellations, and halts to global trade, resulting in the most extensive economic shock the world has ever experienced (Lora Jones, 2021). According to Statista, the global Gross Domestic Product decreased by 5% in 2020, representing a loss of nearly 2.96 million U.S. dollars (Szmigiera, 2022). The pandemic's effects on the financial markets were enormous, with the global stock market accounting for a loss of 6 trillion U.S. dollars during the first weeks of the pandemic, and giant international banks experiencing a dramatic drop in their share prices. For instance, JP Morgan Chase's share price fall by 38% and Citigroup's by 49% (Ozili & Arun, 2020) page 10). The Dow Jones faced its largest single-day with a decline of around 3,000 points on 16 March 2020 (Szmigiera, 2022). The hospitality industry was among the hardest hit by the pandemic, as the government's restrictions on staying at home led to widespread closures of hotels and other related

businesses. The global hotel industry suffered a significant economic downturn, with requests for a bailout of USD 150 billion due to cancellations. Many hotels worldwide temporarily closed their operations, resulting in a total loss of 24.3 million jobs (Ozili & Arun, 2020, page 7).

2.2 Overview of e-commerce

In previous years, researchers and authors focused their studies on predicting the future of e-commerce. In 2000 Jonathan Coppel investigated the impacts and policy challenges of a potential increase in e-commerce. In 1999 almost 250 million people were using the internet, with 25% of them making online purchases (Coppel, 2000). It was evident that the developments in e-commerce would have a decisive effect on the future of global trade. E-commerce was expected to experience a rapid progression which eventually would increase it contribution to the world's GDP. In addition, was found that the rise of e-commerce would contribute to the supply chain distribution, and improve productivity and economic growth (Coppel, 2000). In 2017 the annual revenue generated by e-commerce globally, launched to USD 2 trillion.

In 2006, research from To, & Ngai, (2006) aimed to predict the organizational adoption of business-to-consumer e-commerce. In this study, the authors assumed that e-commerce would continue to expand and develop in the long term and that there would be a growing interest in internet transactions. They accomplished a survey of 140 companies and found that even though business-to-consumer commerce is increasing significantly, not every organization has adopted that. To be innovative in this field, they must allow technology to make changes (To, & Ngai, 2006).

According to recent research by Alfonso et al. (2021), "*The lower the level of e-commerce in a given country in 2019, the higher the growth rate of e-commerce during the Covid-19 pandemic*" (Alfonso et al., 2021). This study aimed to investigate E-commerce during the pandemic and beyond. They found that the e-commerce revenues differ from country to country ranging from 0.5% of the GDP in Kazakhstan to 3.7% the of GDP in Korea. Later, they concluded that although e-commerce experienced significant increase during Covid-19, there were challenges such as product availability, logistics, transportation disruptions, and consumer protection that e-commerce faced. Finally, the researchers also examined the policies adopted by the e-commerce industry to overcome these challenges, expanding their services, and adopting new business models (Alfonso et al., 2021).

2.3 The growth of the air cargo industry

According to Hemisphere (2022), in November of 1910, the first cargo flight occurred when some silk was transferred from Dayton to Columbus. In 1914, the United States accomplished the first cargo flight, while in 1930, the first Contract Airmail routes were created to operate on specific destinations (Hemisphere, 2022). World War II was very critical for air the cargo industry. In 1949, cargo flights had surpassed the railways in terms of transportation. The massive demand for supplies during the war promoted and developed aviation. Later in 1970, the industry developed the door-to-door express packages while in 1971, the first Boeing 747, designed exclusively for cargo, entered the industry (Hemisphere, 2022). The fact that passenger airlines were already operating their cargo operations made it difficult for new competitors to enter the industry. However, the fear of competition from existing freight carriers led to small freight carriers later attempts to control prices, with Civil Aeronautics Board permitting them to operate exclusively only for cargo. Flying Tigers was the hugest company in terms of profits in the 50s when the belly cargo first appeared in the market and seemed very profitable (Mall, 2019). Airfreight increased significantly in the next period with the rise of numerous transportation companies such as FedEx, UPS, DHL, and TNT. In the following decades, the development of technology and internet made air cargo industry to experience its highest growth until today (Mall, 2019).

Kim et al., (2020) conducted a study to investigate the trends in the cargo export field before and after Covid-19. Within their study, they found that the rise of e-commerce expanded the air cargo exports, which on average were growing by 3.5% every year, over the last decade. Analyzing the case of Korean air cargo, it was found that despite the economic recession faced by the entire aviation industry during the pandemic, the air cargo industry experienced a significant increase. Specifically, Korea's air cargo exports expanded thank to the massive increase in sales of IT products such as wireless devices and computers, which led to substantial economic growth. From January to April 2020, there was a 4.4% increase year on year in air cargo exports, demonstrating the resilience of the air cargo industry during the pandemic. (Kim et al, 2020).

Li., (2020) analyzed China’s air cargo sector in the context of Covid-19, discussing the situation of China’s air cargo industry through a SWOT analysis indicating strengths, weaknesses, opportunities, and risks. China’s air cargo overcame very quickly the economic downturn, as in May 2020, experienced an economic growth of 21.8% compared to last

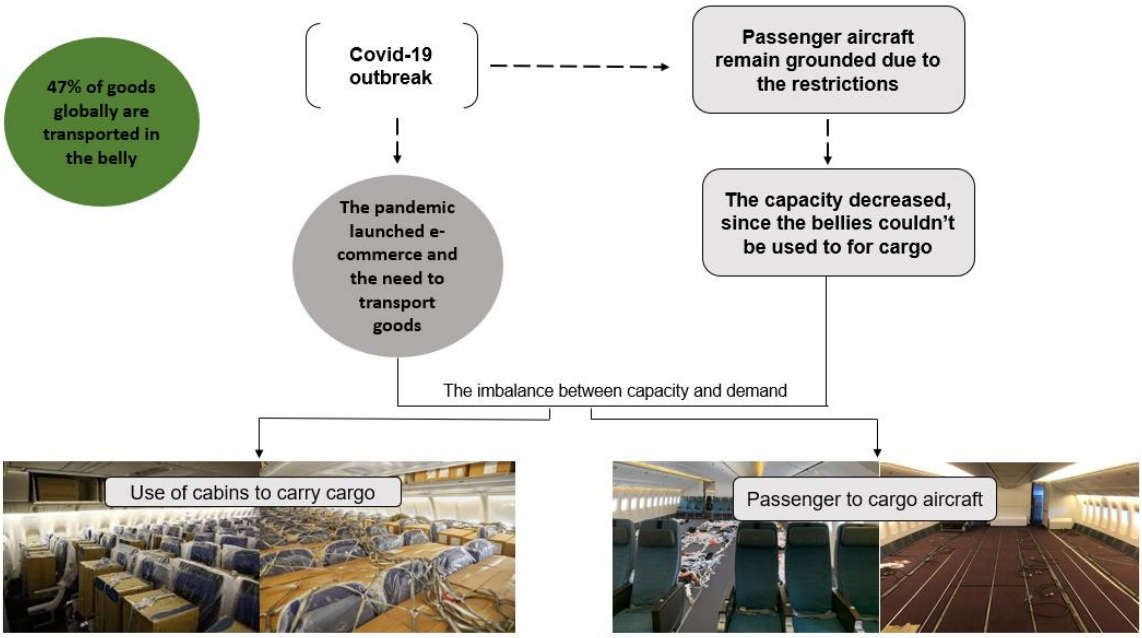
year's same period. Furthermore, during Covid-19, big e-commerce companies developed their business in air logistics. At the same time, it is noteworthy that in 2010 China accounted for only 1% of the global e-commerce market, while now accounts for 42%. The author found that the air cargo market was dramatically developed during the pandemic, and since consumption and demand are still increasing, a successful future can be expected for China's air cargo industry. Despite the significant growth, China's air cargo faced insufficient capacity, which resulted in new strategies for Chinese airlines by using passenger aircraft's belly to carry cargo. To conclude, passenger aircraft played a significant role in China's air cargo carrying in 2019, 48.6% of international air cargo.

2.4 The imbalance between air cargo capacity and demand

The air cargo industry was one of the industries that quickly overcame the pandemic's shock and started benefiting from that. However, at the beginning of Covid-19, the industry faced some disruptions. According to Shaban et al (2021), there was a significant increase in global air cargo demand by 27.7% in 2020 compared to 2019, while capacity decreased by 42%. This imbalance resulted in irregularities in the market as the supply and the demand of cargo were not matching. To face this problem in the demand and maintain the balance, Shaban et al., (2021), introduced a novel model supporting that the problem could be handled by the airlines. Within these strategies, quantity discount policies were proposed, aiming to increase the profits of the underutilized routes, but also to decrease the profits of the hot-selling routes. Prior to Covid-19, only 20% of air cargo was transported by cargo planes, while the rest of it (80%) was transported in the bellies of passenger aircraft (Verhoeven et al., 2021). That means that the airlines, always scheduled the capacity according to the needs of passengers and cargo capacity. During the pandemic, everything was different. Travel restrictions cancelled passenger operations. Non-active passenger operations resulted in the loss of the belly capacity of passenger aircraft, and airlines were called to balance this out to operate efficiently and safely. Therefore, in 2020, airlines, started using the passenger aircraft exclusively for cargo operations removing the cabins, or even fully converting it into a freighter. Hence, during the pandemic, air cargo was undoubtedly the only source of revenue for airlines. (Verhoeven et al., 2021), tried to make a short-term forecast for the air cargo demand between a central European airport hub and the United States during Covid-19 aiming to add the necessary capacity into transformed flight schedules. Through different models and approaches, it was found that the air cargo demand in the United States differed

from region to region, something that created difficulties into making precise predictions (Verhoeven et al., 2021).

Figure 2. The imbalance between capacity and demand



2.4.1 A comparison of CTK's and ACTK's per region from 2019-2021

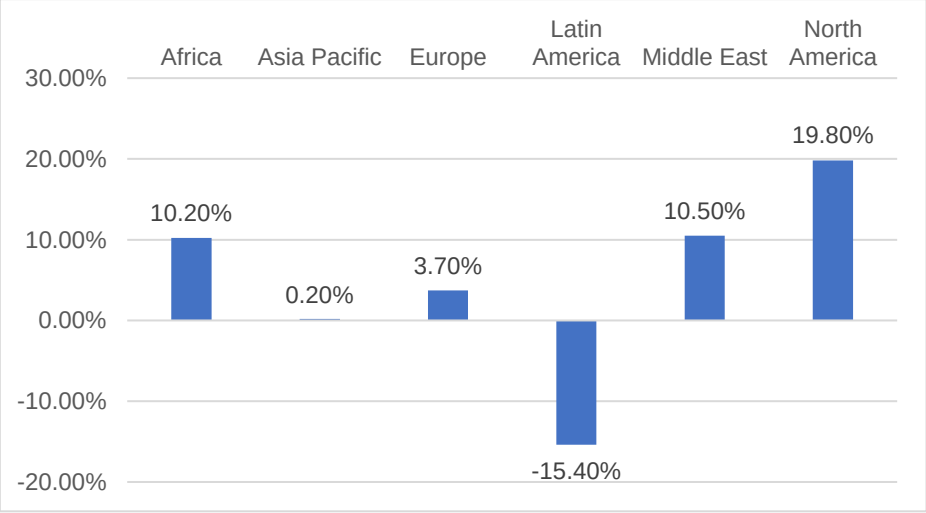
A general overview of the cargo tones carried, and available capacity for each service-continent will provide a general picture of the performance of the air cargo industry worldwide, and it will clarify and explain the imbalance created between the capacity and the demand.

In Figure 3, it is presented the year-on-year growth rate of CTK (Cargo Tonne Kilometers) for the regions of Africa, Asia Pacific, Europe, Latin America, the Middle East, and North America from 2019 to 2021. Over the three-year period, North America demonstrated the most significant increase in Cargo Tones, with a growth rate of 19.8%. This is explained, by the fast response of North America in the outbreak of the COVID-19 pandemic and the subsequent surge in e-commerce activity, by capitalizing on supportive government policies related to innovation and infrastructure capabilities. In addition, industry stakeholders have actively pursued the adoption and development of new technologies aimed at improving operational efficiency and enhancing customer experience (The Insight Partners, 2021).

Africa, Europe, Asia Pacific and Middle East recorded moderate growths due to a rising demand for air cargo services as the economy on those regions continued to develop.

Latin America encountered a decline of 15.4% in the cargo tones carried, which is attributed to various economic factors affecting the region. The air cargo industry in this region, faced a challenging period in 2020 and 2021, as it experienced a 15.4% decrease in the cargo tone. That was a result of the restructuring processes and financial difficulties that the industry of that region faced. Notably, Latam Group Airlines, a leader in the Latin America air cargo market, successfully completed its financial restructuring process in 2021. Despite experiencing a decline in cargo tones, as illustrated in Figure 3, the airline was able to reduce its debts and access to new financial sources, thereby converting its business model in response to the pandemic. The reorganization, of the airline, allowed it to maintain its leadership position in the market by adopting a more modernized fleet and expanding its network (Latam Airlines, 2022), (IATA, 2022).

Figure 3. Growth rate of CTK from 2019 to 2021

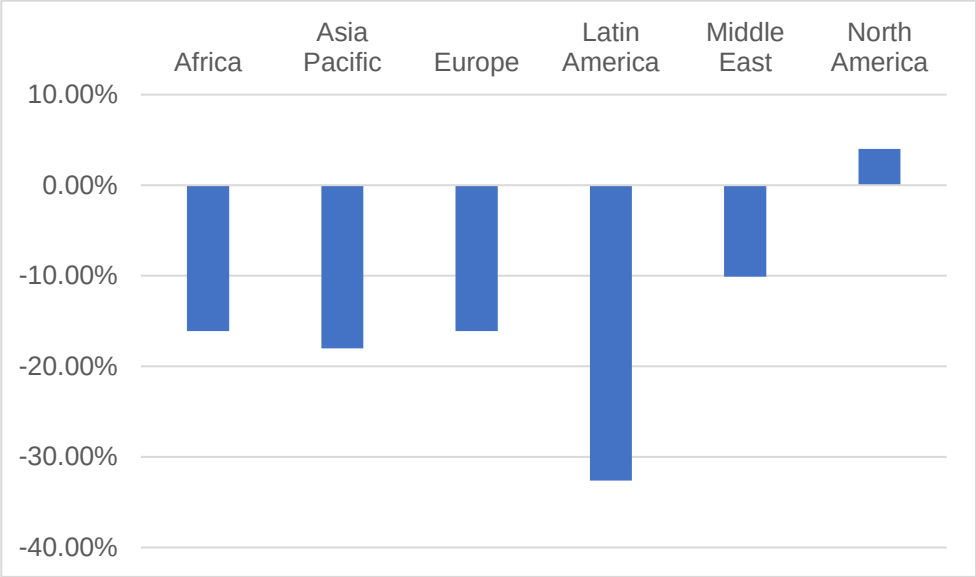


Source: (IATA, 2022) *CTK: Cargo Tones Kilometers

To identify the difference between capacity and demand, Figure 4 had been created. This chart, clarifies the change in available air cargo capacity from 2019 to 2021 across different regions. Most regions experienced a decrease in the available capacity in period with Latin America showing the largest decline of 32.6% (IATA, 2022). Asia Pacific, Europe, and Africa experienced similar declines in air cargo capacity, all around 16%. Both restrictions and stagnant passenger aircraft resulted in the decrease of the available capacity. On the other hand, North America air cargo saw an increase of 4%. As mentioned earlier, this region, had the fastest reaction in the Covid-19 outbreak, with collaboration with the governmental

policies accomplished to handle the increased demand and finally to increase its capacity (IATA, 2022).

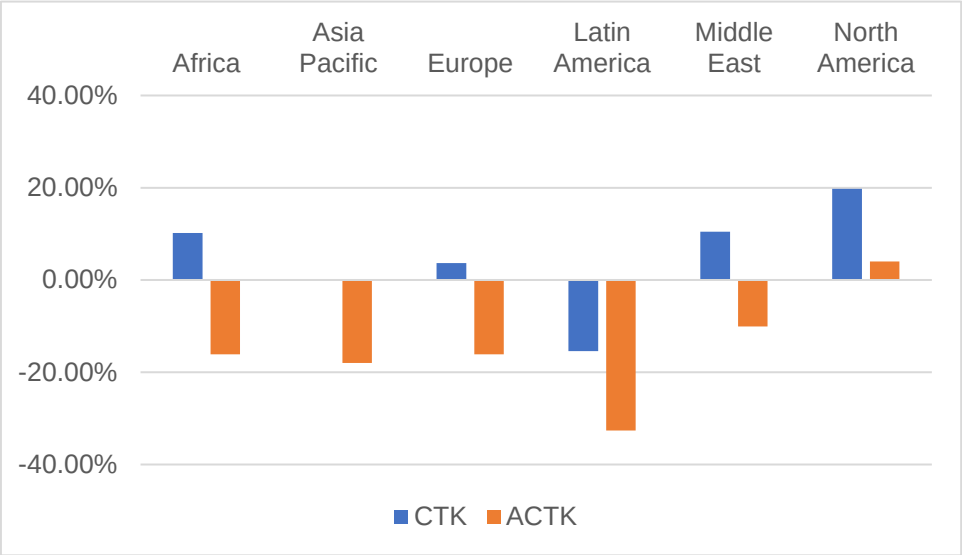
Figure 4. Growth rate of ACTK from 2019 to 2021



Source: (IATA, 2022) *ACTK: Available Capacity Tones Kilometers

Figure 5, presents a comparison chart between cargo tones and available capacity per region for the period 2019-2021, which provides further insights into the trends observed in Figures 3 and 4. The analysis shows that Africa, Asia Pacific, Europe, and the Middle East exhibited a similar performance in terms of growth in cargo tones and available capacity, albeit at different rates. This statement suggest, that these regions faced similar challenges and opportunities in the air cargo market during this period. However, Latin and North America and were the exemptions since they followed different trends . Latin America faced a important decline in tons carried and the available capacity, while North America experienced a rise in both available capacity and cargo tones (IATA, 2022).

Figure 5. Comparison between CTK's and ACTK's from 2019-2021



Source: (IATA, 2022)

The comparison between cargo tones and available capacity can provide additional insights into the performance of different regions in the air cargo market. For instance, the fact that in most regions the cargo tonnage growth exceeds the growth in available capacity, results in capacity constraints and consequently in higher transportation costs which had been a significant reason for the high growth in the market share for every region.

2.5 Theoretical relevance

The Covid-19 outbreak has caused unprecedented disruptions in the global aviation and in the supply chain industry. One of the biggest effects was seen in the logistics patterns for exporting and importing. While sea cargo demand decreased dramatically, air cargo demand faced a significant rise. This resulted in various opportunities for researching about the short-term and long-term implications of this situation. Therefore, this thesis will identify opportunities, challenges, and risks that the air cargo industry has experienced in recent years due to the pandemic. Furthermore, based on interviews with stakeholders, this research aims to advice strategies that the industry should focus on, to be prepared for another recession, and to ensure a successful future growth. To this end, further research is required to comprehensively analyse the air cargo industry. This analysis will be pivotal for informing industry stakeholders, policymakers and other key players within the aviation sector on how to approach the industry's future development and deal with the risks and challenges occurred from the pandemic.

Although several studies have examined the impact of the pandemic on the aviation industry, the vast majority have assessed the effects for passenger's transport and just few of them have focused on the air cargo industry. Some papers have analyzed the effect of the pandemic (in specific countries or regions), identified challenges, discovered opportunities, and proposed general suggestions for the future, nevertheless, none of them extended the analysis to the implications on the profitability of the industry. Furthermore, there are not studies aiming to give specific recommendations and strategic advice to the industry for future development.

For instance, Kim et al., (2020) analyzed the export trends of air cargo during and after the pandemic, and the possibilities of future growth of the Korean aviation industry. They found that a massive increase in the export air cargo volumes in that country was supported by the rapid rise in sales of high tech IT products and e-commerce. In a similar way, Li., (2020), found that, although China's air cargo industry was highly affected by the fall in the demand worldwide, it overcame quickly that shock thanks to incentives given by the government to improve capacity and competitiveness. Likewise, Nycz (2021), focused its research on the European air freight market and found, that the air cargo transportation had been significantly impacted from the pandemic. The author dispelled the belief that air cargo could save the airlines and suggested that any improvements to the aviation systems should take into serious account the environmental policies and focus on the balance between passenger and cargo operations.

Although previous studies found significant aspects of the impact of the pandemic on the air cargo in the short-term and long-term, none of them focused the analysis on the future of the industry. In the case of Kim et al., (2020) and Li., (2020), the assessment did not include an analysis of the profitability of the industry. They only investigated the disruptions brought by the Covid-19 outbreak on specific countries. On the contrary, Li., (2020), and Nycz (2021), proposed some brief advice for the industry, but did not emphasize into accurate steps for the future and preparation for another pandemic.

Overall, the purpose of the thesis is to contribute to the existing literature done for the air cargo industry, by utilizing qualitative research methods and collecting data to examine how the Covid-19 affected the profitability of the air cargo industry, and to give strategic advice for the future. The interviews focused mostly on the impact of the pandemic in the industry,

including the potential strategic advice for a future development and preparation for a next disrupting scenario.

3. Research questions and hypotheses

The research analyses the effect of the Covid-19 pandemic on the air cargo industry profitability. This is done by reflecting on the theory and analyzing data from that perspective. Lastly, the thesis aims to propose strategic advice and recommendations for the future of the air cargo industry in the scenario of entering into a new pandemic .

The first research question is related to the impact of the pandemic on the profitability of the air cargo industry with a specific focus on the revenue performance of various airlines before and after the pandemic.

Research question 1: What is the effect of the COVID-19 pandemic on the profitability of the cargo airlines?

The main hypothesis of this research is that the air cargo industry was affected positively by the pandemic and became more profitable. According to various sources and information collected from interviews, it is believed that the restrictions of the pandemic created a huge demand for air transport as other modes of transport were not allowed to operate. The last statement leads to the idea that airlines with cargo operations were more profitable during the pandemic.

Considering the above statements, two hypotheses were created which have been investigated and answered in this research.

- Cargo operations became more profitable during Covid-19.
- The demand for air cargo transport increased during the pandemic

Assuming that the air cargo industry's profitability was positively affected, this research comes up with opportunities and strategies that the industry should adopt to remain profitable, be well prepared for another recession, and develop its operation.

Research question 2: What strategies should the industry implement to remain profitable and be prepared for another pandemic?

4. Methodology and scope

The research starts by analyzing and interpreting an existing literature review through online research, articles, papers, and press releases to gather information on the impact of the pandemic and e-commerce trends on the aviation industry, specifically the air cargo industry. This is done in two phases: a qualitative analysis through various online sources such as articles, news and semi-structured interviews to explain the impact of the pandemic on the air cargo industry, followed by an analysis of the revenue performance of five e-commerce companies, namely Amazon, Rakuten, Zalando, Alibaba, and Asos, before, during, and after the pandemic. Data will be gathered mainly from Macrotrends, a premier research platform for long-term investors. All data will be analyzed using excel to create different graphs of revenue performance, and the growth rate will be created to indicate the growth of each company. The research will also present the strategies that the industry adopted to overcome the launch of e-commerce.

Next, the research will analyze the performance of the shipping industry during the Covid-19 pandemic and the role of pharmaceuticals in the air cargo industry. Challenges and risks that the industry faced during the transport of vaccines and pharmaceutical equipment will be identified through various online sources. To show the key role of the air cargo industry in the transport of vaccines and pharmaceutical equipment, the performance of three different airlines, Turkish Cargo, Lufthansa Cargo, and Delta Cargo, in terms of vaccines transported and tones of medical equipment will be presented through an analysis of information retrieved from the annual reports of each airline. The performance of these airlines will be clarified by explaining and comparing the market share of each airline. However, since the sample size is small, and the airlines operate in different networks, the sample may not be representative enough to make an accurate comparison between the airlines.

To have a more representative sample of the performance of the airlines and identify clearly how the pandemic and its consequences affected the air cargo industry, the research will analyze and compare the performance of six randomly chosen airlines in terms of revenues and other operational indicators such as tones transported, from 2017 to 2021. Data from the financial statements of Turkish Cargo, KLM Cargo, Delta Cargo, Qatar Cargo, Lufthansa Cargo, and Delta Cargo will be collected and interpreted. Specifically, the turnovers and volumes of every airline will be separately analyzed and presented through graphs and tables. Although the airlines operate in different countries and services, and the demand varies, a

comparison in turnovers of all airlines will provide an overview of the performance worldwide and enable the research to conclude and give advice to the industry.

To connect the performance per comparable turnover and the impact of the pandemic on the air cargo industry with the future and potential of the industry, semi-structured interviews will be conducted with experts and specialists in the sector. Pre-determined questions will be asked, and the interviews will be analyzed and interpreted to provide strategic advice and recommendations for the future of the industry.

4.1 Interviewee sample: Air cargo agents and Structure for the interviews

From the view of the air cargo industry, various representatives from the following airlines and were chosen to make the interviews: Turkish airlines, KLM Air France Martinair Cargo, Latam Airlines, IATA, TIATCA, PAS Aviation Logistics, SwissAir Cargo, DHL (Appendix 11.2). Every interview took place in English and 6 people were interviewed in total, while all interviewees came from similar positions. All interviews were recorded and the participants were aware of that. Likewise, it was mentioned from the side of the interviewer that all sensitive and confidential information would be treated in confidence and used for a qualitative analysis. The interviews were made and recorded on Microsoft Teams and took place from August 2022 until September 2022.

The interviews were structured in three parts:

- The first part is based on the effects that COVID-19 on the air cargo industry, and the actions done by the airline and in general the industry to react to the pandemic.
- The second part refers to the challenges that the industry experienced during and after the pandemic
- The third part refers to e-commerce. What was the influence of e-commerce on the air cargo industry and how did the industry react?
- The fourth and most important part is about the opportunities for the air cargo industry after the pandemic and the strategies that could be established to promote and develop the industry.

Appendix 11.1, provides an overview of the questions that were used during the interviews. The results of the data collected from the interviews are presented in the following section. The information collected is not exactly followed from the structure of the set questions (Appendix 11.1) and this happened because this part of the research took place mostly as a discussion. That means that interviewees did many times respond to follow-up questions.

However, every effort was made to maintain an organized discussion and structure throughout the interviews.

5. Data analysis

This section analyzes the impact of the COVID-19 pandemic on the aviation industry, particularly the air cargo sector. The section highlights three significant factors that had the highest influence on the air cargo industry during the pandemic: the rise of e-commerce, the collapse of the shipping industry, and the transportation of pharmaceuticals.

5.1 Impact of the pandemic on aviation

As stated to all of the interviews, prior to the pandemic, aviation industry was experiencing a ten year growth after the financial crisis in 2008-2009. The passenger airlines were experiencing over 5% year on year growth and passenger networks were larger than ever. Later, the Covid-19 pandemic has had a profound impact on the aviation industry, causing significant losses in revenue and passengers. In 2020, the industry recorded its worst year ever for revenues, passengers, and routes, due to travel restrictions, event cancellations, and reduced demand. This resulted in billions of dollars in losses for airlines and airports (Rensonnet & Cassart, 2022). According to the International Air Transport Association, in 2020, compared to 2019, the aviation industry accounted for a total loss of USD 189 billion in 2020, representing a 69%. In 2020, 60.2% less passenger travelled by air, while also international domestic passenger demand dropped by 75.6% and 48.8%, respectively (International Airport Review, 2021). The recession of aviation affected consequently millions of employees, and the industry accounted for 2.3 million fewer jobs than in 2019s' and pre-pandemic levels (Dobilas / Shutterstock, 2021). During the pandemic, aviation-supported jobs decreased by almost 50%, with total job losses of 1.7 million in general airport positions (Dobilas / Shutterstock, 2021).

European aviation marked similar downfalls. At the end of 2020 European region flights, compared to 2019, faced a decrease of 52.6%, while world-wide international flights decreased by 33.8% (TUNCAL et al., 2021). Accounting for more than 40% of the world's cases in 2020, the European Union & Schengen area closed its borders, while the United Kingdom banned all international flights. In April and May 2020, European air traffic decreased by 93.6% in contrast to 2019 (TUNCAL et al., 2021).

Despite the hope brought by millions of vaccinations and the lifting of the restrictions worldwide, the European aviation industry's recovery was slow in 2021. In January, the industry operated only 9.241 flights, a 64% decrease from 2019 levels. While there was some improvement by the end of the year, with 6.2 million flights operated, this is still significantly lower than the 11.1 million flights in 2019 (Europe Control, 2022).

5.1.1 Performance of three random airlines in terms of revenues and passengers traveled

This chapter presents the growth rates of two key indicators per airline between the years 2017 and 2021. The first indicator is the revenue generated from passengers, and the second is the number of passengers that travelled during the same period. The figures presented are percentages, representing the growth rate of these indicators in each year compared the previous year.

For KLM Royal Dutch Airlines, it can be observed that the growth rates of both indicators were positive in 2018 and 2019 with the revenue generated from passengers growing by 1% and 2% respectively, and the number of passengers traveling increasing by 2% in both years. However, in 2020 when the pandemic outbroke a significant decline is evident, with revenue and passenger numbers dropping by 69% and 67% respectively. In 2021, there was a moderate recovery, with revenue and passenger numbers increasing by 31% and 24% respectively, although both indicators remained significantly below pre-pandemic levels (KLM 2017-2021).

In the case of Lufthansa Airline, the data indicate a 2% increase in passengers growth rate from 2018 to 2019, followed by a significant decline of 75% in 2020 due to the COVID-19 pandemic. However, there was a moderate recovery in 2021 with a growth rate of 29%,. In terms of revenue, was observed a positive trend over 3% in 2018 to 2019, but experienced a significant decline of 77% in 2020, during the outbreak of the pandemic. However, the revenue growth rate showed signs of improvement increasing to 29% in 2021 (Lufthansa Group 2017-2021)

Turkish airlines, in 2019, experienced a small decline by 1% in terms of passengers travelled, while in 2020, on the beginning of the pandemic there was a significant decrease by 62.20%. in the number of passengers. In terms of revenue, it followed the same trend in 2020 when during the pandemic it fell over 65% compared to 2019. Similarly, in 2021, the revenues started increasing resulting to a remarkable growth of 69% (Turkish Airlines).

Overall, the analysis of the data indicates that all three airlines exhibited similar trends in terms of passenger volume and revenue generation. This finding, serves as evidence of the uniform negative impact of the COVID-19 pandemic across the aviation industry at the early stage of the outbreak.

5.2 The shock of Covid-19 on the air cargo industry

According to Patrick (2020) and confirmed from the interviews, the air cargo industry is directly connected with the global economy. After, the crisis economic crisis in 2008-2009, the air cargo volumes were dramatically low and remained stagnant for lot of years. In early 2020, lots of passenger aircraft were grounded since travel restrictions didn't allow them to operate. The capacity of air cargo dramatically dropped by 35%-45% compared the previous year, as their bellies were unavailable for use. Simultaneously, the global demand for air cargo decreased by 27.7% before eventually recovering (Patrick, 2020, Niestadt, 2020). Manufacturing production in China declined, and global exports experienced their largest decrease on record (IATA, 2020).

During the pandemic, the air cargo sector was the only source of revenue for airlines, as cargo freighters were the only planes in operation. However, the high demand for cargo exceeded the available capacity, forcing airlines to find solutions to avoid collapse. The long-term restrictions and lockdowns led to the development of online shopping (Murray, 2020). Coupled with the increase in e-commerce and the congestion in shipping transportation, the urgent need for transportation of goods, medical equipment and pharmaceuticals contributed to the rise in the cargo volume demand (Jackson, 2022).

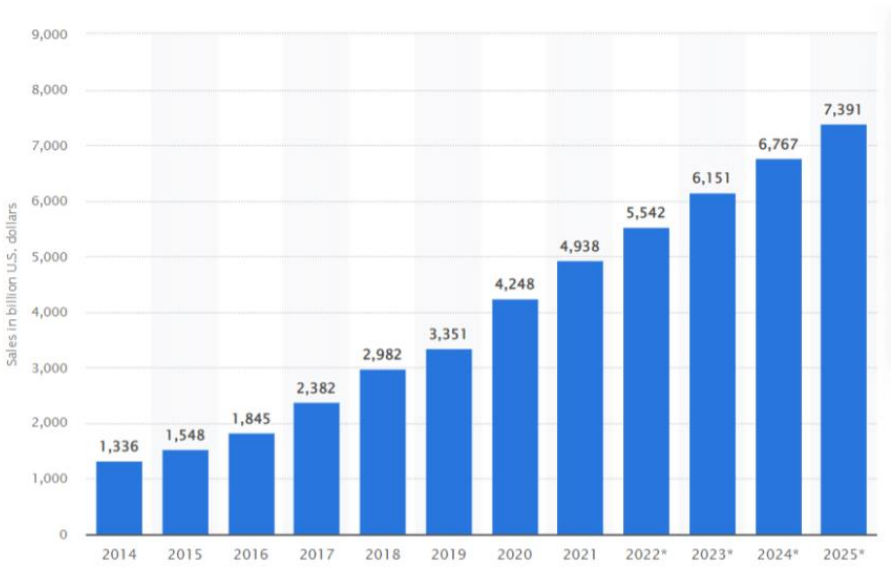
To respond to the increased demand but also the missing capacity, the airlines, took advantage of the stagnant passenger aircraft by carrying cargo in the cabin, removing the seats, or even wholly converting the passenger aircraft into freighters (IATA, 2020). In the middle of 2020, more than 20 airlines were using passenger aircraft for cargo operations, among others Qatar Airways, Delta, Lufthansa, Turkish Airlines and KLM. As a result, the airlines managed to increase their capacity, keep the grounded aircraft flying and minimize their maintenance costs (Fenton, 2020). According to the Regional Cargo Director of Turkish Airlines, initially, the airline began conducting cargo operations exclusively via passenger aircrafts only to European destinations, with the aim of testing the efficiency and productivity of such a strategy. Subsequently, the airline expanded its operations to include Far Eastern destinations, and increased the number of passenger aircrafts available in its fleet for cargo

operations over time. In April 2020, KLM Royal Dutch Airlines accomplished its first passenger carrier flight, a flight from Shanghai to Amsterdam carried almost 500 packages of medical equipment and pharmaceuticals. This innovative solution to the air cargo capacity problem enabled transfer of important goods, and increased flight capacity, in response to the pressing needs of the healthcare crisis (Klm, 2020). Per the statement made by the General Director of the International Air Cargo Association (TIATCA), " the utilization of passenger aircrafts for only cargo operations has led to the creation of the largest cargo fleet ever witnessed in the industry. Despite this development, the fleet size is still deemed insufficient to meet the high demand for cargo transportation."

5.3 E-commerce

In 2017 the annual revenue of e-commerce globally launched to USD 2 trillion, while three years later, in 2020, Covid-19 unexpectedly increased the e-commerce sales. The outbreak of the pandemic had been very critical for the retail shopping and e-commerce benefited from the lockdowns and the restrictions since people could accomplish their purchases only online (April Berthene et al., 2022). As presented in Figure 2 by IATA (2022), the e-commerce industry reached a revenue of USD 4.9 trillion in 2021 (IATA, 2022). The giant logistics provider DHL, saw the potential of e-commerce to increase its revenue and shipping volumes far more than expected. More specifically, in 2021 e-commerce increased the profitability of the company by 22.8% compared to 2020, generating revenue of € 5,9 million. In response to the significant growth of e-commerce, DHL Group established numerous new businesses including DHL E-commerce Solutions department accounting for a 28% share of new businesses (DHL Group, 2021). According to the Vice President of Strategy and Development of DHL, Covid-19 had been a stressful situation for the company at the beginning. Although with the necessary strategies, the company took advantage of the pandemic, developed its operations and increased it's revenues. The substantial growth of online shopping led consequently to mass waves of orders and new challenges for the logistics providers. In Figure 6, it is presented a global retail e-commerce sale forecast for the period 2014 to 2025.

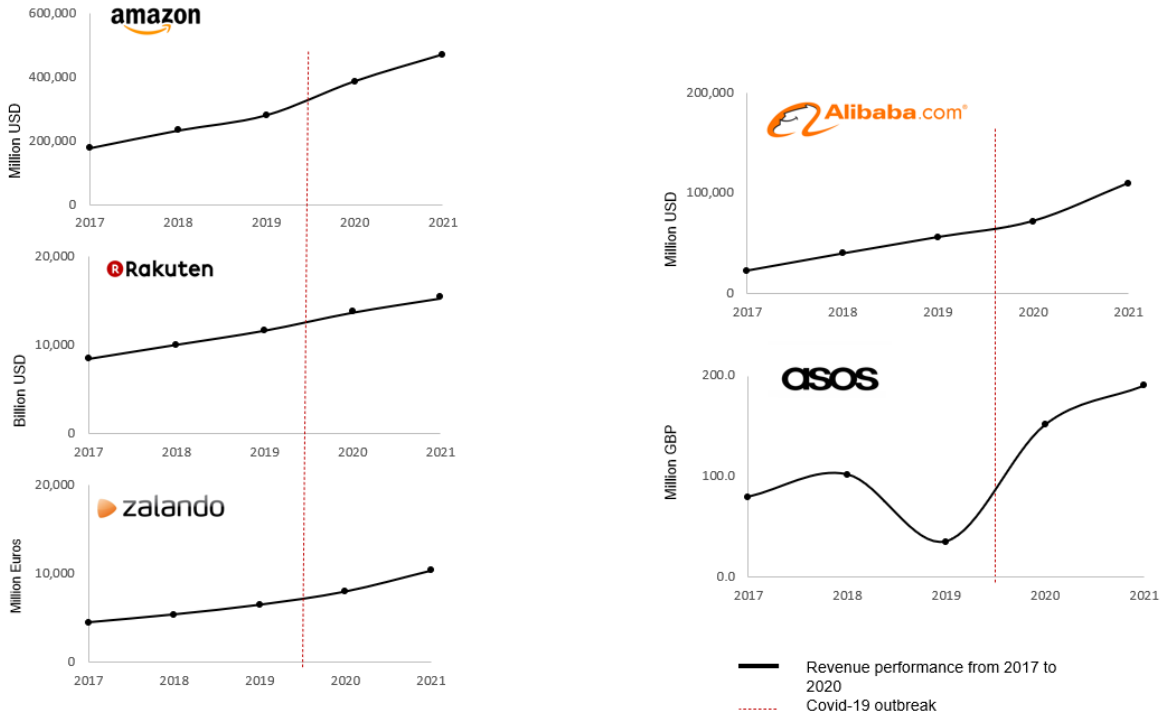
Figure 6. Global retail e-commerce sales forecast from 2014 to 2025



Source: Statista 2022

The Covid-19 outbreak resulted to a variety of changes to global trends leading to disruptions in the retail industry and accelerating online shopping (Bhatti et al., 2020). Figure 7, provides a comprehensive analysis of the impact of Covid-19 on the e-commerce market. This chart was done by investigating the performance in revenues of the world's five largest e-commerce companies in the world: Amazon, Rakuten, Zalando, Alibaba, and Asos.

Figure 7. E-commerce companies' revenue from 2017 to 2021



Sources: Statista 2022, macro trends 2022

Amazon: The e-commerce giant Amazon experienced a surge In revenue during the pandemic as demonstrated in Figures 4 and 5. In 2019, before the Covid-19 outbreak, Amazon accounted for a revenue of USD 280,5 million (Statista, 2022). However, the next two years were very profitable for the company. In 2020 the revenue of amazon launched to USD 386 million, while in 2021 increased by 38% reaching USD 470 million (Statista, 2022).

Rakuten: The outbreak of the pandemic did not affect revenues of the company to any great extent as it has continued its upward trend over the last few years without showing signs of any exceptional increase during the pandemic (Macrotrends, 2022). More specifically from 2017 to 2021, Rakuten followed a bullish path in terms of revenue. Nevertheless, Covid-19 contributed to this upward trend and in 2020 and 2021 its revenues increased by 18% and 12% compared to 2019 respectively (Macrotrends, 2022).

Zalando: The German multinational e-commerce company Zalando is very close to the previous case of Rakuten. Although the company's revenue was steadily increasing since 2017, during the pandemic the growth rate was higher compared to the previous years. More specifically, in 2020, the revenue of Zalando increased by 23% to 8 million Euros compared to 2019. In 2021 it continued its growth reaching 10,5 million Euros approximately (Koptyug, 2022).

Alibaba: The online shopping company Alibaba experienced a huge increase in terms of revenue in 2018 increasing by 73%. During the pandemic, in 2020, Alibaba saw its revenue having an important increase from USD 56,1 U.S. million to USD 72 million compared to 2019. On the other hand, in 2021, the revenue of the company sharply increased reaching USD 110 million approximately (Ma, 2021).

Asos: The clothing online company Asos had a unique experience during the pandemic. In 2018 the company attempted to increase its profits by replacing people with robots in all European warehouses, while also by expanding its operations in the United States (BBC, 2019). Unfortunately, this resulted in a dramatic decrease of 66%. However, the outbreak of Covid-19 proved to be a turning point of the company. In 2020 the revenue of Asos accounted for 151 million GBP, a 330% extraordinary increase compared to 2019, while in 2021 the revenues continued the same trend rising by 26% (Chevalier, 2022).

5.3.1 The influence of e-commerce on the air cargo and the first reactions by the industry

The pandemic disrupted the global trends, leading to an upsurge in e-commerce and creating an increased demand for goods to be transported. To meet the changing consumer demands and the state of the global trade, the air cargo industry prioritized quality, convenience and digitalization. The combination of these factors made air transportation a viable option to meet consumer expectations (Jackson, 2022).

The rise of e-commerce, created high demand for the transport of cargo by air while the additional capacity was emerging. Many airlines had to adapt their business models and invest in new technologies and services to keep up with the changing landscape. For instance, Lufthansa Cargo, founded a new subsidiary called "world", which accelerated the company's cargo sector (Galea-Pace, 2020). Realizing that the bellies couldn't meet the high demand, the airline announced the launch of short medium-haul network, in which the airline accomplished more frequent routes to smaller airports. In addition, Lufthansa Cargo, on April 2022, presented its first full converted air freighter A321, to cover destinations within Europe.

Similarly, KLM Cargo, in 2021, based on the use of passenger aircraft for cargo operations, did increase its capacity by 10.5% (KLM, 2021). In the case of FedEx, the company extended its operation to seven days and offered door service options to win the fast-growing e-commerce market. In 2021, the company completed an important step in digitalization, providing real-time data to suppliers and customers in order to make it operations more efficient. The rise in capacity, volume growth, network extension, and the optimization of technology drove the company to strong revenue and operating income (FedEx, 2021). The Global Head Cargo of the International Air Transport Association (IATA) supports that, a passenger aircraft used for cargo operations, was able to carry the 2/3 of the total cargo, while in combination to the low fuel costs and the high rates it was financially sustainable and created high profits. To explain his statement, he presented a detailed example of how many tones of cargo can a Boeing 777 aircraft carry under different circumstances:

- A Boeing 777 aircraft can carry in total no more than 100 tones of combined passenger and cargo
- Passengers on board**:** 25 tones of cargo
- No passengers on board, but with the seats still in it: 45 - 50 tones of cargo
- No seats (=no passengers): 60 – 65 tones of cargo.

Comparing the tones of cargo for each circumstance, it can be found that the use of passenger aircraft for cargo operation can effectively carry almost two-thirds of the total volume of the aircraft, which as stated above, in combination with the low fuel costs and high rates generate high profits.

Overall, the rise in e-commerce significantly worked as a reminder for the air cargo industry, which realized that the urgency for action and improvements and innovative strategies that would contribute to the development and profitability of the industry was crucial.

5.4 Performance of the shipping industry during Covid-19

According to Danelia (2021) in the last decades, the shipping industry has undergone a substantial upward trend. Specifically, from 2003 onwards, containerized volumes had been increasing steadily at an annual average rate of more than 35%. The shipping industry experienced a huge growth until 2018. This growth has been accompanied by numerous innovations that have contributed to the development of the industry in the last two decades. Container ships were progressing year to year, marking improvements in the loading, and unloading times, leading to reduced turnaround times, and consequently cost savings. Big vessels have also undergone continuous renovations, resulting in an increased capacity and an improved efficiency (Danelia, 2021).

However, the outbreak of Covid-19 has had undoubtedly a major impact in the maritime industry and shipping, causing disruptions to the global trade and leading to unprecedented challenges for the sector. After the first lockdown in China and the consequent limitation of trade with the rest of the world, the volumes of imports and exports significantly declined, with global trade shipping volume dropping by 8.5% and imports and exports decreasing by 8.8% and 7.6%, respectively (Danelia, 2021). In April 2020, as demand continued to fall, shipping carriers were forced to respond to the situation. This decline in demand led to a big reduction in the supply, with shipping companies and operators cancelling services and moving vessels out of service. This resulted in thousands of carriers reducing their capacity, with a reduction of 2.5 million Twenty-foot Equivalent Units (TEU) recorded in March 2020 alone (International Transport Forum, 2020).

Despite the continuation and expansion of lockdowns and restrictions around the world, several emerging trends such as e-commerce created challenges and trade imbalances for the shipping industry. The demand for containerized goods surpassed initial expectations, with shipping capacity unable to qualify the demand. Shortage of containers, and empty containers

parked in irrelevant ports led to shifts in the container trade geography (UNCTAD, 2021). Empty containers in ports created a shortage of parking spaces for goods waiting to be loaded onto vessels. The limited storage space caused delays and congestion, with ships remaining berthed in ports waiting for the containers, while vessels remain anchored outside the ports (Marsh, 2021).

During the pandemic, the transportation of cargo has become a critical aspect of supply chain. While both air and ocean freight were always viable options, air freight emerged as the preferred choice due to its ability to provide timely, accurate and flexible transportation. That was especially relevant since the congestion and delays in shipping have been blocking the global trade, which turned manufacturers and suppliers to seek out air services. Overall, the urgency of distributing medical equipment, fresh products and vaccines proved the critical importance of air freight and converted it to a main competitor in the supply chain (Makhanov, 2021).

5.5 The influence of pharmaceuticals

During the pandemic, the need for the transportation of pharmaceuticals increased and the air cargo industry was the key of transporting medicines, vaccines, and every kind of pharmaceuticals (IATA, 2020). Nevertheless, the transport of these sensitive products has a lot of risks and especially the transportation of vaccines was considered the most difficult challenge of the century for the global industry. As most pharmaceuticals require special conditions, the air cargo operators faced various challenges and had to adopt these conditions to operate and transport the goods (Menkor Aviation, 2020). There is a variety of temperature-controlled shipping requirements for COVID-19 vaccines, with some requiring deep freezing and others more typical shipping temperatures. To meet new standards, new deep-freeze vaccines required novel solutions. The logistical and technological difficulties associated with shipping these vaccines in large quantities across the globe, have prompted responses from providers of temperature-controlled shipping solutions. Boosters were also required, in addition to the vaccines currently being shipped and those in development. Given that they were transported alongside the flu vaccines and other pharmaceutical payloads, this continued to increase the volumes of pharmaceutical products being shipped (Hyde, 2021). As stated to the interviews, the massive demand for the transport of pharmaceuticals and medical equipment during the pandemic, was the one of the biggest challenges that the air cargo industry has ever faced. Since 2014 the global pharmaceutical sector was significantly

increasing, meaning that the need for temperature management was becoming higher. The lack of this technology and infrastructure and the lack of standardization and compliance led to a decrease of the pharma products shipped by air by 6% in the 2000s, while also to billions of losses for the air cargo industry (Pharmaceutical Logistics, 2021).

5.5.1 Risks and challenges of the industry for vaccines distribution

Until 2021 the pharmaceutical companies Pfizer and Moderna have jointly produced more than 500 billion doses of vaccines. According to Jones (2020), over 8.000 flights would be needed to distribute all these vaccine doses around the world. As previously mentioned in this research, the air cargo industry faced various difficulties in transporting pharmaceuticals, especially vaccines. The special temperature requirements of vaccines made the industry's task even more demanding (Kiernan, 2021). For instance, Pfizer's vaccines need to be maintained at -70 degrees Celsius, while those of Moderna can be maintained from 2 to 8 degrees Celsius (Jones, 2020). Some of the most significant challenges and risks for the air cargo industry regarding vaccine transportation are presented below.

Lack of information: According to Polman (2021), the industry was not enough informed about what to expect such as the unique requirements of each vaccine, which made it challenging to predict the necessary transportation and cooling infrastructure. To address this issue, and contribute to the development of the vaccine transportation. The International Air Cargo Association, approached multiple manufacturers for more information and prepare accordingly. In addition, they involved various stakeholders sharing different practices to inform and mainly prepare for what was about to come. (Polman, 2021)

Missing infrastructure and capacity: As previously noted, controlling temperature was one of the biggest challenges for the air cargo industry in transporting vaccines. Operators were concerned about the need for special equipment, temperature, and maintenance, and the capability of each aircraft to meet these specific requirements. Moreover, maintaining and storing vaccines at each airport was critical, as there was a high risk of cold chain failures and the potential loss of a significant number of vaccines, as highlighted by the W.H.O. (Ofman & World Staff, 2022). This challenge was further compounded by the increased demand for accessories such as masks and medical supplies during the pandemic period, which required more storage space. It had been estimated that the surroundings of the vaccines such as masks and medical supplies, would count six times the volumes of vaccines themselves (Petkov, 2021). On the other hand, administration of vaccines was more complicated than a simple

transport, and many parts of the world lacked adequate infrastructure. In Africa for instance, only 3 countries out of 56 had suitable facilities at airports to store vaccines at right temperature.

5.5.2 Performance of airlines on the transport of medical and pharmaceutical equipment, capacity investments

This chapter presents an analysis the performance of three selected airlines regarding the transportation of pharmaceuticals. It should be noted that this is only a small sample since every airline worldwide contributed to the transportation of pharmaceuticals during the pandemic.

Qatar cargo had been one of the leader in the aviation industry before and during the pandemic. Showing its high sense of responsibility to contribute in the distribution of vaccines and pharmaceuticals, the airline, signed a five year agreement with UNICEF, to support the organization and contribute to the transportation of vaccines and pharmaceuticals. Furthermore, airline, expanded its network to reaching the 73 pharma hub stations, and added to its network the Pharma express flights from different pharmaceutical hubs worldwide. As a result, Qatar cargo, transported over 20 million doses of vaccines to more than 25 countries (Qatar, 2021).

In 2020 when the pandemic started, Turkish cargo broke records, by transporting more than 50,000 tons of healthcare goods and boosting its market share of global medications and pharmaceutical transport to 7.5%. When the efforts to create the vaccine against Covid-19 started, the Turkish cargo made preparations for the its transportation, and invested to the necessary infrastructure and temperature management. In November 2020 the Turkish cargo accomplished the first transport of the first vaccine in starting from Turkey and distributing it to more countries (Turkish Airlines, 2020). One year later in 2021, Turkish cargo continued playing a critical role in vaccine transportation. More specifically, it transported more than 340 million doses of Covid-19 vaccines to more than 60 countries, ensuring the special control temperature of each country and achieving secure and safe transport of them (Turkish Airlines, 2021).

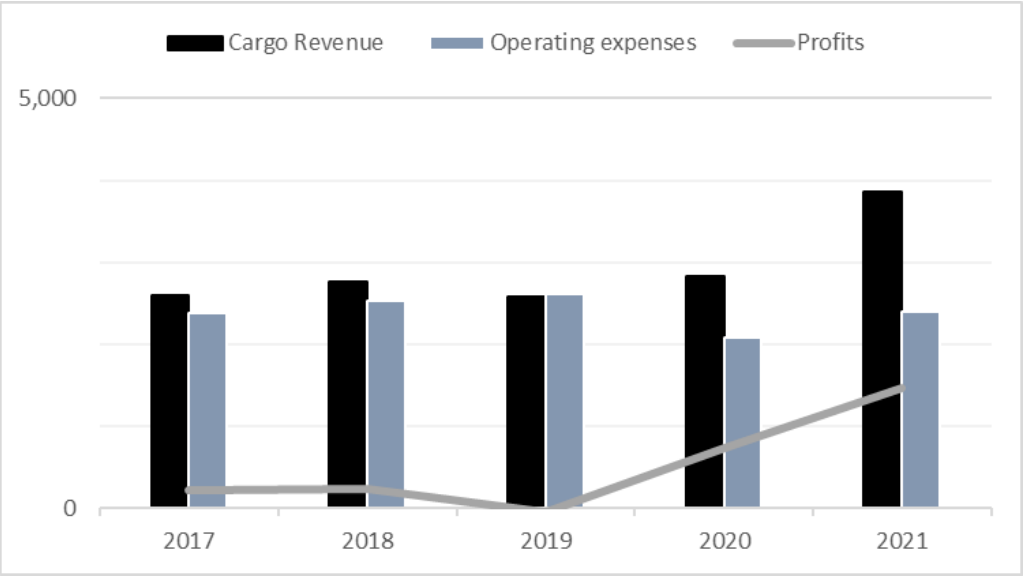
Delta cargo airline has a key role in vaccine transportation emphasizing on a safe and reliable transport of pharmaceutical products in recent years (Graham, 2020). During the pandemic, the airline created the Vaccine Watch Tower, a unique system that allows the monitoring and supporting of the shipment 24/7, while also provides full visibility. The airline's extensive

experience in distributing pharmaceutical products, along with the large warehouses and the certified pharmaceutical infrastructure in many airports in the US allowed the airline to be one of the safest and most efficient distributors of the vaccines. In coordination with airline partners, Delta cargo operated more than 40 cargo flight per week for only pharmaceutical purposes (AviationGhana, 2020) worldwide. During the pandemic, the airline developed a new cooler system, which provided temperature control solutions (Graham, 2020). Finally, the airline was a major boost of vaccine distribution in Colombia, transporting more than 4 million doses (Writer, 2021).

6. Performance of 6 selected airlines in terms of revenues, profits and tones of cargo transported from 2017-2021

The aim of this chapter is to present an analysis in the revenues, profits of six randomly selected airlines, before and during the pandemic. This investigation aim to indicate, whether the revenue performance of these airlines had been positively affected by the pandemic. Turkish Airlines, KLM Royal Dutch Airlines, Delta Airlines, Qatar Airways, Latam Airlines, Lufthansa Group Airlines are the airlines that are going to be presented and analyzed.

Figure 8. Lufthansa Cargo Profits in millions USD

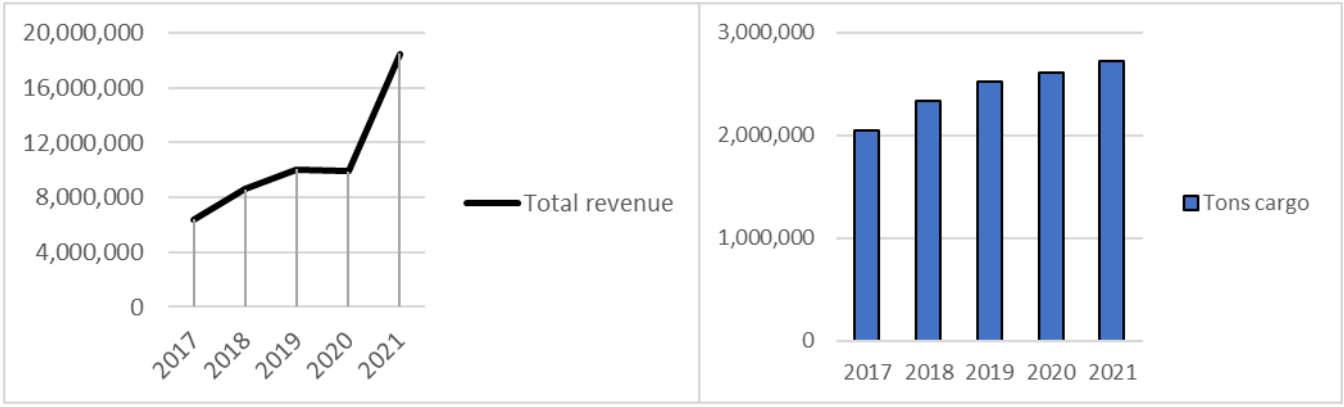


Source: Lufthansa Annual Reports 2017-2021

The financial performance of Lufthansa Airlines in the cargo sector between the years 2017-2021 in terms of profits is presented in Figure 8. Before the pandemic, the airline had maintained a steady pace of profitability, reporting profits of 217 million USD and 232

million USD for 2017 and 2018, respectively (Lufthansa Group, 2019). However the year 2019 was proved to devastating year for the airline with high prices, declining yields for the two most significant tradelines, and low load factors contributing to a loss of 117% compared to the previous year (Whiteman, 2019), (Lufthansa Group, 2019). In response to the outbreak of the pandemic, Lufthansa Cargo took swift action to mitigate the impact on its business. The profitability of the airline was not affected from me the pandemic and kept rising its profits in 2020, totaling 744 million USD. Furthermore, in 2021, Lufthansa Airlines observed a significant increase in profits due to the surging demand for cargo transportation resulting from the pandemic, with profits rising by approximately 100% compared to the previous year Lufthansa Group, 2020,2021).

Figure 9. Qatar Cargo revenues and tons of cargo in USD



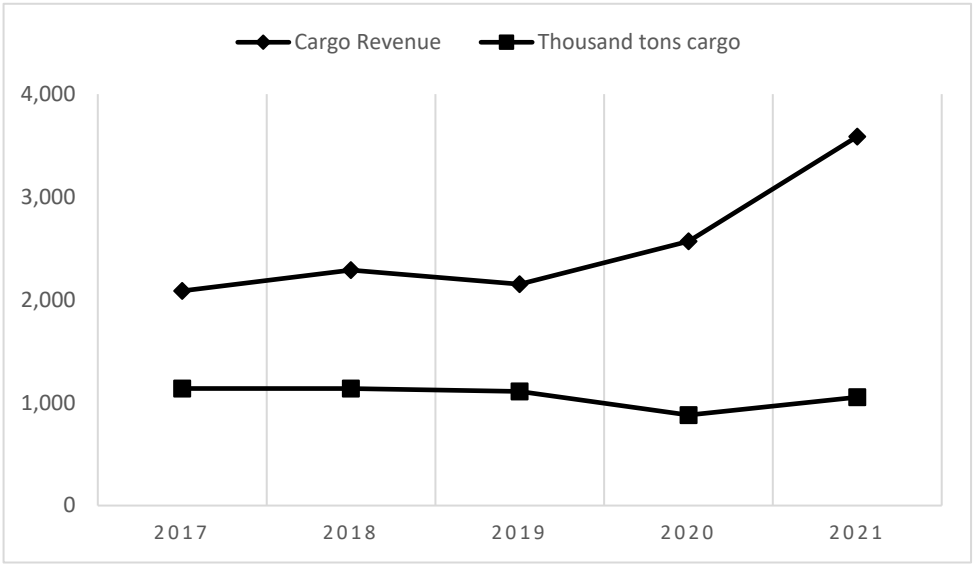
Sources: Qatar Airways Annual Reports 2017-2021

Figure 9, depicts an analysis of the revenue and tonnes carried by Qatar Cargo, before and after the outbreak of the Covid-19 pandemic. In the year 2017/2018, Qatar's cargo division expanded its capacity by adding four new full freighter destinations (London, Phnom Penh, Pittsburg and Yangon) and became the second largest Cargo Airline in the world. Furthermore, the airline expanded its 75 Pharma hubs, and established a new Climate Control Center (Qatar Airways, 2018). In the year 2019, the revenue of the airline increased to 10,100 million USD compared to 2018 (8,600 million USD), and the airline transported more than 2,500 tons of goods. The year 2020, marked a critical year for the entire world due to the outbreak of the pandemic, causing stagnation due to the imposed restrictions. Although Qatar cargo faced a small increase in the volumes carried in 2020, the revenues decreased by 1%. During the peak of the pandemic, the airline increased its cargo operations reaching 183 flights per day in May 2020. In the years 2020-2021, the Qatar cargo carried more than 2,200 million tons, while it doubled its revenues to 18,500 million USD compared to 2020. The rise

in revenues can be attributed to the heightened demand for transport and the ramped-up air freight fares during the pandemic. (Qatar Airways, 2021).

Figure 10. KLM Royal Dutch Airlines revenues and tons of cargo

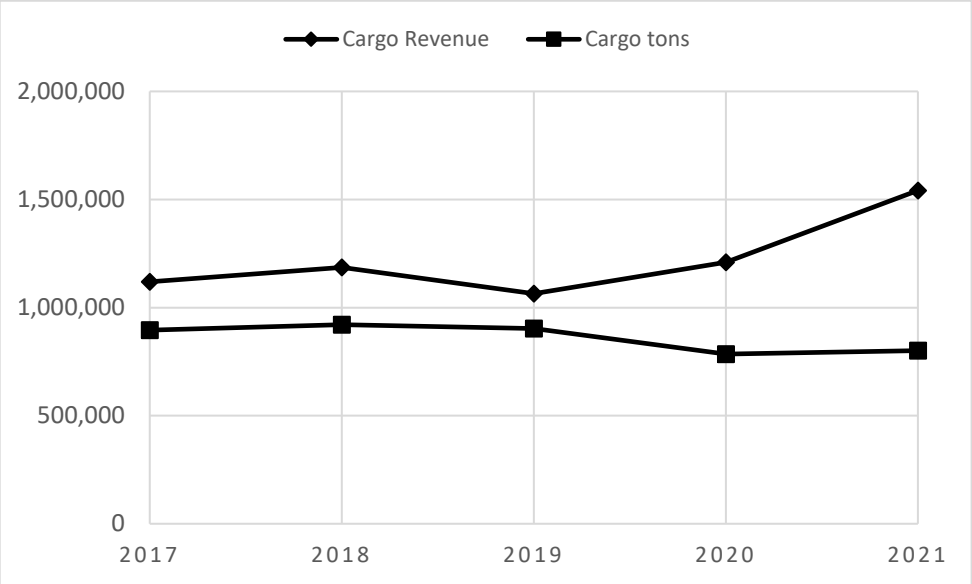
in million USD



Sources: KLM Royal Dutch Airlines Annual Reports 2017-2021

Based on the financial statements of KLM (2017-2021), in Figure 10, can be observed a difference between the cargo revenue and the tones carried during the pandemic. This is a result of the imbalance between the demand-capacity, as well as the high air freight fares during the pandemic. Specifically, KLM's cargo revenue followed some small fluctuations, with a revenue of USD 2.1 million in, a 19% increase in 2020 and almost two times higher revenue in 2021 compared to the pre-pandemic levels. However, KLM's tones carried decreased significantly in 2020 due to the impact of the pandemic on the load factor and capacity of the airline. The pandemic initially reduced the load factor and the capacity of the airline. One year later in 2021 strategic decisions were made to mitigate the effects the pandemic including the use the passenger aircrafts for cargo operations. This resulted in an increase the capacity and the load factor of the airline (KLM 2017-2021).

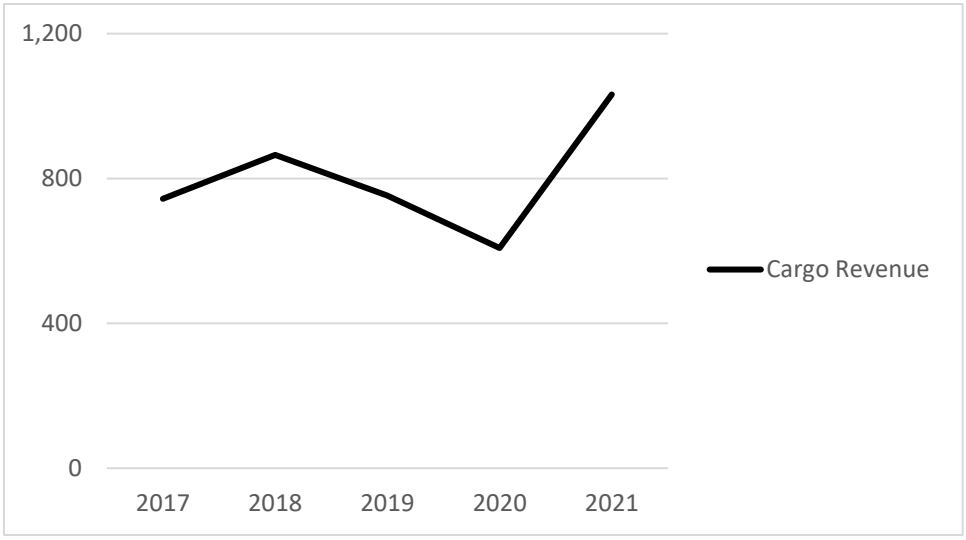
Figure 11. Latam Cargo revenues and tons of cargo 2017-2021



Sources: Latam Airlines Group Annual Reports 2017-2021

The Latam Airlines Group for the cargo sector exhibited a similar performance with KLM Royal Dutch Airlines. Specifically, the airline generated cargo revenue of USD 1.18 million and USD 1.06 million in 2018 and 2019, respectively. For the year 2020, the cargo revenue increased by 14%, and during the pandemic the revenues had been surged to USD 1,54 million. However, the airline's capacity to carry cargo was negatively affected when the pandemic started, due to the impact of stagnant aircrafts, while in 2021 it showed a slight increase (Latam 2017-2021). Furthermore, the difference between the increased revenues and the decreased cargo tones can be attributed in the fact that during this period restructuring processes such as reorganization and improvements into fleets and expansion of the network took place for the airline. The lower volumes created higher air freight rates resulting to a reverse performance between cargo tones carried and revenues of the airline (Latam Airlines, 2022).

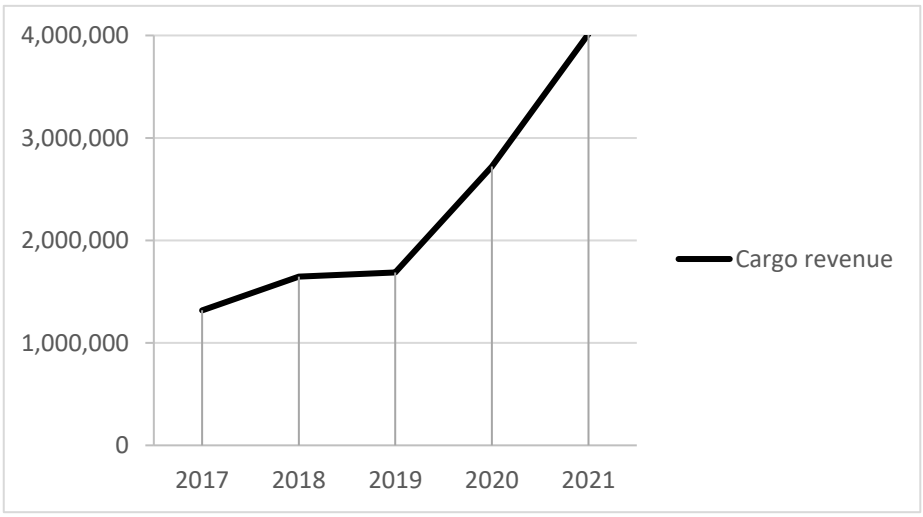
Figure 12. Delta Cargo revenue 2017-2021



Sources: Latam Airlines Group Annual Reports 2017-2021

During the period from 2017 to 2019 the cargo revenue of Delta airways followed some fluctuations. According to Figure 12, in 2019 Delta cargo generated a revenue of USD 753 million compared to 2020 when it decreased by more than USD 100 million. During the pandemic, more specifically in the second quarter of 2021, the Delta cargo airline revenue has already exceeded the revenue of the previous year's counting an increase of 35% (Harry, 2021). At the end of 2021, Delta Cargo had reached and exceeded the USD 1 billion in revenue. The results mentioned, are remarkable ass they illustrate the success of an airline strategically focused on cargo-passenger flights during and after the pandemic, adapting to demand fluctuations (Kulisch, 2021).

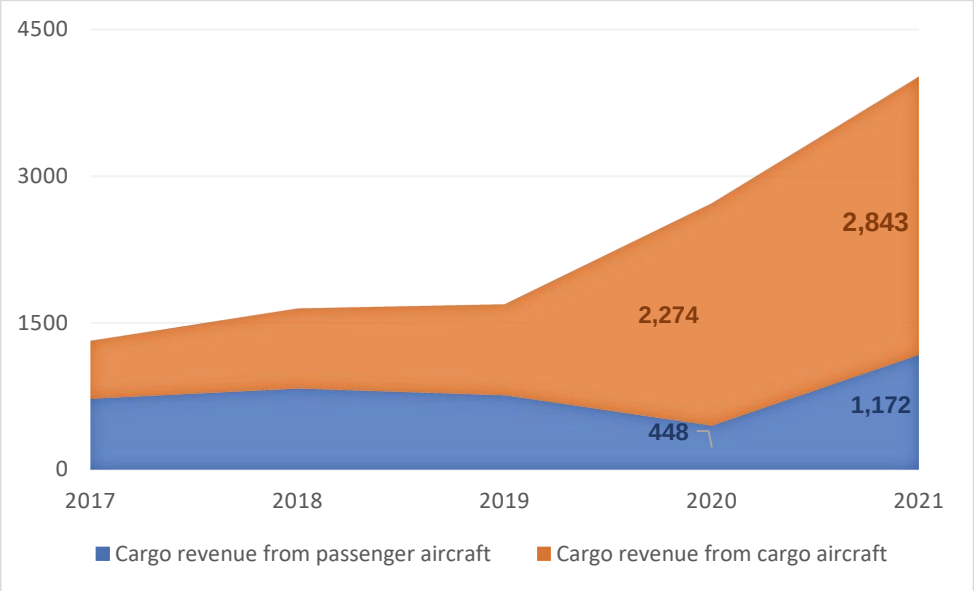
Figure 13. Turkish Airlines Cargo revenue 2017-2021



Sources: Turkish Airlines Annual Reports 2017-2021

The data presented in Figure 13, demonstrate the remarkable performance of the Turkish Cargo airlines in terms of revenue from 2017 to 2021. The cargo sector of Turkish airlines has experienced a steady expansion. More specifically from 2017 to 2019, the revenue increased by 28% indicating a successful expansion of the air cargo sector (Turkish Airlines, 2018). In 2020 when the pandemic outbroke, the sector faced one of the most rapid growths in its history. At the same year the airline saw an impressive 60% increase in revenue showing its abilities to the different conditions of the market. In 2021 the revenues were almost twice compared to 2020 reflecting the strong demand for air transport during and after the pandemic (Turkish Airlines, 2020, 2021).

Figure 14. Turkish Airlines Cargo revenue 2017-2021. A comparison between cargo and passenger aircraft in millions USD



Sources: Turkish Airlines Annual Reports 2017-2021

As it is already mentioned in this thesis, the air cargo industry encountered a significant challenge during the pandemic related to capacity. In figure 14, it is observed, the difference in the revenue generation between cargo and passenger aircraft. Notably, due to the stagnant passenger aircrafts, the revenue generated from the cargo aircraft was more than 5 times higher compared to the revenue generated from passenger aircraft. On the other hand, in 2021, when the passenger aircraft started being used for cargo operations, its revenue increased to USD 1,172 million compared to 2020 (448 million USD). Despite this substantial growth, the difference between the cargo and passenger aircraft remained high. In 2021 the revenue earned from cargo aircraft launched to 2,8 million USD (Turkish Airlines, 2017,2021).

6.1 Overview and comparison of the six airlines in terms of turnovers

Due to the Covid-19 outbreak, the airline industry has experienced several changes and the economic and financial performance of individual carriers has had a significant fluctuation. When considering the turnover of six major airlines – KLM, Latam, Lufthansa, Qatar, Delta, and Turkish – over a five-year period, from 2017 to 2021, several trends become apparent. Overall, between 2017 and 2019, total revenue increased for all airlines. However, in 2020 some airlines experienced a decrease in their revenue, while others faced a slowdown in the rates of revenue growth compared to previous years.

The temporary decrease in 2020 can be attributed to the outbreak of the pandemic which brought a disruption to global supply chain and to every economic sector. Due to effect of the pandemic on the passengers' aircraft, the air cargo operational capacity was affected indirectly and the cargo that was normally transported in the belly of those airplanes could not be moved. As carriers were unable to meet the demand and faced a decrease in their revenues, had to adjust their revenue sources and optimize their costs (Makhanov, 2021). Carriers and airlines started converting or using passengers' aircraft for cargo operations, in addition they restructured and expanded their networks by accomplishing routes to smaller airports with higher frequency to deliver the cargo on time and closer to the destination. As opposite, sea carriers were not able to respond very quickly to the demand's requirements, hence, manufacturers and suppliers were forced to use air transportation as it seemed the only viable solution (Makhanov, 2021).

The strategies implemented created positive effects on the air transport industry, which started seeing a gradual increase in their revenue. In the meantime, another major factor that contributed to the high revenues was the rise in the air freight prices. The imbalance between the supply and the demand resulted in the rise of air freight rates compared to 2019 (USITC, 2020).

In Table 1, it is presented, the revenue growth rate for the airlines for the period 2017-2021. Alli in all, all six airlines achieved records in revenues and experienced a relevant growth, overcoming their pre-pandemic revenue levels. More specifically during the time period, Qatar Airways and Lufthansa Airlines showed the highest growth rates by 189% and 437% respectively with the last one recovering after the loss that occurred in 2019. Turkish Airlines has experienced the 34% growth rate in revenue, while KLM and Delta airlines' revenue increased by 13% for each. On the other hand, Latam Airlines had the lowest growth rate

revenue by 9%, which is remarkable considering the financial difficulties and the restructuring processes that already mentioned.

Table 1. Revenue growth from 2017-2021

	2017-2021
Lufthansa	437%
KLM	13%
Latam	9%
Qatar	189%
Delta	13%
Turkish	34%

The differences in revenue growth rates among the airlines listed can be attributed to various factors such as their market position, fleet size, route network, and business strategy. The presented airlines, service different networks with various demands, therefore the comparison between them cannot give a completely representative result for which airline has the highest KPI in terms of turnovers. To make the comparison more accurate and representative, chapter 6.1.1 was created, to explain the differences in the revenue, through a comparison between the cargo fleet size and the network of each airline.

6.2 Comparison of the airlines in terms of fleet size and network

The substantial difference in growth rates among the airlines listed in the table can be attributed to several factors, two of which is the fleet size and the network of the airline. That, is presented in Table 2, in which are compared the cargo fleet size and the network for each airline. It should be mentioned that the network is calculated in terms of destinations that each airline serves, while in the fleet are included only the freight aircrafts and not the bellies of the passenger aircrafts.

Table 2. Cargo fleet size and network per airline

	KLM	Latam	Lufthansa	Qatar	Delta	Turkish
Cargo Fleet Size	12	11	20	30	23	18
Network	70	140	300	60	300	120

*cargo fleet measured in cargo aircrafts, * network measured in destinations serving

Lufthansa is one of the largest airlines worldwide. The airline, manages a fleet of 16 Boeing 777 freighters, while also operates four additional aircraft in partnership with the DHL Express. In addition, the airline has recently introduced two new Airbus A321 converted freighters to its cargo operations. Moreover, Lufthansa manages the cargo operations of its subsidiary airlines including Austrian Airlines, Brussels Airlines, and Eurowings Discover. Furthermore, the airline can carry cargo into the belly of 16 different types of it passenger aircraft, something that makes Lufthansa a competitive airlines in the market. In terms of networking, Lufthansa Cargo serves up to 300 destination combined to more than 100 globally. It's extensive network and the fleet size, enables the airline to transport a higher volume of cargo in comparison with its competitors (Lufthansa Cargo, 2021) . At this point, It should be mentioned that Lufthansa's system, does not separate logistics operations such as road transport and cargo. Therefore, the cargo revenue and the are included in the logistics division. This approach, it is likely to a significant remark to the high difference in Lufthansa's cargo revenue compared to the rest of the airlines, (Lufthansa Group 2021).

Qatar Airways stands in the second position in terms of revenue growth. In 2021, the airline upgraded its cargo fleet receiving three new Boeing 777 freighters, reaching a total cargo fleet of 30 freighters. Specifically, the airline operates 4 Airbus A330 freighters, 24 Boeing 777 freighters, and two Boeing 747 freighters. Qatar Airways Cargo network is separated from the passenger network and serves over 60 destinations in more than 30 countries worldwide (Qatar Airways 2021).

Turkish Cargo, operates a fleet of 18 dedicated freighter aircraft with payload capacities ranging from 65 to 102 metric tonnes. Additionally, the airline utilizes the belly space of Turkish Airlines' passenger aircraft for additional cargo transportation capacity. Furthermore, the airline operates a global network of air cargo transportation services covering more than 300 destinations in over 120 countries worldwide (Turkish Cargo, 2023)

Klm, AirFrance, Martinair Cargo Group, operates a cargo network, serving approximately 125 destinations in more than 70 countries worldwide, utilizing a fleet of 12 dedicated freighter aircraft and the belly space of KLM's passenger aircraft (AFKLC, 2023)

Likewise, Latam airlines, serves over 140 destinations worldwide. The airline, manages a cargo fleet of 11 freight aircraft, while also the airline utilizes aircrafts from its 133 passenger aircraft fleet for cargo operations. It is noteworthy to mention that Latam airline, has also strategic partnerships with carriers such as DHL, and Atlas Air (Latam 2021).

Lastly, Delta airlines, which experienced the same revenue growth with KLM, operates an extensive global network of cargo routes covering various destinations in North America, South America, Europe, Asia, and Australia, reaching the 185 destinations worldwide. The airline, owns a fleet of 23 freight aircrafts, while similarly they utilize some of the passenger aircraft for freight operations. At the same time, Delta Cargo has also established strategic partnerships with other cargo carriers, offering

its customers access to additional destinations and capacity (Writer, 2021), (Delta Cargo , 2023).

In conclusion, although Lufthansa has a really competitive position in the market, it operated a relatively smaller cargo fleet compared to the rest of the airlines. The extensive network of the airline allows Lufthansa to generate higher revenue compared to the competitors. In contrast, Qatar Airways operated a larger cargo fleet, but its network is smaller enough compared to Lufthansa's. Due to the significant differences in fleet size, network coverage, and other factors, it is challenging to create precise comparisons and generate accurate results when comparing these airlines in the cargo segment.

All in all, linking Table 1 with the research question 1, the impact of the pandemic had a significant impact on the profitability of every airline. Each of them separately faced a small decline during the outbreak of the pandemic. However, all of them recovered quickly and contributed separately to the distribution of medical equipment and in the fight of the world against Covid-19. Meanwhile, the revenues of the airlines that were generated during the pandemic, not only overcame the pre-pandemic levels but also achieved records that have not been created again in history.

7. Strategic advice for future development, and preparation for another pandemic

This chapter provides recommendations and advice to inform the future development of the industry, with a focus on preparing it for potential pandemics or recessions. The information was collected through interviews with industry experts and reputable online sources. The recommendations aim to enhance the industry's resilience and preparedness, providing remarkable practices in topics that are noteworthy to be improved.

To begin with, the increased demand and the development opportunities created during the pandemic, create the possibilities of a huge grow for the industry. The focus point of the

industry, must be the challenges and difficulties experienced due to Covid-19, and take advantage by improving its operations and infrastructure, investing in digitalization and technologies to reduce costs and increase efficiency and productivity. Furthermore, emerging and underdeveloped markets such as South America and Africa, could become major players in the industry, providing growth opportunities.

On the other hand, there is also uncertainty in the future of the air cargo industry, as the pandemic has demonstrated how breakable the supply chains are while also its potential disruptions. The industry must be prepared for future shocks and continue adopting and innovating to remain competitive.

Overall, while the future of the air cargo industry remains uncertain, there are plenty of opportunities for growth and development. According to information gathered from the interviews There are two possible perspectives that resulted regarding the future of the air cargo industry but in general plenty of needs and opportunities:

- The industry will return in to pre-pandemic levels
- The industry can keep its outstanding position and continue developing if some specific strategies and actions take place.

As stated in two out of six interviews, the air cargo industry will eventually return to pre-pandemic levels, creating a fall in industry figures and a return to a state of "normality". The expectation is based on the belief that the development which the industry experienced during the pandemic had been just a circumstantial, driven by the increased demand in e-commerce, vaccines, basic goods, etc. Although air transport was always the most expensive mode of transport, at this time it was the only one that could meet every requirement and be on time. As a result, individuals and businesses had no choice but the pay the high costs of the air cargo. However, after the pandemic, air cargo remains the most expensive mode of transport, and people will not continue preferring it to cheaper modes such as shipping. The deeper meaning of that is that air cargo is extremely linked to what happens to the world. For instance, if a volcano erupts in Europe, all airspace is closed, if strikes go on in factories there is no production and consequently no demand for transport. Furthermore, inflation and high rates are also impacting the industry, with prices increasing quickly. Due to high inflation, people are obliged to pay high amounts of money for their needs, such as rent, fuel and gas prices. Therefore, if the inflation remains high over the years, consumers would not be willing to spend their savings, and will decide to wait until the economic situation returns to

normal. The air cargo industry and the entire supply chain are directly affected by this situation. Therefore, some interviewers suggest that the high profitability and demand for air transport was only a result that the pandemic created as the world had to find a solution to keep surviving. According to the Managing Director of PAS Aviation Logistics, during the pandemic, the air cargo industry, experienced an extremely high rise in its profits because of the high prices. However, the industry is expected to return in the pre pandemic levels as the world and the prices, comes back to normality To remain competitive, industry stakeholders must develop flexible and sustainable business models.

On the other hand, the rest of the interviewees support the statement that the industry is going to maintain its dominant position in the global supply chain and will continue to develop. Apparently, this is the aspect should be the industry's primary focus as it has the potential to significantly increase its profits. The key to achieving this success is to address and improve the weaknesses in the industry. As the Covid-19 outbreak exposed the shortages in the industry, it highlighted the areas that needed to be improved and upgraded. Reflecting on the early days of the industry, it is evidence that there has been continues value being added. Initially, air transport was always there to move cargo with little consideration to its contents. It was just goods being moved around the world. Then as things evolved, the cargo started taking various forms, ranging from fruits, vegetables, and fresh flowers, pharmaceuticals, and vaccines. The industry now transports not just stuff in a box but commodities that require special care. Fresh flowers, fruits, and vegetables must be moved quickly at a chill temperature. High value must be moved, the environment needs to be controlled so there are always security provisions, hence every asset is protected. Furthermore, dangerous goods need to be controlled, protected, and stored in special conditions.

Over the years, supply chains have been developed to support these changing requirements. Today, the air cargo industry must invest in more sophisticated and efficient supply chains, that account for temperature sensitivity, time sensitivity, sensitive security and safety, digitalization, and facility – infrastructure.

7.1 Strategic advice per category

7.1.1 Infrastructure – facility

The Covid-19 pandemic made it clear that the industry should first prioritize and invest heavily in the quality of infrastructure as it is a fundamental area that cannot be delayed. As previously discussed in this research, the air cargo sector encountered significant infrastructure-related issues during the pandemic. Low-capacity warehouses, missing temperature infrastructure, and other missing facilities such as animal care centers were always underestimated issues for the airlines and mostly during the pandemic. All the interviewees agreed and commonly suggested that the industry must focus on warehousing and facility problems such as capacity, particularly as e-commerce continues growing at a rapid pace. Rather than relying on large giant pallets coming in, airlines should prioritize smaller parcels that will be palletized at the airport improving productivity and efficiency. Furthermore, the industry should consider further investing in specialized facilities and cover different sectors, such as animals and temperature controlled goods. For instance, the transportation of animals had long been a "headache" for airports due to the absence of special facilities. Therefore, it is now an opportunity for the industry in collaboration with airports to invest in animal care centers and facilities. Consequently, the industry needs to focus on different facilities such as e-commerce, animals care centers, and temperature control as these sectors are experiencing rapid growth. Another crucial aspect of the infrastructure connected to the air cargo industry is sustainability. According to the air cargo advisor Soufiane Daher, airports need to understand, the value that the cargo adds to the global trade and economy and finally separate the air cargo from the rest of the logistics segment (Daher, 2021). The industry must ensure that it continues improving its sustainable operations and minimizing its environmental impact by adopting renewable energies for ground-based vehicles and warehousing. To secure its long-term future the industry needs to take into serious consideration that all developments regarding infrastructure should be environmentally sustainable.

7.1.2 Technology

The technological transformation of the industry is very critical to improve its efficiency and productivity. As demonstrated during the pandemic, the adoption of digital technologies enables airlines to improve their revenue streams and reduce operational inefficiencies. The General Director of TIATCA stated: “By digitalizing their sales, airlines achieve higher revenues”. In addition, digital platforms and apps provide real-time shipment processes, eliminating the need for lengthy phone calls and streamlining data entry, resulting in greater efficiency and customer satisfaction For example, the “eCargoWise” is a software that allows forwarders to facilitate their shipments without waiting hours in calls, improving efficiency and eliminating data entry (McCorquodale, 2021), (Ferri et al., 2021). Currently, the air cargo industry has already done some significant steps on the way toward digitalization. The International Air Transport Association in collaboration with the Cargo Operations and Technology Board (COTB) are promoting the digitalization of the air cargo sector by implementing new concepts, creating new technologies, and streamlining operations. One of the most ambitious of their projects is the Electronic Airway Bill (e-AWB). The e-AWB is a digital environment that replaces the manual and paperwork, improves communication, and reduces inaccuracies in the entire supply chain.

7.1.3 Governments, networking

In every country, the national carrier is considered as a symbol of the nation and governments tend to be “protective” with their national passenger carries. As air cargo had a key role in the global economy during the pandemic, new regulatory environments for governments are needed to benefit this industry. Specifically, governments should grant more freedom to airlines allowing them to operate between third countries. To explain that in detail, during the interviews, the following example was created: Consider a cargo aircraft that is registered in Switzerland and operates only continental flights. If there is high demand for cargo transportation from Mexico but there are no cargo aircraft, it would be considered inefficient and unprofitable to fly only in one direction and coming the way back to Switzerland empty. However, a more efficient approach would be to identify a huge demand from Mexico to Dubai where there is higher demand for European exports. By filling the aircraft with cargo and flying to Dubai the airline can create a profitable route, extend the global trade and create new supply chains. To achieve those outcomes, the airlines need more flexible environments,

which allow them to expand their network. Governments must recognize how essential the air cargo industry had been during the pandemic and understand that the goods that contribute to the country's economy need to be imported/exported with the highest value. Finally, new regulations from the governments and the cooperation and partnerships between governments and airlines are necessary to create a globally connected environment and ensure a bright future for the air cargo industry (Globalia Logistics Network, 2022).

8. Conclusion and Discussion

This thesis aims to identify the impact of the pandemic on the profitability of the air cargo industry, give strategic advice for future development and prepare the industry for another possible pandemic. Moreover, this research explores the after Covid-19 era aiming to provide possible opportunities and giving strategic advice for the future development of the industry. To accomplish these goals, this research conducts a qualitative analysis of data and knowledge sourced from industry experts. Although there were some different aspects, there was a variety of new innovative ideas and strategies that could significantly be enhanced to the future performance of the air cargo industry. The pandemic of Covid-19 affected the global economy causing disruptions to almost every industry. Among the hardest hit sectors was aviation which experienced an unexpectedly high economic recession. Although the passenger segment of aviation was almost collapsed, the air cargo industry, recovered quickly and benefited to high levels from that. Therefore this thesis's purpose is to response the following research questions and hypothesis:

Research question 1: What is the effect of the COVID-19 pandemic on the profitability of the cargo airlines?

Research question 2: What strategies should the industry implement to remain profitable and be prepared for another pandemic?

Hypotheses 1: Cargo operations became more profitable during Covid-19 than before the pandemic.

Hypotheses 2: The demand for air cargo transport increased during the pandemic

To reply to these research questions and investigate the two hypotheses, semi-structured interviews were performed with several people related to the industry.

In terms of impacts an challenges, the most important were the increase of the demand for air transport in contrast to the decreased capacity caused from the grounded aircrafts, the rise of e-commerce, and the collapse of the shipping industry In addition, the need for transport of pharmaceuticals and medical equipment had been a significant challenge revealing weaknesses and the needs of the industry. Furthermore, operational, technological, and infrastructure challenges and effects were also found. However, all the impacts were recovered quickly providing the industry the opportunity to develop and finally achieving to be the key for the elimination of the Covid-19. While the industry was fighting one of the worst pandemics, it managed to face the hugest development in its history. Therefore, all the proposed strategies are related to the effects generated by the pandemic. The thesis, collected critical information, and provided important solutions strategies and recommendations for the future of the industry. These solutions could be used in the short and long term and contribute for the expansion and the development of the industry.

8.1 Interpretation of the results

Research question 1: What is the effect of the COVID-19 pandemic on the profitability of the cargo airlines? The results indicate a positive impact of the pandemic on the profitability of the air cargo industry. The study analyzed the financial performance of six randomly selected airlines in terms of revenue and tonnage carried during the period of 2017-2021, (pre- and post-pandemic). Notably, the revenue performance of the analyzed airlines varied significantly, which was attributed to diverse factors, such as network and service of operation, and fleet size. However, all six airlines followed an upward trend, increasing their revenues.

Research question 2: What strategies should the industry implement to remain profitable and be prepared for another pandemic? Initially, the research findings demonstrate two distinct perspectives on the future of the air cargo industry. The majority suggests that the industry will maintain its remarkable standing in the global market, generating substantial profits and growth. Conversely, there is a belief that the industry will revert to pre-pandemic levels. Nevertheless, it is widely acknowledged that to sustain profitability and development, industry stakeholders must adopt flexible, sustainable business models that prioritize efficiency and productivity. The air cargo industry must prioritize and allocate resources towards infrastructure and facility improvements to enhance their operations. Investments in modernized systems will enable airlines to increase their capacity, productivity, and

efficiency, resulting in improved profitability. Adopting new technologies and systems through technological transformation and digitalization is also critical for the industry's growth. These innovations will enhance the shipment processes and give airlines a competitive edge by improving their efficiency, sales, and revenues. Furthermore, collaboration between airlines, governments, and policymakers is essential for networking and expanding the industry's global supply chains. Governments and policymakers should provide airlines with the necessary freedom to operate in different airspaces, leading to more efficient routes and expanding the world's supply chains. The resulting interconnectedness will lead to enhanced economic growth and sustainability of the air cargo industry.

9. Limitations and future research

The research presented in this paper, includes various limitations that should be taken into account. First, the sample of the interviews was not big enough. It is very likely that there lot of different opinions and aspects that have not been discussed in this research, since very few of the approached people were willing to share their opinions. Increasing the sample size may enhance the representativeness of the sample and increase the robustness of the strategic recommendations. Nonetheless, it would be prudent for future research to undertake a cost-benefit and feasibility analysis of each strategy and recommendation. In general qualitative data should be generated and combined with quantitative information by policy makers and consultants for maximizing the planning of the air cargo industry.

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11. Appendix

11.1 Set of questions

Impact of Covid - 19

1. How would you briefly describe the effect of Covid-19 on the air cargo industry?
2. What were/are the challenges for the air cargo industry / your company to cope with the pandemic?
3. Considering the role of your company in the air cargo industry, which challenges influenced your operation during the COVID-19 outbreak?

E-commerce

1. Regarding the huge and rapid increase of e-commerce during the pandemic. How in your opinion did it influence the air cargo industry?
2. Were the industry and your company ready for this rapid increase in e-commerce? What did you do in order to face this challenge? What is the situation now?

Challenges

1. During the pandemic, the grounded passenger aircraft and the increase in e-commerce created an imbalance in the demand and the capacity. The demand was increased but there was a shortage of capacity since the belly of the passenger aircraft could not be used. How did you cope with that problem?
2. Following the previous question, passenger aircraft were in use for cargo to respond to the increased demand. How did it affect your company financially and operationally?
3. Considering that after the restrictions were released until now and passengers are again allowed to travel, does your company still face problems regarding the demand and the capacity of the cargo?

Future

1. How do you describe the role of the air cargo industry in the global supply chain after the pandemic?
2. What are the factors or limitations that the air cargo industry has to cope with after the pandemic?
3. What are the policies now regarding risks, with which the industry is more prepared for another pandemic/recession?
4. What kind of economic & operational challenges do you see for the upcoming years of the air cargo industry?
5. What kind of actions, strategies, and changes, should the industry follow to ensure its economic and operational sustainability for an upcoming pandemic/recession?
6. Considering that the air cargo sector remained the only source of revenue for almost every airline during the pandemic, should in your opinion airlines now focus and invest more in the air cargo sector?
7. What are the opportunities for the industry?

8. What was the performance of the profit for the air cargo services according to your company?

11.2 Interviewees and their roles

Company	Position	Name
International Air Cargo Association (TIACA)	General director	Glyn Hughes
International Air Transport Association (IATA)	Global Head Cargo	Brendan Sullivan
Turkish Airlines	Regional Cargo Director	M. Rasit Yilmaz
PAS Aviation Logistics	Managing Director	Peter Scholten
Latam Airlines Cargo	Senior Manager Cargo Operations for Europe, Oceania & Asia	Sebastian Puerta Mantilla
DHL Supply Chain	VP Strategy Development	George Dimas