Economic analysis of passenger transport at polish airports before and during the Covid-19 pandemic

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Abstract
The subject of the article is the economic analysis of passenger transport at polish airports before and during the COVID-19 pandemic. Air transport is considered as an integral part of polish transport system, which significantly increased the dynamism of service development, after joining the European Union by Poland. Along with the globalization of production and international economic exchange, the demand for efficient communication between airports is increasing. During the initial phase of the pandemic, the passenger transport had stopped altogether and afterwards was significantly weaker compared to the times prior to the pandemic. It was caused by the closure of borders and partial suspension of transport connections. One of the key tasks for airports is the provision of passenger service at the appropriate level. The level of passenger service can be considered satisfying his needs in terms of quality, punctuality, comfort and reliability. Important issues in ensuring the appropriate quality of service is the possibility for the passenger to choose more than one airport, as well as the profit from non-aviation activities. One of the most important factors influencing the passenger service process is the activity of air carriers, staff and management of the airport, as well as services located within the airport. As a consequence of spreading the coronavirus (COVID-19) worldwide and the actions taken by the authorities, the demand for international traveling at polish airports ceased to exist at the time. The article presents an economical analysis of passenger transport before and during the pandemic.

Keywords: analysis, pandemic, airport, passenger transport, COVID-19.

Introduction

Air transport is considered as an integral part of polish transport system, which significantly increased the dynamism of service development, after joining the European Union by Poland. Transportation is provided by airports, that enable the transit of passengers. Airport companies are also suppliers of services, which are offered and sold at a certain prices and that impacts their usability level in public spaces.

The transactions are made at commercial airports where the air service starts and ends. Airports also provide other additional services for carriers and their means of transport. Inherent elements of the services provided, are their high quality and highly specialized personnel. Along with the globalization of production and international economic exchange, the demand for efficient communication between airports, both in terms of cargo and passengers, is increasing. Today, however, the process of globalization has significantly weakened. It is caused by restrictions in international trade, closure of borders and partial suspension of transport connections. As a result of the coronavirus (COVID-19) pandemic outbreak and actions taken by authorities, the demand for...
international air travel essentially ceased to exist during the pandemic.

There are currently 15 airports in Poland that can be qualified as central, regional and local. Such division was used in the study of the phenomenon of passenger traffic - it resulted from the intention of showing the situation of Polish airports objectively and transparently (Table 1).

The development of quantitative data was performed using a computer tool from the Office environment - MS Excel. The program was used to organize the obtained results and to prepare them visually – in the form of charts. It was used to analyze the changes in the number of flights at Polish communication airports. The formula for calculating the changes is called „the dynamic indicator”. It is known as a value, usually a percentage, that is obtained by dividing the current size of the phenomenon by its “base” – the preceding value.

Table 1. The division of Polish airports by the number of passengers

| Centralny Port Lotniczy | Regionalne Porty Lotnicze | Lokalne Porty Lotnicze |
|-------------------------|---------------------------|------------------------|
| Łotnisko Chopina w Warszawie | Międzynarodowy Port Lotniczy im. Jana Pawła II Kraków-Balice | Port Lotniczy Szczecin-Goleniów im. NSZZ Solidarność |
| Port Lotniczy Gdańskim. Lecha Wałęsy | Port Lotniczy Bydgoszcz im. Ignacego Paderewskiego | |
| Górniośląskie Towarzystwo Lotnicze. Międzynarodowy Port Lotniczy Katowice-Pyrzowice | | Port Lotniczy Łódź im. Władysława Reymonta |
| Port Lotniczy Poznań-Lawica im. Henryka Wieniawskiego | Mazowiecki Port Lotniczy Warszawa-Modlin | |
| Port Lotniczy Wrocław im. Mikołaja Kopernika | Port Lotniczy Rzeszów-Jasionka | |
| | Port Lotniczy Zielona Góra-Babimost | |
| | Port Lotniczy „Mazury” Olsztyn | |
| | Port Lotniczy Lublin | |
| | Port Lotniczy Warszawa-Radom im. Bohaterów Radomskiego Czerwca 1976 roku | |

Source: Own study based on: D. Rucińska, A. Ruciński, D. Tłoczyński, Transport lotniczy. Ekonomika i organizacja, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2018, s. 106.

The studied phenomenon was taken as a kind of reference. The formula for a single base index is as follows (Kopczyński, M., 2005):

\[ i = \frac{x_1}{x_0} \times 100\% , \]

where:

- \( x_1 \) – value of the phenomenon in the analyzed period
- \( x_0 \) – value of the phenomenon in the period preceding the examined period.

Material and methods

To achieve the goal of the article, a research method in the form of economic analysis was used. Economic analysis is a method of scientific research which divides the whole through
logical abstractions. In this method, the key role is played by the activity of mental analysis (according to Stanag 1977). A review of source materials, containing data on passenger transport at Polish airports from before and during the COVID-19 pandemic, was performed.

The economic analysis of the number of checked-in passengers is presented using charts and tables.

Analysis of the passenger situation at airports before the pandemic

According to the report published on the travelplanet.pl website, Poles were very eager to use foreign trips available at individual airports. From the presented results it can be concluded that the most popular countries (Egypt, Tunisia and Turkey) were those, with guaranteed warm weather and the possibility of booking four- and five-star hotels, which in recent years has become the key selection criterion in choosing the final destination. The popularity of these travel destinations allows travel agencies to sign long-term hotel rental contracts, which makes the offer for individual clients even more attractive and affordable. The realized trips could not have happened without the efficient and well-functioning cooperation between travel agencies and airports. It also has a significant impact on the development of air traffic in the world, and the visible "peak" (increase significantly exceeding the results recorded so far) of passenger traffic at airports is visible in the summer months. Of course, charter flights were not the main revenue for the airports, but the regular flights were, incl. cheap carriers. These factors made many Poles willingly go on trips abroad, some of them, who so far had a small budget, could get to know the corners of the world that were only available to them in the sphere of dreams.

Nowadays, the transportation of VIPs or people with many bonus points within a given airline by limousine, directly to and from planes, has become almost common. This allowed for even more effective use of travel time, enabling practically uninterrupted work in comfortable conditions.

Chart 1. Number of passengers boarded at regional airports in years 2010-2019

Source: Own study based on: https://www.ulc.gov.pl/pl/statystyka-analizy/statatyki-i-analizy-rynku-transportu-lotniczego/3724-statatyki-wg-portow-lotniczych (30.05.2022)

The travels of Poles meant that regional airports also began to develop and board an increasing number of travelers. It becomes a powerful impulse for the development of neighbouring regions. Medium and small towns, which so far were poorly connected with the world, have become more attractive for domestic and foreign investors. As a result, the wealth of local residents is rapidly increasing, and the use of air transport ceases to be a luxury, which they could not afford.

The second most "crowded" domestic airport is Krakow-Balice airport, therefore, according to the EU division, it is called the main regional airport in the country. According to statistical data, the port boards 4 686 111 travelers per year on average. This result is due to the number of connections from the airport (over 100 directions) and the expansion of the terminal and a multi-storey building (with a parking) and linear infrastructure (runway, taxi track and hardstand). All these elements make the Krakow airport a good buffer for a crowded central airport and it has become one for the southern part of Poland. The constantly developing Krakow, where an increasing number of foreign specialists and managers settle, means that the Balice airport has further significant growth prospects in the future. This will allow it to
maintain its national position as the region's leader for many years. In the north of the country, such an airport is the one located in Gdańsk. As can be seen in the chart, it is ranked third in terms of the number of passengers boarded. The development of the airport contributed to the launch of the railway, which strengthened its position in the ranking. As a result, in 2019 the number of travelers (departing and arriving) exceeded 5 million. In the south of Poland, apart from the city of Krakow, important airports are those located in Katowice and Wrocław. The first of them serves an average of 3,235,353 passengers per year in the analyzed period, and the second - 2,333,859. Katowice achieved this result thanks to the response to the needs of travelers, which allowed them to overtake the older Wrocław. This can be seen most clearly in 2017, when the largest increase in the number of people using the airport was recorded - 3,877,235 travelers. Since then, the Katowice communication airport has remained at a fairly stable level, which allowed for the extension and putting a runway with dimensions of 3200 x 45 m into use in 2015. It is worth mentioning that the reconstruction of the airport terminal is currently underway. It’s designed for handling more potential participants of passenger air traffic. As for the mentioned Wrocław-Starachowice airport, although it is older than the previous one, it has only 10 regular airlines, which in 2010 boarded approximately 1.5 million passengers. And its best result was recorded in 2018, when the number of checked-in persons amounted to almost 600,000. Its proximity to our western neighbours – Germany - makes it attractive also for them. Good access roads, lower parking costs are often the key aspects for abandoning the airports they have chosen so far. In this way, they can save not only money but also time, which we all have so little these days. Regional airports allow you to quickly find your way around the location, check-in gates and the entire infrastructure. When using them, we do not have to plan additional time to find a parking space, often very distant from the terminal at larger airports and huge queues of passengers checking in there. Bydgoszcz airport, located almost 300 km south-east, can boast similar results. The number of passengers handled was the closest to Szczecin in years 2010-2014, which is almost a half of the selected period. Later, there is a significant decrease in relation to the Szczecin airport.
The airport is doing very well anyway. This is shown by the record of boarded passengers in 2019, which amounted to 413,472. This is a satisfactory result for this type of facility with, in fact, a small number of passenger connections. It should be added that the results achieved do not stop the airport from making investments; in 2015, the modernization of the runway began, and the construction of a photovoltaic farm is planned, which shall provide ecological electricity for the unit. Its future, especially its further growth potential in the coming years, however, remains a big unknown. Plans for the construction of the Central Communication Port, the development of the high-speed rail network may be the key factors that will limit or completely stop its development. Low number of domestic connections and all the communication facilities may lead to a situation in which the inhabitants of the region stop using the Bydgoszcz airport. Another airport under discussion is the one located in the village of Jasionka near Rzeszów, which boasts of having the second longest runway in the country - 3,200 m. At the end of the first analyzed period, the south-eastern airport handled approximately 450,000 travelers. A big change took place after the decision to completely renovate and modernize the facility. After the official putting of the new air terminal to use, which gave the opportunity to increase the service, the number of travelers has continued to increase. The best year in the company's operations was 2018, when 769,475 travelers were boarded. The decline in 2019 was very small, hence it can be generalized to the conclusion that the airport is developing at a very good pace. It is supported not only by the infrastructure, but also by the network of connections, which has recently been joined by the WizzAir airline. As for the Rzeszów-Jasionka airport, it has the best results among small local airports of this type. This is evidenced by the fact that the average number of passengers in the analyzed period was 622,363 per year. The airport is also the driving force of local business and the economic zone, where more and more production and maintenance companies from the aviation industry are located. It is the latter industry of servicing aircrafts and aero engines that will gain importance in the coming years and will cause a significant increase in passenger traffic, employing over 1,000 people annually for 3 consecutive years. The combination of business success goes hand in hand with the airport's success, resulting in their perfect coexistence. The next small operating airport is Zielona Góra-Babimost located in the Lubuskie Voivodeship. It is one of the least busy airports in Poland, from which approximately 14,000 passengers depart and arrive to the central domestic civil airport. The smallest number of passengers were boarded in 2010 - 3,627, and the biggest in 2019 - 33,078.

To sum up, Polish airports, thanks to their different status, give travelers the opportunity to take advantage of the offer of each of them (regardless of its size). Thanks to coordinating the network of connections and adapting the aviation infrastructure to European standards, they can board more and more travelers. This allows for better and better results in terms of the number of passengers boarded. As a consequence, it attracts new investors in the form of airlines and fills the communication gaps for existing and potential clients of the companies.
Economic analysis of the passenger situation at airports during the pandemic

The coronavirus pandemic has shaken the entire world, resulting in entire economies stagnating, including air transport, which has been suspended for a long time. The situation changed only after June 2020, when it was possible to start traveling in limited conditions. Poles who had been closed for a long time, willingly, but not as numerous as in previous years, began to show again tourist activity inside the country and abroad. This translated into the number of people using the airports (Chart 3).

![Chart 3. Number of passengers handled at Polish airports in 2020](https://www.ulc.gov.pl/pl/statystyka-analizy-statatyki-i-analizy-rynku-transportu-lotniczego/3724-statatyki-wg-portow-lotniczych)

**Source:** Own study based on: https://www.ulc.gov.pl/pl/statystyka-analizy-statatyki-i-analizy-rynku-transportu-lotniczego/3724-statatyki-wg-portow-lotniczych (8.06.2021)

The largest number of connections, and thus the largest number of passengers boarded, was made at the central Chopin airport in Warsaw. It amounted to 5,473,224 people. Such a result of the airport in Warsaw was guaranteed by the network of connections with the largest number of destinations available to Polish tourists, such as Dubai or Zanzibar, and the implementation of the charter offer rented by travel agencies. However, for such a large airport it is not a satisfactory amount - it can be compared to the number of people served at airports in Gdańsk or Katowice, which pushes the largest communication port to the rank of 2nd category airports. As regards of the aforementioned Katowice, during the first year of the pandemic, they managed to board approx. 3 million travelers. The same result was achieved by the Kraków-Balice airport, which had the status of the main regional airport before 2020. The third place in terms of passenger traffic was held by the Gdańsk Airport named after Lech Wałęsa. Its result oscillated around 2 million passengers. There was the airport in Wroclaw right behind it, with the number of passengers handled slightly over a million. This means that it has retained its place at the forefront of regional airports. The next part was the Warsaw-Modlin airport, which prior to the pandemic was a significant leader among airports with a local typology. Before March 2020, the airport boarded more than 3 million passengers, while, after a year of operation in the pandemic reality, the airport handled just over 800,000 travelers. The airport of Wielkopolska is located right behind the airport near Warsaw. The difference between the two was just over 200,000 passengers. Next, there is an airport near Rzeszów, from which a little over 200,000 people departed. Next in line are the airports of Szczecin, Bydgoszcz and Lublin. This may be related to the greater willingness of Poles to spend holidays in the country, and all of the airports provided an ideal opportunity to explore the capital. The more so as the Polish carrier has significantly lowered ticket prices on domestic lines. In the penultimate place Olsztyn communication airport is located with the result of less than 100,000 travelers. At the end of the list there is a small airport in Zielona Góra, where the number of served passengers did not exceed the threshold of 20,000. The airport in Radom does not count here, because since 2018 no passenger plane has arrived or departed from there, and thus no man has been boarded.

In order to thoroughly understand the effects of the SARS COV-2 virus epidemic, it was necessary to compare the percentage change. This percentage change is called the dynamic
indicator. Thanks to it, it was easy to estimate how much "havoc" was caused by the epidemic in the field of airplane tourism (Table 2).

**Table 2. Percentage change in the number of passengers served over time of coronavirus epidemic**

| Airport/Year            | 2019    | 2020    | Dynamic indicator (base=100) |
|-------------------------|---------|---------|-----------------------------|
| Chopin-Warszawa         | 18 844 591 | 5 473 224 | 29%                         |
| Kraków-Balice           | 8 402 859  | 2 588 970  | 31%                         |
| Gdańsk im. L. Wałęsy     | 5 361 134 | 1 697 406 | 32%                         |
| Katowice-Pyrzowice       | 4 843 859 | 2 588 970 | 53%                         |
| Wroclaw-Strachowice      | 3 543 398 | 1 003 066 | 28%                         |
| Poznań-Lawica            | 2 372 184 | 652 833  | 28%                         |
| Szczecin-Goleniów        | 580 479  | 185 848  | 32%                         |
| Bydgoszcz-Szewderowo     | 413 472  | 124 545  | 30%                         |
| Rzeszów-Jasionka         | 769 252  | 234 355  | 30%                         |
| Zielona Góra-Babimost    | 33 078   | 19 266   | 58%                         |
| Warszawa-Modlin          | 3 104 277 | 870 831  | 28%                         |
| Lublin                   | 356 011  | 123 512  | 35%                         |
| Radom-Sadków             | 0        | 0        | 0%                          |
| Olsztyn-Mazury           | 147 466  | 61 114   | 41%                         |

Source: Own study based on: [https://www.ulc.gov.pl/pl/statystyka-analizy/statatyki-i-analizy-rynku-transportu-lotniczego/3724-statatyki-wg-portow-lotniczych (1.06.2022)]

The sharpest decline was recorded by Warsaw airports - 71%, which meant that they did not use their capabilities and infrastructural resources. However, eight other airports were in a similar situation, including the two leading airports in Kraków and Gdańsk. In the rest of the cases, there were drops in the range of 70-65%. Not all airports recorded such large drops, because in the case of three facilities the decrease was within the range of 42-59%. The first civil airport of them is located in Pyrzowice, and the next two are relatively small ports from Zielona Góra and Olsztyn. You can look for reasons for this in quick adaptation of the offers by airports, e.g. encouraging to the use of business offers - renting a conference rooms or other non-aircraft activities of this type provided by airports.

The situation of airports in Poland in the era of the coronavirus epidemic did not pass without clear consequences. Airports recorded very large drops in the number of passengers handled. This change will have many years of consequences, and returning to pre-pandemic levels will not be so easy. Companies that previously used air transport in their daily operations had to find alternative solutions for running their businesses. An example may be the numerous videoconferences, which untill pandemic had been underestimated, yet they have become the only possible way of video communication. The application market has responded to the business needs and transferred direct contacts into the virtual world. Many companies are looking for savings as ways to overcome the crisis. Some of them, so far marginalizing online meetings, see them as a solution that will reduce travel costs and increase employee time availability. Taking all of the above into account, only a few will immediately revert to their previous business travel practices, and air passenger traffic companies will have to look for other incentives for development to beat historic results. In the era of the coronavirus, only two small airports (Zielona Góra-Babimost and Olsztyn-Mazury) and a large "player" on the aviation market - Katowice-Pyrzowice Airport, which especially during the holiday season, when the virus was on its retreat, came out with very good results in terms of charter flights. Poles, despite their fears, were still interested in resting in exotic destinations and sometimes fulfilling their dreams, for which they did not have the courage for years. Locking us all in our homes, huge restrictions and full lockdown have shown many
people how important diversity is for them, the possibility of contact with the world and building memories that will stay with them for years. In addition, a key aspect influencing the success of this airport was a better adjustment of the network of connections and non-aeronautical activities of the companies.

**Analysis of security measures**

According to the research ordered by a website dealing with the presentation of hotel and accommodation offers - nocowanie.pl, it results that nearly 43% of Poles plan a trip abroad during the holiday season. Almost 45% of respondents declare that their departure will last from 7 to 10 days. Countries with access to the sea or mountains will dominate. The presented results clearly indicate what offers must be prepared not only by travel agencies or hotel facilities, but primarily by airports. Among the countries that meet the sanitary and epidemiological conditions and are open to Polish tourists are Egypt, Spain, Maldives, Greece and Bosnia-Herzegovina.

The airports, acting in line with the decrees of the European Parliament and the EU Council, introduced in their facilities the recommendations resulting from the issued regulations, which imposes on them (Regulation of the European Parliament and the EU of May 25, 2020) obligation to wear protective masks in airport buildings,

- mapping paths for passenger check-in along with marking points separated by 2 m each, defining social distance,
- providing the users of the airport with disinfectants, e.g. hand disinfectant,
- disinfection of areas inside the airport in accordance with the schedule,
- submitting a passenger list to the relevant government administration bodies with the direction of arrival and departure for epidemiological identification at the border.

**Results and discussion**

The analysis of the data presented in this study allows the following conclusions to be drawn regarding the impact of the SARS-COV-2 pandemic on passenger traffic at Polish airports:

- the pandemic had a significant impact on the profitability of airports - most recorded drops in the number of checked-in passengers by around 70%;
- all entries of the legal act required the operating airports to introduce improvements and change the work schedule.

The vast majority of large communication airports have gone a step further in ensuring greater comfort of travel. According to the national regulation, each person arriving in Poland is required to present a negative coronavirus test, performed no earlier than 48 hours before departure / arrival. If the person doesn’t do it, he/she should automatically go to ten-day home isolation. It is worth mentioning that people who had recovered from COVID-19 and fully vaccinated people with a certificate in the form of a QR code, which was officially introduced in Poland on June 1, 2021, are exempt from quarantine.

Antigen tests or PCR could be done in diagnostic laboratories, but not everyone had the opportunity to do it. Therefore, large air communication units have opened up testing points for arriving and departing people, in which those willing can test themselves immediately. Such solutions have been introduced, among others, by Chopin airport in Warsaw, Kraków-Balice, or Wrocław-Starachowice. According to the information provided, the waiting time for the test results varies between 15 to 60 minutes, depending on the selected method. The prices, on the other hand, are in the range of PLN 150-200, payable in cash or by credit card.

In conclusion, recommendations related to the prevention of the spread of the SARS COV-2 forced airports to change their thinking and the way they operate by 180°. As a result, they not only had to adapt to EU and national legal regulations, but also expand their product offer. These airports, which were able to quickly introduce additional facilities, increased their financial result and improved competitive position in the market.
• generally, the size of the airport did not have a significant impact on the percentage decrease in the number of checked-in passengers;
• most airports looked for additional revenues in non-aviation activities;
• after the first full lockdown, tools enabling limited travel have been introduced – certificates of recovery, vaccination certificates or a negative test result, performed shortly before departure - this enabled the resumption of the operation of airports in their "basic" scope of services, which is passenger transport;
• in order to maintain the competitiveness of offers and the ability to function in the light of the restrictions related to the pandemic, airports have been forced to increase financial outlays on hygiene and safety issues - a social distance has been introduced, the obligation to periodically disinfect rooms and introduction of test points for passengers for the presence of coronavirus in their organisms;
• companies from various industries noticed that electronic forms of communication are much cheaper and in most cases sufficiently effective to, at least partially, give up business trips, which will undoubtedly affect the number of passengers checked-in in the coming years.

Conclusions

All activities in passenger air transport take place at specialized airports. It is from here that, according to the law, economic flights are carried out. The largest decrease was recorded at the central airport of Poland, where the percentage of people decreased by 71% compared to the previous year. Other ports also recorded similar results. Only three airports managed to achieve a decrease of less than 60%, and these were airports near Katowice, Zielona Góra and Olsztyn. The reasons can be seen in the rapid adaptation of the objects to the pandemic reality, i.e. the change from aviation to non-aviation activities.

The ongoing coronavirus pandemic has forced many companies to change their attitude towards the end customer. It was no different in passenger air transport, where a number of orders were introduced. Airports, as the most representative link in the air transport chain, have adapted their activities to the present state of, among others, giving passengers the opportunity to test for COVID-19 in their building. The result of these activities was an improvement in the economic situation and an increase in the confidence of current and potential passengers.

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