The air travel during the coronavirus pandemic: crisis phenomena and directions for future development

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Abstract. The article proves the significant impact of the COVID-19 pandemic on air transportation due to travel restrictions and falling demand among travellers. COVID-19 has caused more significant damage to the transport sector, in particular air travel, than to the other economic activities. The study identified the operating costs of air passenger transport in relation to the 2020 coronavirus pandemic; analysed the key environmental factors that determine new conditions for the formation of demand for airline services; predicted changes in strategies and methods of air transport management in the post-COVID era. An author attempted assesses the potential vectors of transmission of the virus to Ukraine as a result of commercial air travel. The statistical base of the study consists of case data from Johns Hopkins University, detailed and constantly updated information on air traffic from the IATA and ICAO, it allows visualize how commercial air travel interact with the risk of infection spreading globally.

1. Introduction

Responses to COVID-19, from implementing social distancing to isolation policies for affected areas, have enormous implications for the mobility and connectivity of people and goods, the continuity of transport services, and therefore the entire aviation sector. It will also have a cumulative impact on the economic activity of cities, regions, passenger and cargo logistics, as well as related industries, such as tourism, markets and supply chains. Global passenger traffic is expected to decline by more than 40 percent till the end of year, and huge revenue losses could threaten the financial stability of many airlines and the industry as a whole. On the other hand, it is believed that commercial aviation has made a significant contribution to the spread of coronavirus infection. Especially during the period while restrictions and medical protection protocols were not introduced, and flights continued to operate.

Nowadays many researchers, aviation business representatives and experts point out that the COVID-19 pandemic has caused more damage to the transport sector, in particular air travel, than to the other economic activities that can continue to operate in isolation within minimal human-to-human contact. For instance, Suau-Sanchez P, Voltes-Dorta A and Cugueró-Escofet N [1] note that the sudden growth in number of flight cancellations, travel bans and border closures immediately affected lower occupancy rates and profitability for airlines, while airports are losing non-aviation revenues [2]. At the same time, Sakkakom Maneenopa and Suntichai Kocharinb [3] highlight the importance of national government in providing support to the aviation business in the face of the introduction the

isolation policies that oppresses the industry. M&A policy easing, tax breaks and government subsidies are proposed as relief measures [4]. Assuming that a decrease of passengers/routs may impact the entire aviation sector proportionally IATA experts roughly estimate the expected number of job losses and economy damages at global scale. Considering the whole year 2020, in the worst scenario, the global GDP will have reduced 1.67% (that is about $323 billion) and at least 500,000 airline workers will have been fired [5,6]. However some researchers note that, especially at the initial stage of the pandemic, commercial aviation was an important channel for the spread of the virus beyond the borders of its origin. It had been finding that by January 31, 2020, passengers from China were likely exporting at least 1.5 cases of COVID-19 globally per day [7]. But despite the great relevance and significance of the topic, many important issues remain unaddressed. This primarily concerns the analysis of the shifts that have occurred in the field of aviation and the tourism business due to COVID-19 restrictions implementation, as well as assessing the effectiveness of government support measures for the aviation business and new development strategies for the post-pandemic period.

The aims of the study are: 1) the highlighting of the operational costs of air passenger transport in connection with the coronavirus pandemic in 2020; 2) the analysis of the key environmental factors determining new conditions for the formation of demand for air travel; 3) forecasting changes in strategies and methods of air transport management in the post-pandemic era. It is also attempted to assess the potential vectors of transmission of the virus to Ukraine as a result of commercial air travel. Understanding the patterns of the spread of COVID-19 regionally and globally can help policymakers mitigate emerging public health threats.

2. Materials and methods

The statistical base of the study consists of case data from Johns Hopkins University, distribution statistics from the Ministry of Health, detailed and constantly updated information on air travel from the International Air Transport Association, and ICAO reports. Together, these datasets help visualize how COVID-19 infections and commercial air travel interact with the risk of infection spreading globally. The methodology includes statistical analysis, such us: the dynamics of the number of passengers and passenger-kilometers performed by airlines around the world and in certain regions over the past 15 years; change in the number of flights and their occupancy rate, etc. In turn, a retrospective of past epidemics and visualization of data about directions and rate of spread of COVID-19 makes it possible to identify existing and potential sources of infection and to suggest the most likely areas and scenarios for the restrictive measures implementation.

3. Results

The intensification of economic, political, social and cultural ties, strengthening of interdependence between countries and peoples, personal mobility are the principles of current stage of civilization development. Globalization in the XXI century has turned from an important trend into an obligatory condition for the modern society functioning. A significant role in this was played by the stable and dynamic growth in air transportations and the expansion of their geography. The aviation has provided the fastest transfer for any distances, made possible global supply chains and doing business around the world. At the same time, such a close interconnectedness provokes the emergence of a new category of risks, the essence of which is the inability to localize the effects of undesirable factors and their potential for global spread. Such risks include epidemics, which are spreading very rapidly and uncontrollably in today's closely interconnected world and resulting in significant human casualties and causing essential negative social, political and economic consequences. The most devastating epidemic was in 1918-1919, when from 20 to 50 million people died from the Spanish flu, and about a third of the world's population – 500 million – were ill. In 1957-1958, and then in 1968, two waves of "Asian" influenza swept the world, claiming from one to four million lives. In the 21st century, mankind has already faced five epidemics. in 2002-2003 Severe Acute Respiratory Syndrome (SARS) claimed the lives of 800 people (out of more than 8 thousand cases). Then in Asia there was an

outbreak of the deadly dangerous avian influenza caused by the H5N1 virus, from which 455 people out of approximately 1,000 cases have died in 16 countries since 2003. Middle East Respiratory Syndrome (MERS), since 2012, has affected 2,500 people in 23 countries of the world (850 deaths) [8]. Since 2014, when a massive outbreak of Ebola began in West Africa, has been already recorded 28.6 thousand cases in 10 countries of the world, of which approximately 11 thousand were fatal. COVID -19 is less deadly, but it has spread much more quickly and widely throughout the world. A numbers of researchers note the role of air transport as one of the most important channels of infection.

Since the first case of COVID-19 was reported in China, the disease has spread worldwide and has affected more than 27 million people [9]. More than half of the reported cases occur in the Americas (over 14 million) and Southeast Asia (4.5 million), while higher incidence per million occurs in the USA, South and Central America, the Mediterranean and North Eurasia. (Figure 1).

To contain the spread of the coronavirus, many countries have taken extreme measures, including quarantines and border closures. As of early April 2020, 91 %f the world's population (7.1 billion) lived in countries that restricted or prohibited the entry of non-residents. Roughly 3 billion people, or 39%, lived in countries whose borders are closed completely [10]. As of August 2020, the situation has stabilized, only 40 countries kept to strict restraint, while the rest introduced partial restrictions in the form of mandatory tests and serving 14 days of quarantine for those arriving in the country. Thus, international migrations, both business and leisure travel, are gradually resuming, but their intensity is still much lower than in 2019.

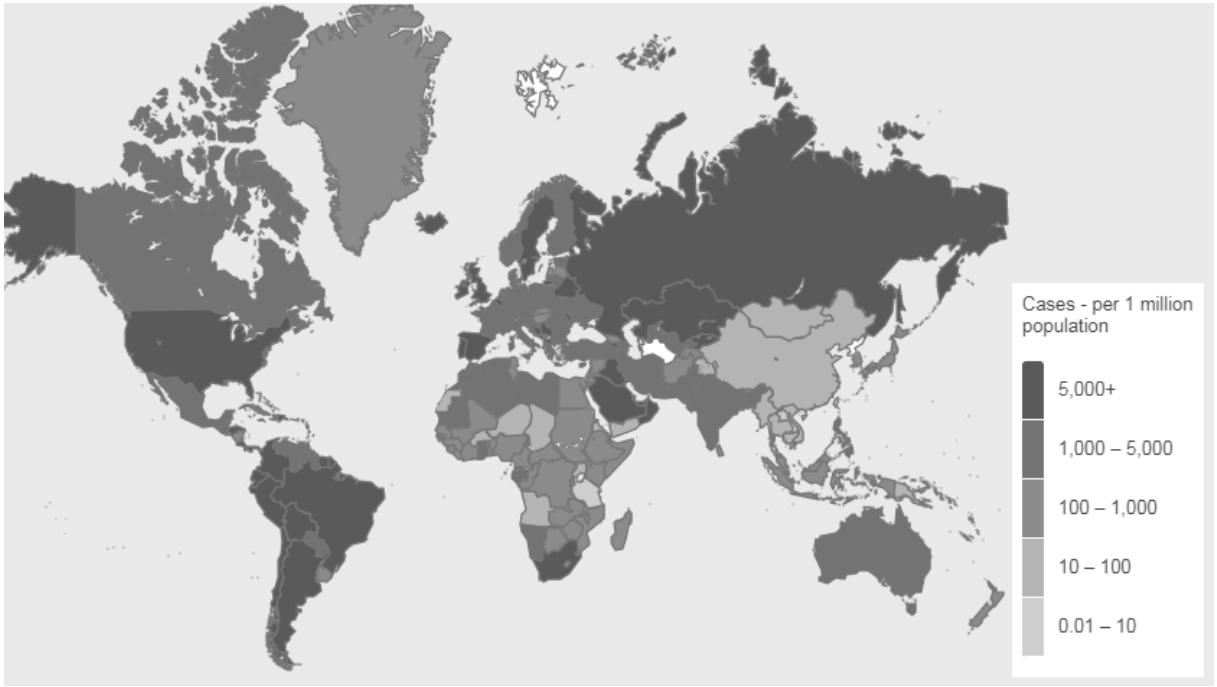

Figure 1. Intensity of COVID-19 spread (by Johns Hopkins University COVID-19 Dashboard) [11].

In addition to human lives, COVID-19 is devastating the global economy. While almost every sector is experiencing some kind of impact, the few have been hit as badly as the air travel and travel sector. Of particular importance was the fact that both industries are subject to seasonal fluctuations in demand. The maximum spread of infection in Southeast Asia fell on the eve of the Chinese New Year, at a time when local aviation and tourism traditionally receive the most orders. In 2020, there was no tourism boom; airlines, along with the tourism sector, lost more than half of the expected profits. Into Europe and America COVID-19 came during the low season, when the financial resources of

companies are minimal, which immediately led to a wave of bankruptcy among small and medium-sized companies. That and the aforementioned border closures explain the fact that COVID-19's sharp drop in demand for air travel was much more deeper than those which have been observed after September 11, 2001, during SARS 2003/04 and the 2008 financial crisis combined [12]. Airline activity dropped by more than 70 percent in early April 2020 compared to April 2019. At that time, several major airlines were temporarily out of work. In general, almost 60% of the world fleet was grounded in early April 2020 [13]. According to IATA forecasts, the number of passengers transported by air would decrease by 49.4%. Airline passenger revenues could drop by $ 314 billion in 2020 due to COVID-19; a fall of 55% compared to 2019, well above the 19 percent annual decline since September 11, 2001 and 11 percent after the 2008 global financial crisis [6] (Figure 2).

The analysis of reduction of passenger air transportation intensity by regions showed that the Middle East, European and Africa suffered the most (for each of them the decline in the first seven months of 2020 was more than 50% compared to the corresponding period of 2019) [14]. That is explained by a larger, than in other regions, share of international air transportation compared to domestic [6] (Table 1).

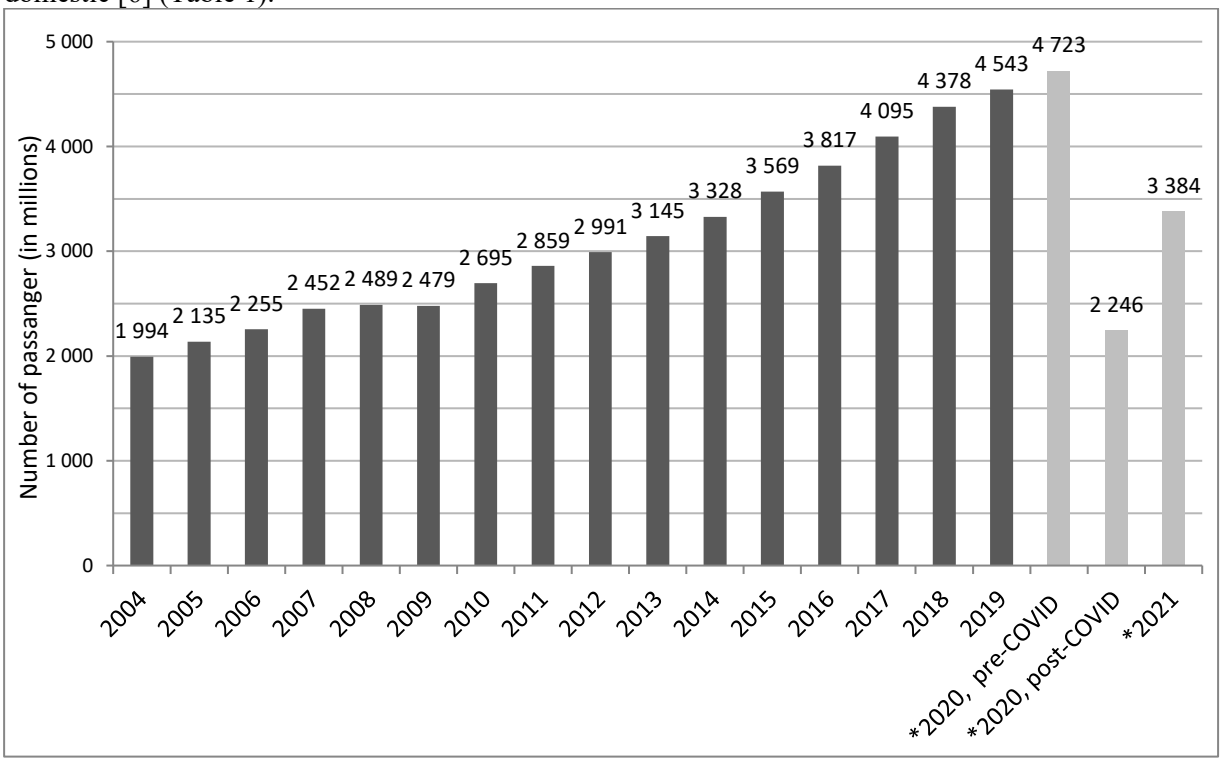

Figure 2. Number of air passengers carried worldwide 2004-2019 and forecast on 2020-2021.

Table 1. COVID-19 impact on air traffic by region.

Regions	Scheduled flights among January- July (both domestic and international)			Regional distribution of scheduled traffic	
	2019	2020	difference 2020/2019 in %	international scheduled revenue passenger-kilometres, % of world traffic, 2019	domestic scheduled revenue passenger-kilometres, % of world traffic, 2019

Asia Pacific	7297830	4178240	-42.75	30.3	42.9
Europe	5105614	2296727	-55.02	36.6	9.0
North America	10323778	8154645	-21.01	12.2	39.9
Latin America	1738136	888029	-48.91	13.9	6.6
Middle East	660844	288760	-56.30	4.3	1.1
Africa	527017	257517	-51.14	2.8	1.0
World	25653219	16063918	-37.38	100	100

Ukraine, like other European countries, has been subjected to the COVID-19. The aviation business has suffered significant losses. In 2019, the number of passengers who used the services of Ukrainian airlines increased by 9.4 percent and amounted to 13.705 million (of which only 1.1 million on domestic routes) another 9.4 million passengers were transported through Ukrainian airports by foreign carrier. In January-July 2020, the passenger traffic of Ukrainian air companies fall by 69.3% compared to the corresponded period past year and contain 2.349 million, including international — by 70.1% to 2.088 million. Passenger traffic through the airports of Ukraine decreased by 64.6% and amounted to 4.757 million, including in international traffic — by 65% to 4.228 million. In January-July 2020, Ukrainian airlines performed only 22.7 thousand commercial flights (a decrease compared to the same period last year — by 61.3%), including international — 18.5 thousand (reduction — by 62.3%).

The opening of the international air service was on June 15, 2020. In July 1.578 million Ukraine citizens crossed the border, in June - 747.3 thousand. In addition to the intensification of labor migration, it indicates the resumption of tourist flows. Currently among the countries open to Ukrainians: Albania, Antigua and Barbuda, the Bahamas, Belarus, Bulgaria, Brazil, Great Britain, Armenia, Dominican Republic, Ecuador, Egypt, Ireland, Kazakhstan, Cambodia, Kenya, Comoros, Lebanon Mexico, UAE, South Korea, North Macedonia, Puerto Rico, Serbia, Slovenia, USA, Tanzania, Turkey, Croatia, Montenegro, Jamaica and some other less popular African and Asian countries. According to the portal Misto.travel, the most popular air routes among Ukrainians, as in previous years, remain Turkey, Egypt, the UAE, as well as Montenegro and Croatia, in conditions where other more frequently visited countries remain inaccessible (Table 2). For example, in the first week of September, from Boryspil daily flew an average 20 flights to Turkey and 8 - to Egypt.

Table 2. The most visited by Ukrainians countries

Countries	% of outbound tourist's flows,2019	the number of newly detected cases of COVID-19 in the last 14 days per 100 thousand population as of September 4, 2020
Egypt	48.3	2.4
Turkey	26.0	24.6
trip by bus	5.2	-
UAE	3.6	63.4
China	3.2	0.0
Cyprus	2.4	12.6
Greece	2.3	28.7
Tunisia	1.8	15,1
Spain	1.2	231.6
Montenegro	1.2	135.8
Sri Lanka	1.1	0.9
Bulgaria	0.9	23.3
Albania	0.5	66,9

Thailand	0.4	0,1
Georgia	0.4	4,7
Italy	0.4	26.9
Portugal	0.2	38.3
Andorra	0.2	229.7
Croatia	0.1	89.6
Tanzania	0.1	-
Dominican Republic	0.1	69.8
Czech Republic	0.1	46.7
The other	0.1	-

Analyzing the information about newly detected cases of COVID-19 in these countries and comparing it with the indicator in Ukraine, we can conclude that travel to Spain, Montenegro and Andorra is potentially the most risky for Ukrainian tourists.

4. Discussion

The reduction in demand, primarily for international flights, led not only to a decrease in number of flights and flight programs to the resort regions, but also caused a number of changes in the work of airlines. Thus, the procedure for boarding and servicing on board has changed. Temperature checks are performed before boarding and exiting aircraft, in addition to other mandatory medical checks at airports. Passengers are required to wear face masks and the number of people-to-people contacts has been significantly reduced during the trip. Some airlines practice sells an adjacent unoccupied seat due to ensure a safe distance.

It should also be noted that different aviation business models experience unequal pressure from COVID-19 restrictions. Business aviation suffered less than regular air travel, as some flights remained necessary even during quarantine. With the lifting of blocking restrictions, business aviation will be able to capture premium passengers who were previously able to choose regular airlines but who may now prefer the social distancing provided by a private jet. However, the restoration of the regularity of business travel is proceeding very slowly, mainly due to the extreme weakness of the MICE segment (trip to conferences, exhibitions, symposiums and incentive tours) as well as uneven lifting of travel bans. Telecommuting (work from home) was seen as a significant threat to demand, as in the current context of digital transformation and cloud applications, more efficient telecommuting solutions were offered than traditional video conferencing. Fear of contracting the disease on the airport or plane and health problems have been identified as major concerns for leisure travelers. The recovery of the passenger segment also slows down by the decline in disposable income. This reduces the propensity to fly and will require significant support such as route subsidies.

Full Service Network Carriers (FSNCs) are likely to lose heavily as recovery in international markets is slower, and they may face renewed competition with the potential for new airlines to enter their home hub markets. Regional airlines have been identified as possible short-term winners during the recovery period as they could potentially help FSNC adjust its capacity. Low cost carriers are expected to focus on primary markets with possible hub connections and overall frequency reductions at the route level [15].

IATA’s experts predict that airlines will not return to normal operation and demand levels until 2022, and when they do, it will be in a world forever changed by COVID-19. In 2020, airlines are trying to stabilize their businesses, preparing for a recovery in demand, while they are already operating in an uncertain environment where previous assumptions about travel behavior may be useless. Most airlines are now focused on staying in business. At an all-time low in travel, airlines must develop new strategies for dealing with customers who are not yet flying and employees who remain unemployed. At the first stage with a stopped fleet or most passenger flights canceled, airlines directed their energies to help in the fight against coronavirus. Some airlines provided free services to medical professionals, while others helped provide of personnel to areas where extra hands are required. Many planes that people normally fly now carry cargo, including medicines used to fight COVID-19.

Moreover, airlines must recover and scale up their operations along with ever-changing health requirements and mandatory government directives, in particular with regard to the possible re-closure of borders with some countries. It is also necessary to closely monitor early indicators of demand, such as search queries, and study the data to determine the segment and geography of customers that may represent new growth zones. The experience of Chinese airlines shows that there is a growing segment of young travelers who are less at risk of severe illness. There has also been a decline in travel budgets, and shorter booking windows (often a week or two) have become common as fewer travelers make plans in advance. Passengers also mostly book domestic flights, with international travel still awaiting his return. Since travel can take years to reach pre-COVID-19 levels, airlines may have questions about how to drive demand. For example, segments that in the past may have been easily attracted to flights with cheap fares and offers may be less susceptible to such actions if they have doubts about the effectiveness of the airline's safety protocols or the direction remains risky. Some governments can also complicate the picture by introducing unexpected policy changes that restrict travel to or from their countries, even after the pandemic has subsided. As airlines gather information about these changes, they may need to update their route networks, pricing and revenue management systems.

Conclusions

The latest estimates indicate that the possible COVID-19 impact on commercial aviation in 2020 contains: reduction ranging from 47% to 50% on seats offered by airlines and about 366 to 389 billion USD potential loss of gross passenger operating revenues. According to IATA, in 2021 the number of passengers will grow by 62 percent, but it would still remain almost a third less than in 2019. Thus, the full recovery of passenger numbers to 2019 levels is not expected until 2023. During the recovery period, it is important to understand that passengers may hesitate to travel even after the coronavirus is contained, believing that airports and aircraft could expose them to infection, and employees may have similar concerns when returning to work. Many airlines have already adopted new safety protocols, while others are developing them. The most popular solutions (in particular those tested by Chinese airlines, which were the first to begin restoring flights, including international ones) were the requirement for passengers to wear masks and measure their temperature before flying, register a previous or planned trip, and present test results. Air carriers that are strategically thinking about managing their return to large-scale operations need to rethink their business and reform their organization to meet the new regulations in the in a post-COVID reality. For example, some airlines already have formed marketing partnerships with hotels, travel agencies and other members of the tourism ecosystem to increase demand or help governments and regulators establish global or regional hygiene or operational standards. Such cooperation, as well as other strategic steps, will help airlines return to their core goal of connecting our world.

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