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The Impact of Covid-19 on EU Air Transportation and Foreseen Strategies

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Abstract. This study examines the impact of the Covid-19 pandemic on air transportation in the European Union to predict volume of European air transport according to the official number of infected people. It proposes convenient response strategies that airlines companies could adopt to overcome Covid-19 consequences. Three variables have been collected for each EU country: people air transporting, goods air transporting, and recorded number of Covid-19 infected people on the period between 1/1/2020 and 30/6/2020. We use Ordinary Least Square (OLS) to analyze the impact of Covid-19 on the investigated variables and to predict the number of people and volume of goods transported. We use the Hausman test and redundant fixed effects-likelihood test to determine the most appropriate model. Then, four evolution possibilities of the Covid-19 epidemic have been subtracted; for each one, an appropriate response strategy has been proposed for airlines companies. Results indicate that there is a significant negative impact of Covid-19 on the number of people and volume of goods transported by air in the European Union. Each additional infected person in the EU will lead to a decrease of 99 air passengers. Also, each additional infected people in the EU led to a decrease of 0.075 tons in air goods transportation. Airline companies are recommended to adopt a number of strategies to overcome Covid-19 consequences, such as establishing partnerships, developing markets, and initiating acquisitions. European governments should increase their support to airline companies, and more money should be invested in Research and Development (R&D) to increase flexibility in defeating pandemics.

Keywords: Covid-19, air transportation, European Union, air passengers, airline companies.

1. Introduction

The air transportation sector is a primordial success factor for both developed and developing countries' economies to increase their national incomes, as well as realize cultural and social progress, and contribute to their wealth and prosperity (McBride et al., 2021). Although this sector is the subject of continuous development in terms of safety and security, it is susceptible to an economic, social, political, and medical crisis using the latest modern technologies (Miller, 2002). For example, the September 11, 2001 attacks caused the bankruptcy of 8 airline companies, while the 2008 economic crisis resulted in 14 European airline companies (Gudmundsson et al., 2021). Surprisingly, certain epidemics, such as SARS, Birds Flu, Pig Flu, did not cause similar losses to the global economy and business.

The quick spread of Covid-19 has negatively affected many sectors, but the transportation industry was affected the most, particularly airline transport (Hollinger, 2020). The health, security, and comfort of passengers and staff are the primordial aviation industry's pride and preoccupations. Airports are imperatively called to apply several new security and health measures to guarantee the safety and well-being of passengers.

Rapidly affected, air transport is one of the most damaged industries of the crisis. The COVID-19 pandemic has caused a global transportation disaster. It is soon turned into an exceptional and unprecedented crisis. All companies in this industry attempt to survive by searching managerial methods to keep going even with minimal revenue.

Many studies and research papers have focused on the impact of this pandemic, how to deal with it in order to overcome its awful consequences Donthu and Gustafsson (2020) use simulation tools to predict the number of future deceased and infected people and to predict the impact of this pandemic on different sectors.

Therefore, investigating the impact of Covid-19 on air transport in the European Union is essential to analyze the correlation between the recorded infected people number and the volume of two types of air transport (passengers and goods) in order to elaborate and recommend appropriate strategies to airlines companies (Dunn, 2020).

This study is relatively different from all other precedent papers in scope and coverage. First, it concentrates on the impact of Covid-19 on air transport in a group of countries, the European Union (not only one country, and not overall the world). Second, because the paper analyzes the impact of Covid-19 on the number of passengers and the volume of transported tons of goods by airways in the European Union, third, this research proposes the best strategies to be adopted by European air transport companies in the function of these companies' importance in the market and the function of Covid-19 epidemic type of future evolution.

2. Healthcare Crisis & Air Transport Management

According to its intensity and available resources, a crisis is a critical point or a difficult situation people or organizations should face differently. It started with a personal crisis passing by organizations' or government's crisis and ended by the international crisis (Weick, 1998). The crisis is an unstable phenomenon and a direct threat that could put an organization in danger. Negative effects could result in the organization's position, reputation, and future. Therefore, a critical decision to defeat these negative effects should be taken. (DeSalvo et al., 2021). It is not a problem (which is one crisis' phase), not a disaster (sudden undefeated tragedy), not an event (a defect to be repaired), not a conflict (a contradiction of interests), not a threat (a pre-crisis alarm), not discord (mismatch).

Each crisis has an origin. Some crisis is due to an epidemic or a contradiction of beliefs or a new international system. It is characterized by emergency, lack of control, uncertainty, lack of information, an atmosphere of fear, and time pressure toward making fast, reasonable decisions.

Crisis management focuses on how to defeat emergency cases and plan the process to control them. It is the capacity to remove most risks and uncertainties to control the organization's fate. Success factors of crisis management are good risk management, high environment control degree, high defeat speed, short action time, and having some alternatives.

A scientific method to assure controlling a crisis should include three phases: a preliminary study (determination and ranking of danger factors, determining of positive and negative forces), analysis study (determining of causes), Confrontation planning (communications, procedures of control and performance development).

A crisis like the Covid-19 epidemic is disturbing all aspects of our daily lives. It defies every government, sector, company, organization, and even individual life. So, effective and appropriate strategies to overcome the crisis are required. A crisis represents a phase of the extreme risk of trouble. Consequently, crisis management requires a plan to challenge any unpredicted upcoming incident that may have an undesirable effect.

Large-scale epidemics (Pandemics) have historically led to international demographic, social, economic evolutions. They were killing millions of people. The 21-century epidemics are SARS (2002), Birds Flu (2003-2009), Pigs Flu (2009), Ebola (2014), and finally COVID-19 (2019). The last epidemic was terrifying because of the spreading speed and its mysterious and dangerous effects on people worldwide (Singh et al., 2021)

The transportation sector has a central role in economic, social, urban situations. Its development results in GPO improvement and increasing financial outcomes. Because of linking production zones to consumption zones, assuring people and goods movement, adding new employment opportunities, and facilitating cultural exchanges between people. (Scala and Delahaye, 2021).

Transport could be categorized according to working scope: internal, external, urban, and international) or according to the pathway (by the river, by sea, by train, or by air) or according to service type (passengers, goods, both.), or according to service level (fast, normal) (Gudmundsson and Merkert, 2021).

Air transport is the primary driver of international trade. Air Transport Management studies the airline industry organization in terms of competition dynamics, entry barriers.

Aviation industry has witnessed a very large evolution since the Second World War. The main results of this evolution are concentrated on comfort, speed, security, and profit. However, the main disadvantages are power consumption, maintenance requirements that mean increasing high costs (Deutsche and Welle, 2020).

Among all industries, the aviation sector is probably among the most damaged by the COVID-19 pandemic. This pandemic has critically affected human and industrial activities. For example, air transport in China witnessed a sharp decline in February 2020, gradually recovered during a year. The airline companies dramatically reduced the flight volume and readjusted the aircraft types.

It is often unnoticed that the air transport sector is not only a victim of COVID-19; it is also recognized to contribute to extending diseases, transforming the chance of a (national) epidemic into an (international) pandemic.

Many companies had to stop almost all their flights and activities. Several airports have closed their airstrips in order to get more space for planes parking. Air transport companies are working with minimal staffing, and planes manufacturers have generally stopped their production lines.

3. Literature Review

Several papers have analyzed the impact of Corona virus on the transport sector differently, particularly on-air transport activities. Sun et al. (2021) analyzes the impact of coronavirus on aviation and the role aviation played in spreading COVID-19. They have collected 110 papers on the subject published in 2020, leading to the following categories: analysis of the global air transportation system during COVID-19, the impacts on the passenger-centric flight experience, and the long-term impacts on broad aviation. The research concludes with recommendations for future scientific directions; hopefully helping aviation prepare for a post-COVID-19 world.

In another paper authored by Sandro Nižetić entitled "Impact of coronavirus (COVID-19) pandemic on air transport mobility, energy, and environment: A case study", transport mobility was analyzed on EU data from the relevant sources associated with the airline industry. Data were analyzed in specific periods from January to April of 2020, which corresponded with the initialization of the pandemic in the EU and later in its full development. Specifically, two airports were selected in Croatia as case studies to analyze the impact of COVID-19 more

thoroughly on mobility together with the estimation of carbon footprint during the pandemic and the year before the pandemic state. The results revealed that COVID-19 gradually affected air transport mobility in the EU, where a peak was reached in April with a reduction in the number of flights in the EU region, reaching more than 89%. Cargo traffic was not significantly affected by the pandemic and was even increased in some cases due to the supply of medical equipment in the fight against the disease.

It concludes that air transport mobility plays an important role in the global economy with complex and intertwined impacts on economic systems and societies. The current impacts on air transport mobility are drastic, where long-term effects could be devastating if the pandemic state maintains the same magnitude.

A study by Sun et al. (2021) on the impact of COVID-19 on the Air Transportation Network in the United States, Europe, and China finds that air transportation with its unprecedented connectivity creates an environment where small epidemic outbreaks may quickly turn into full-blown pandemics. This singularity was exactly witnessed at a large scale with the emergence of COVID-19 throughout the year 2020. Notably, the universal patterns underlying the spread of diseases have been understood well by epidemiologists for several decades, based on historical events.

This study reports on a cross-comparison of the impact of COVID-19 on the three aviation centers of the world: the United States, Europe-27 (referring to 27 European Union countries after the United Kingdom leaving the European Union), and China. The study reports the evolution of international connectivity with a focus on the three regions under consideration, investigates the specifics of the intra-continental networks, analyzes the impact of COVID-19 on specific airports of the three regions.

In 2020, many papers were published about the impact of the COVID-19 pandemic on air transport and its role in the spread of COVID-19. These papers can be grouped according to their main application field. Three basic categories can be noticed: 1- The analysis of the global air transportation system during COVID-19, 2- The impact on the passenger-centric flight experience, and 3- The long-term impacts on broad aviation.

Airport council international has diffused on March 2021 an analytical report entitled "The impact of COVID-19 on the airport business and the path to recovery". In this report, two main axes have been clarified "COVID-19 crisis had an unprecedented impact on airport traffic" and "COVID-19 outbreak catastrophic impact on airport revenues".

4. Study Sample and analysis

The air transportation data from 27 EU countries is the sample of this study. Those 27 EU countries are Belgium, Bulgaria, Czech, Demark, Germany, Estonia, Ireland,

Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Holland, Austria, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden.

Real detailed data has been collected on the volume of air transport for passengers and goods, in addition to the number of Covid-19 infected people in each of these 27 European countries, during the first six months of 2020. Besides, were used Eviews10 software and Panel Data method, and adopting tests such as the Hausman test to determine the appropriate model between the Random-effects model and Fixed effects model; Redundant fixed effects-likelihood test to determine the appropriate model between the pooled regression model and Fixed effects model.

Table 1 Descriptive Statistics of independent and dependent variables

	Passengers	**Goods**	**CORONA**
Mean	1280884	40015.45	14003.14
Median	202850	7118	1031
Maximum	14069946	379845	132200
Minimum	26	67	0
Std. Dev.	2792527	77787.78	31009.52
Skewness	3.264720	3.042975	2.611881
Kurtosis	13.42208	12.67527	8.5857798
Jarque-Bera	1014.658	876.4416	392.3625
Probability	0	0	0
Sum	2.06E+08	6442488	2254505
Sum Sq. Dev.	1.25E+15	9.66E+11	1.54E+11
Observations	161	161	161

Table 1 above shows that through 161 observations, the passengers' number is between a minimum of 26 passengers and a maximum of almost 14 million passengers. The transported goods volume are between a minimum of 67 tons and a maximum of practically 380000 tons. The Covid-19 infected persons are between a minimum of 0 people and a maximum of nearly 132000 people.

We were estimating the impact of Covid-19 on air transportation. Tests show that the Fixed effects model is the best model to fit the data.

The first regression equation represents the impact of Covid-19 on the number of persons transported by air.

$$P= 2667323-99.5 \text{ corona}$$

On average, in the case of non-Covid-19 infected people, the number of

passengers is 2667323. Each new infected case results in a decrease of 99 passengers. Hence, the number of air transport passengers decreases if the number of Covid-19 infected cases increases in the EU, along with Warnock-Smith et al. (2021). In addition, 90.2% of air transport passengers is explained by the number of Covid-19 infected people's evolution.

Table 2: Regression results of Covid-19 on number of passengers and volume of goods (Source: Panel Data method results)

Dependent Variable: Number of Passengers				
Total panel (balanced) observations: 161				
Variable	**Coefficient**	**Std. Error**	**T_Statistic**	**Prob.**
C	2667323	829793..62	32.14431	0
Covid-19	-99.51088	3.375288	-29.48219	0
Adjust R-squared	0.902192			
Variable	Coefficient	Std. Error	T_Statistic	Prob.
G	41079.41	572.0924	71.80554	0
Covid-19	-0.075980	0.023182	-3.277592	0.0013
Adjust R-squared	0.994095			

Note: Results are obtained from OLS estimates based on Panel Data using a fixed-effect model.

The second regression equation represents the impact of Covid-19 on the volume of goods transported by air:

$$G= 41079.41-0.075 \text{ corona}$$

On average, in the case of non-Covid-19 infected people, the volume of goods transported by air is 41079.41 tons. Each new infected case means a decrease of 0.075 transported tons. Hence, the volume of air transported goods decreases if Covid-19 infected people increases in the EU. Also, 99.4% of the volume of air transported goods' evolution is explained by the number of Covid-19 infected people. To conclude, the impact of Covid-19 on both European air transport passengers and European air transported goods is vital and dynamic.

5. Proposed strategies to adopt by Airlines according to Covid-19 epidemic evolution

Two criteria determine the degree of an airline company's strength. The first is the high level of profit (more than 10%), and the second is the ability to deal with large

travel canceling (owner of its planes) (Albers and Rundshagen, 2020).

When a good vaccine/drug has been discovered, rescued weak companies will restart because the air transport sector is recovered. Weak companies could adopt a Joint venture strategy or Merge Strategies. (Sun et al., 2021) in order to be able to overthrow their weakness and restart their activities powerfully. On the other hand, flights could be full of passengers, which will help them to improve their financial state. This high demand can help companies to get their financial recovery soon.

Damaged strong companies can adopt a market penetration strategy, increasing their flights with attractive offers to get a large market share. Alternatively, a market development strategy with new destination flights could be implemented. Acquisition Strategy, which means purchasing other companies, could also work. These strategies may accelerate repairing or removing damages. On the other hand, improving the competitive state could be based on increasing flights and destinations (Low, 2020).

When the number of Covid-19 infected people decreases, according to the resulting regression equation, each decreased infected case will result in 99 additional passengers. Hence, rescued weak companies could continue their previous flights without any change because the market is still risky. Measures like PCR tests and social isolation should be applied. Flights with a small number of passengers should be canceled (Meyer, Prescott, and Sheng, 2020). These measures permit saving costs and keeping a minimal level of activities.

Damaged strong companies can accept non-full flights in order to keep permanency and trust with their customers. On the other hand, improving the competitive state could be based on keeping the same flights and destinations (Thiessen, 2020). When the number of Covid-19 infected people increases, as expected in winter, each new infected case means less than 99 passengers. This represents a real danger in terms of demand. For weak companies, the best strategy to survive is the divestiture strategy (selling a nonprofit part, selling some planes, or canceling some destinations).

Damaged strong companies could close some departments or cancel some destinations, focusing on the most demanded and profitable ones. On the other hand, measures like using air filters are recommended. The number of passengers will decrease, and flight prices will increase because of increasing costs.

When there is a new Covid19 quarantine, weak companies will do their best to survive, but certain companies will be forced to sell the whole company or close completely because they cannot decrease their costs. Indeed, some weak air transport companies will completely disappear. Strong companies will acquire them.

Damaged strong companies could adopt a retrenchment strategy by selling some buildings, decreasing the number of employees in order to survive during the quarantine, waiting for new better conditions.

Table 3: Strategies in the function of company's strength and Covid-19 evolution

Covid19 quarantine	**Weak + quarantine**	**Strong + quarantine**
Increasing infected number	Weak + increasing infected number	Strong + increasing infected number
Decreasing infected number	Weak + decreasing infected number	Strong + decreasing infected number
A good drug is available	Weak + a good vaccine/drug is available	Strong + a good vaccine/drug is available
COVID-19 state/ company state	Weak companies	Strong companies

6. Results & recommendations

COVID-19 pandemic negatively affected air transport activities in the EU, in both terms, number of passengers and volume of transported goods. Each new infected case means a decrease of 99 passengers and 0.075 transported tons. 99% of the number of air transported goods' evolution is explained by the number of Covid-19 infected people' evolution, and 91% of the number of air transport passengers' evolution is explained by the number of Covid-19 infected people' evolution.

If a reliable vaccine/drug has been discovered, weak companies could adopt joint-venture strategies or mergers strategies. Strong companies can adopt Market Penetration Strategy. If the number of Covid-19 infected people decreases, strong companies could accept non-full flights in order to keep with their customers. Also, if the number of Covid-19 infected people decreases, for weak companies, the best strategy is divestiture strategy (selling some planes or canceling some destinations). Strong companies could close some departments or cancel some destinations.

Finally, if there is a new Covid19 quarantine, weak companies will do their best to survive but certainly will be forced to sell the whole company or close completely because they cannot decrease their costs. Strong companies could adopt a retrenchment strategy by selling some buildings, decreasing the number of employees to be able to survive.

One of these research limitations is the absence of other variables affecting the evolution of European air transport. It is evident that decreasing or increasing passengers' number and transported goods' quantities are not only dependent on COVID-19. Hence, future research may be performed globally and consider all factors affecting the evolution of air transport activities. Also, examining the impact of applying safety measures, such as PCR tests, on-air transport activities could be performed. Finally, a good research proposal could be to study the impact of the COVID-19 pandemic on other types of transport activities such as sea and train transportation.

References

Airport council international. (2021). The impact of COVID-19 on the airport business and the path to recovery, *Advisory Bulletins*. 216-221.

Albers S., Rundshagen V. (2020). European airlines′ strategic responses to the COVID-19 pandemic (January-May, 2020)". *Journal of Air Transport Management*. 87. 112-114**.**

Deutsche Welle. (2020). Lufthansa grounds German wings and cuts fleet size, DW.com, <https://www.dw.com/en/lufthansa-grounds-germanwings-and-cuts-fleet-size/a -53053398>. 223-227.

DeSalvo K, Hughes B, Bassett M, Benjamin G, Fraser M, Galea S, Gracia JN, and Howard J. (2021), "Public Health COVID-19 Impact Assessment: Lessons Learned and Compelling Needs". *National Academy of Medicine*. 191-194.

Donthu N, Gustafsson A. (2020), Effects of COVID-19 on business and research, *Journal of Business Research*, Vol. 117. 284-289.

Dunn G. (2020). The story of the coronavirus impact on airlines in numbers, Flightglobal.com, <https://www.flightglobal.com/strategy/how-the-airline-industry-has-been-hit-by-the-crisis/138554.article?adredir¼1. 133-138>.

Ettlinger M., Hensley J. (2021). COVID-19 Economic Crisis: By State, University of New Hampshire. 124-128.

Gebal M. (2001). Interests and Integration: Market Liberalization, Public Opinion, and the European Union", St. Louis, Missouri. 211-214.

Gudmundsson S., Merkert, R. (2021). SI: Air Transport COVID-19, *Journal of Air Transport Management*, Vol 97. 99-103.

Gudmundsson S.V., Cattaneo M., Redondi R. (2021). Forecasting temporal world recovery in air transport markets in the presence of large economic shocks: The case of COVID-19. *Journal of Air Transport Management*. 114-117.

Hollinger, P. (2020). How coronavirus brought aerospace down to earth, FT.com, <https://www.ft.com/content/3fe8a876-7d7c-11ea-8fdb-7ec06edeef84>. 87-89.

ICAO. (2020). Economic Impacts of COVID-19 on Civil Aviation, *Economic Development*. 149-155.

Kavita Singh K., Kondal D., Mohan S., Jaganathan S., Deepa M., Srinivasapura Venkateshmurthy N., Jarhyan P., Mohan Anjana R., Venkat Narayan K. M., Mohan V., Tandon N., Ali M. K., Prabhakaran D. & Eggleston K. (2021). Health, psychosocial, and economic impacts of the COVID-19 pandemic on people with chronic conditions in India: a mixed methods study. *BMC Public Health*. 277-281.

Khuan Low T. (2020). COVID-19: Strategizing airport operations for the new norm *ACI, Insights*. 178-189.

McBride E., Arden M. A., Chater A., Chilcot J. (2021). The impact of COVID-19 on health behaviour, well-being, and long-term physical health. *British Journal of Health Psychology*. 86-89.

Meyer B. H., Prescott B., and Sheng X. S. (2020). The Impact of the COVID-19 Pandemic on Business Expectations, Federal Reserve Bank of Atlanta, Working Paper. 146-149.

Miller M. (2002). On Responding to the Challenge of Globalization, Discussion paper. 29-32.

Nižetić S. (2020). Impact of coronavirus (COVID-19) pandemic on air transport mobility, energy, and environment: A case study. *International Journal of Energy Research*. 44, 10953-10961.

Scala P., Mujica Mota M., and Delahaye D. (2021). Air Traffic Management during Rare Events Such as a Pandemic: Paris Charles de Gaulle Case Study, *Aerospace*. 203-208.

Spaak, Paul-Henri. (1985). Intergovernmental Committee on European Integration, *The Brussels Report on the General Common Market* (abridged, English translation of document commonly called the Spaak Report). 147-149.

Sun X., Wandelt S., Zheng C., and Zhang. A. (2021). COVID-19 pandemic and air transportation: Successfully navigating the paper hurricane, *Journal of Air Transport Management*, 94. 222-226.

Sun X., Sebastian Wandelt S., Fricke H., and Rosenow J. (2021). "The Impact of COVID-19 on Air Transportation Network in the United States, Europe, and China", *Sustainability*, 13, 9656.

Thiessen T. (2020), Air travel prices set to double: US Europe $2,200 economy fare, Forbes.com, <https://www.forbes.com/sites/tamarathiessen/2020/05/18/air-travel-prices-set-to-double-us-europe/>. 187-289.

Warnock-Smith D., Graham A. F., O'Connell J., Efthymiou M. (2021). Impact of COVID-19 on air transport passenger markets: Examining evidence from the Chinese market, *Journal of Air Transport Management*, N 94. 143-146.

Weick K. (1998). Enacted Sense Making in Crisis Situations. First edition, New York. 231-233.