The Impact of Covid-19 On the Sustainability of the Airline Industry

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Abstract. Since the outbreak of Covid-19, the depth and persistence of the impact on the airline industry have far exceeded expectations, and the pressure on the operation of airline enterprises has continued to increase. This paper intends to understand the impact of Covid-19 on the sustainability of the aviation industry. To achieve this goal, this paper reviews the significant impact of Covid-19 on the global economic landscape and concepts related to supply chain sustainability, focusing on the negative and positive effects of the aviation industry's response to the outbreak on its sustainability. This paper observes that while some measures could locally enhance the sustainability of the airline industry at the environmental and social levels, it generally left sustainability more severely negatively impacted.

Keywords: Airline industry; sustainability, Covid-19.

1. Introduction

In supply chain management, there are five essential parameters being managed simultaneously, which are customer satisfaction, cost, cash, assets and sustainability, and making trade-offs according to different business objectives. As evidence has emerged in recent decades that the earth's environment is deteriorating with human activity and that some people are struggling in difficult working conditions to maintain the most basic needs of themselves and their families, the public is becoming aware of the importance of protecting the environment and society while maintaining economic prosperity. According to International Civil Aviation Organization (ICAO), global civil aviation passenger traffic reached an all-time high of 4.5 billion passengers in 2019 (Data source: International Civil Aviation Organization). Air travel plays a vital role in passenger transportation, especially transoceanic transportation. Although air transport accounts for only 2.5% of global carbon emissions and 11.6% of the transport department (Data source: Our World Data), carbon emissions per seat kilometer for short-haul, intermediate and long-haul flights reach 255g, 156g and 150g, ranking first, fourth and fifth respectively among all types of transport (Data source: Visual Capitalist). As a result, the aviation sector's carbon emissions and carbon reduction plans have received much attention from the public and regulators. Airlines have set their carbon reduction targets and adopted related measures.

However, the first detection of Covid-19 in Wuhan, China, in late 2019 plunged the world into a pandemic, directly and indirectly leading to public health and economic losses. The airline industry, one of the most damaged industries under the impact of the pandemic, is being challenged for its viability and profitability, and with it, management's change of trade-offs in various parameters of the company's business management. This paper will discuss the various negative and positive impacts of the epidemic on the sustainability of the airline industry.

2. Literature review

2.1 The broad impact of Covid-19 on society

Covid-19, which has the most significant direct impact on society as a health hazard, is an infectious disease caused by the coronavirus. Common symptoms of the disease include fever, cough, and loss of taste [1], which are spread primarily through droplets and aerosols (Source: European Centre for Disease Prevention and Control). Until September 8, 2022, the Covid-19 pandemic has

resulted in more than 600 million infections and more than 6.5 million deaths worldwide, making it one of the deadliest epidemics in human history (Data source: Center for Systems Science and Engineering at Johns Hopkins University).

Covid-19 also had its severe negative economic impact on society in the short term. In China, for example, where the initial outbreak occurred, the government's plan to lockdown the city in the first quarter of 2020 to stop the spread of the virus directly reduced social liquidity, leading to a significant drop in social demand and production. According to data released by the Chinese government, national GPD growth was -6.8% in the first quarter of 2020, and -39.2% in Hubei province where Wuhan is located, compared to 6.4% nationwide in the same period in the previous year (Data Source: National Bureau of Statistics).

Besides, Covid-19 also has a long-term negative impact on the economy. The first impact is on the supply side, where factory closures lead to a reduction in the supply of goods and services, and Central Banks' stimulus policies instead lead to an oversupply of money generating inflation [2].

2.2 The impact of Covid-19 on transportation

The outbreak has also hit the transportation sector. Air transportation, one of the primary modes of transoceanic travel, was the first to bear the brunt of the epidemic, with approximately 95% of passenger flights grounded to stop the spread of the Covid-19 outbreak, resulting in immediate and heavy economic losses [3]. The outbreak also led to labor shortages and caused congestion at U.S. ports, leaving U.S. manufacturers with an average record-breaking 92 days to reach the parts and raw materials and assemble them for their products (Data source: The New York Times).

Apart from the directly visible economic aspects, the epidemic also impacts the global sustainability process. Purvis, Mao, and Robinson measured sustainability through three dimensions, which are environmental, economic, and social factors [4]. The ecological dimension focuses on climate change, biodiversity, and air, water, and soil pollution (Source: United Nations Environment Programme). Redclift defined economic dimension as long-term economic growth without negative impacts on the environment, society, and culture [5]. The social dimension ensures that structural barriers do not hinder people in areas such as health and justice [6]. Governments, scholars, news organizations, and industry associations worldwide have many views on the epidemic's impact. Still, they have mainly focused on the economic aspects, and sustainability has not been the research focus. This paper will look at the post-epidemic era of sustainability in the aviation industry and discuss it.

3. Discussion of the impact on the airline industry from Covid-19

3.1 Negative impact

The airline industry has suffered an unprecedented blow due to the outbreak of the Covid-19 epidemic. This has forced airlines to reassess their operations' sustainability and consider both the epidemic's short-term and long-term effects. The lockdown policy and travel ban introduced to control the spread of the epidemic and the reduced willingness of travelers to travel under the epidemic led to a precipitous decline in the airline business. That led to 95% of passenger flights being canceled early in the outbreak. As a traditional asset-heavy industry, the airlines have a high proportion of fixed costs to total costs, which means there are considerable costs to be paid even if operations are discontinued, including employee salaries, aircraft rentals, maintenance, and interest on liabilities, which makes the airlines operations financially unsustainable [7].

The cabin is an enclosed and narrow space with a high personnel density, making it highly susceptible to the spread of Covid-19 [8]. Continuously operating routes, especially international routes, pose a risk of infection for passengers and crew. Particularly after the early months of the outbreak, governments and businesses worldwide were unsatisfied with the economic depression caused by social liquidity reduction, and airlines and airports effectively relaxed their restrictions on Covid-19 to restore business and reduce costs [9]. Airlines have reduced or even eliminated investment in energy saving and carbon reduction measures for long-term sustainability goals that

require additional capital. In fact, in the current situation, it is difficult for airlines to accomplish their economic development goal without harming society and the environment.

3.1.1 Economic factor

The airline industry had been profitable for 11 consecutive years before the outbreak of Covid-19, driven primarily by declining fuel costs and stable growth in the world economy [10]. The growing world economy has prompted the exchange of people between different regions, whether for business or tourism purposes, both of which have contributed to the airline industry's prosperity. As the industry continues to grow, airlines tried to drive down prices to gain market share against competitors [11]. Apart from traditional passenger airlines, different service categories, such as low-cost airlines, cargo airlines, and belly shipping, were created to serve customers of varying spending levels in various price ranges. The oversaturation of the industry has raised doubts about its viability [12].

As the primary means of trans-regional transmission of infectious diseases, many routes, especially international routes, were canceled outrightly in the early stages of the Covid-19 outbreak to limit the spread of the virus between regions. While these measures played a limited role in interrupting the spread of the disease but were equally costly. Apart from the depression caused by the restrictions on socioeconomic activity, various businesses related to the aviation sector were hit even harder. Due to the indirectly caused by Covid-19, airlines are continuously depleting their cash flow. It is already quite challenging to reduce expenses and generate revenue sustainably. As such, the prevalence of Covid-19 has had a significant negative impact on the economic sustainability of the airline. Management had to consider resuming operations to protect the competitiveness of the business in a scenario that affected the sustainability of the other two aspects of the environment and society.

3.1.2 Environmental factor

As the outbreak hit business, management sought to use a variety of ways to cut costs to keep the company afloat. Before the outbreak, some airlines set up sustainability plans and endeavored to reduce a significant percentage of their carbon emissions and improve their energy efficiency per seat mile for a specific period in the future (Source: International Air Transport Association). They typically used GBPs to reach their own sustainability goals, focusing on measures to reduce pollution, waste, and energy use and increase the use of renewable materials, as well as investing in the introduction of various energy-saving devices to ensure that their products and services are delivered in a more environmentally friendly manner [13]. These investments will benefit companies in the long run when they are financially healthy. However, under the epidemic, the financial situation is not good across all industries, especially the airline industry. Management has had to consider slowing down or abandoning its long-term goal of pursuing environmental sustainability. While this goal could be positive for the company's long-term interests, less investment in this area could alleviate its current financial pressures and existential threats.

Reducing the input in environmental sustainability is attractive not only to the management of the industry but also to the industry regulators and authorities. Air transport connects different regions in terms of passenger traffic and provides a channel for exchanging goods. Moreover, the jobs provided and the economic growth created by the airline industry are essential for society. As a result, airline management needs to cut some of their environmental sustainability in their interest to help their businesses survive under challenging conditions. Governments must implement policies to protect these businesses from job loss and economic decline. For example, the U.S. Environmental Protection Agency has suspended some enforcement of pollution controls, providing a more open operating environment for businesses to survive [9]. However, some environmentalists and activists are opposed to this action. They argue that the authorities and the involved companies have magnified the current financial difficulties and are using the crisis to delay or even abandon their self-imposed climate agenda (Source: The Guardian). Although current policies have somewhat hindered the process of environmental sustainability, many consumers remain optimistic about companies that support sustainable development [9]. However, these optimistic attitudes do not help to alleviate the

economic pressure on the aviation industry. In this light, the short-term effects of the Covid-19 outbreak and the long-term effects of the following policies to address the pandemic have hurt the environmental sustainability of the aviation industry.

3.1.3 Social factor

There is no doubt that the Covid-19 outbreak can have a negative impact on human health. The high density of people and frequent exchanges of passenger flow in transportation terminals such as airports and train stations make people working in or traveling through them more vulnerable to the risk of Covid-19 infection. Although airline bans and cities lockdown policies at the beginning of the outbreak prevented most people from gathering and becoming infected in these scenarios, the subsequent lifting of lockdowns and decreasing public attention due to economic and livelihood pressures still posed a risk of transmission to the population.

Airline protection measures for passengers from Covid-19 infection have not been satisfactory. Especially on long-haul flights, passengers' immune systems are weakened by fatigue, poor diet management, panic, and lack of sleep, which can increase their risk of infection [14]. For the crew, the increased workload and extended hours associated with performing additional disease prevention measures can add to their fatigue and increase their risk of infection, particularly in an isolated cabin and with more human contact than passengers. Crew members can also be a source of infection. The consequences of becoming a source of infection to others are more serious because they may be handling the food in the cabin. Passengers usually take off their masks to relax when eating on board, which is the most vulnerable period during the tour[15].

The current state of affairs is a trade-off made by airlines between economic efficiency and the health of individuals. WHO guidelines claim that the primary risk of in-flight transmission of most respiratory infections is with the infectious passenger within two rows of seats (Source: World Health Organization. IATA also recommends that airlines take measures to reduce cabin density, such as canceling middle seats to reduce the risk of virus transmission in the cabin (Source: International Air Transport Association). However, this initiative would reduce seat capacity by 30-50%, and the cost of implementing other social distances and sanitation codes further increases the variable cost to airlines, making it impossible for airlines to break even [16]. While effective in alleviating survival pressures, this compromise of cost considerations by airlines comes at the expense of the health of passengers and crew, placing them at risk of Covid-19.

3.2 Positive impact

The Covid-19 epidemic has hurt airlines' sustainability plans, both directly and indirectly. The economic effect of the epidemic has forced airlines to consider abandoning some of their investments that do not increase short-term revenue and to cut non-essential expenses, as previously mentioned about the postponement or cancellation of environmental sustainability plans and the adoption of only limited anti-epidemic measures in their flights. Keep airlines afloat at the cost of reduced environmental and social sustainability, leaving the economic sustainability of these companies in jeopardy as well as a microscope.

While the epidemic negatively impacts the sustainability of the airline industry at a global level, some localized aspects can improve sustainability in operations. For example, in terms of environmental sustainability, the unpredictable lockdown caused by the epidemic has led some airlines to focus on ultra-long-haul (ULH) flights, which have the advantage of being more fuel efficient and can significantly reduce the carbon emissions associated with fuel use, thereby improving environmental sustainability [12]. On the other hand, the Covid-19 outbreak has made companies and individuals alike aware of the importance of protecting their health. Passengers and crews are taking more steps to protect themselves and the public from the disease than before the outbreak [17]. These measures have been influential not only in combating Covid-19 but also in preventing other respiratory infections such as influenza, which is an advancement in social sustainability brought about by the outbreak.

3.2.1 Environmental factor

Singapore Airlines launched an ultra-long-haul flight in 2004 to connect Singapore directly with New York. However, the project was a commercial failure and ceased operations in 2013 [18,19]. However, with changing demand and improved aircraft fuel efficiency, this route was reopened in 2018. Aircraft types, including the Boeing 787-9 and Airbus A350ULR, can replace the previously less efficient Boeing 777-200LR and Airbus A340-500, reducing operating costs by an average of 15%, thus providing the technology to make ultra-long-haul flights commercially viable [20]. In addition to fuel costs, introducing the ULH would also completely avoid stopover landings and takeoffs of traditional routes, along with the attendant costs and negotiations [12]. ULH routes were already emerging prior to the outbreak, with one of the most successful cases being the 14,500 km Perth-London route launched in 2018, operated by Qantas, with a route load factor of 90% [12]. The epidemic has caused the operating costs of the international feeder network to spike, and it is becoming impractical to maintain the networks. It is also facing competitive pressure from the point-to-point travel represented by ULH routes. In the post-epidemic era, airlines can gain advantages by operating direct flights, including enhanced environmental sustainability.

3.2.2 Social factor

While some airlines are reluctant to cancel the middle seats for economic reasons to reduce the risk of transmission of Covid-19 in the cabin, some airlines have responded positively. Major airlines such as American Airlines and United Airlines have tried to add an element of social distance by canceling middle seats and allowing passengers to change hearts to help address their health concerns (Source: Cable News Network). Other airlines, such as Delta Airlines, have taken measures such as reducing in-flight refreshments, avoiding scenarios where passengers remove their masks, and reducing the opportunity for contact between crew and passengers whenever possible (Source: Cable News Network).

In addition to the environmental advantages, ULH transportation also has social benefits in terms of maintaining public health and following the wishes of passengers. The success of developing ULH programs lies not only in the reduced fuel consumption per seat mile of the new aircraft and the contingency of an epidemic but also in taking into account the needs of the passengers during the journey. Prioritization of human factors has become a central part of the airline's approach to developing the programs [12]. ULH routes allow passengers to be transported from origin to destination in less time by eliminating the additional travel time due to route deviations and takeoffs that would otherwise be required for stopovers or transfers [12]. While some routes require additional transit certificates for connecting flights and, in the case of an epidemic, may include other health certificates, ULH routes that do not require stops or transfers can avoid these hassles altogether, saving passengers time and vigor. In terms of passenger health, ULH transport is more advantageous, especially in the context of a pandemic. Compared to traditional routes, ULH routes require only one boarding, which reduces the risk of spreading infectious diseases by reducing the chance and frequency of contact with the airport staff. Passengers are also more likely to book more premium seats on a single ULH flight, which provides them with a more comfortable flight experience and reduces the density of people around them, lowering the likelihood that they will be infected by others [21]. This business model, accelerated in the epidemic, provides extended protection and increased comfort for travelers and convenience. And for airlines, improving customer satisfaction while controlling costs can effectively increase their social sustainability.

Airlines management needs to consider not only customer satisfaction during the journey, but also their employees' working environment and intensity. Longer continuous flights and work hours compared to other routes can make crew members, including pilots, more fatigued, prompting management to assess their health [22] adequately. Airlines have also increased their attention in this area due to the general concern about health issues brought on by the Covid-19 epidemic. Some airlines require crew members to monitor their health regularly and advise them to suspend their subsequent flight schedule if they are unwell [17]. Companies are also equipping staff with protective

equipment, including masks and disinfectants, to protect them from viral infections. For example, China's Xiamen Airlines and China Southern Airlines take stricter precautions on international flights, equipping all crew members with more protective equipment such as PPE and N95 masks. Crew members are in more frequent contact with people than passengers or other jobs, and the above health management measures and personal protective equipment can largely prevent employees from being infected and effectively protect their rights to work in health (Source: Civil Aviation Administration of China). This positively affects enhancing and maintaining the social sustainability of airlines.

4. Conclusion

This paper focused on and discussed the impact of Covid-19 on the sustainability of the aviation industry, analyzing the positive and negative effects. Covid-19 exerts on it in three dimensions: economic, environmental, and social. The epidemic had positive impacts on localized areas of the aviation industry, including improved fuel efficiency due to route planning preferences during the epidemic, which resulted in lower carbon emissions per seat kilometer and improved environmental sustainability, and increased public health concerns during epidemic, which prompted airlines to pay more attention to the health of passengers and crew and take appropriate measures. All of these elements contribute to the environmental and social sustainability of the airline industry. However, looking at it as a whole, the epidemic has dealt a massive blow to the sustainability of all three dimensions of the airline industry. To cope with the losses from the plunge in passenger traffic, airlines have had to consider reducing their investments in environmental sustainability, even though these investments may bring them benefits in the future, but are non-essential expenditures in the current poor market environment. Airlines have instituted some basic Covid-19 prevention policies to restore passenger traffic and provided relative equipment. Still, they have not eliminated the spread of Covid-19 throughout the flight process to a greater extent, exposing both passengers and staff to a more dangerous environment to travel or work in. This has resulted in the aviation industry having to recover from the damage caused by the epidemic at the expense of the environment and society, all of which have led to a decline in the overall level of sustainability of the aviation industry. Overall, while the epidemic has had a positive impact on the sustainability of the aviation industry in localized areas, it has had an overall negative impact on its sustainability and weakened the willingness of industry entities to be sustainable, with more negative than positive effects overall.

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