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Flight Status - 'Grounded Indefinitely': An Analysis of the Impact of COVID-19 on Commercial Aviation

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ABSTRACT

Since the unexpected eruption of COVID-19, travel has been heavily circumscribed by governments in an endeavour to curb the spread of the virus. This research study aimed at conducting a case-study analysis of the impact of the Coronavirus on the commercial aviation industry. It analysed changes in international passenger capacity from originally planned in a sampling of countries from different regions, from January to April 2020, to measure the impact of the pandemic on commercial aviation. The data for capacity change were regressed against days of lockdown and days of global travel ban to determine the extent of their impact. Qualitative data was also analysed to provide a multifaceted picture. The study found that COVID-19 had a huge influence on commercial aviation during the period observed. Moreover, the restrictions implemented by governments were found to exert a statistically significant impact on the industry, accounting for 84% of the impact on the change in international passenger capacity. The equation generated provides a predictive tool for determining changes in passenger capacity in the foreseeable future if similar restrictive policies are imposed. A qualitative analysis of the context also reveals that airfares will fall in the short run as airlines compete to regain customers, but rise in the long run. The paper thus highlights the importance of government bailouts and the relaxation of specific rules to support airlines during these challenging times. Other necessary measures identified include fleet re-purposing, as well as the institution of additional safety measures to encourage air travel.

Introduction

Until recently, commercial aviation had been a growing industry, with many people travelling all around the world in recent decades. The year 2019 saw over 4.54 billion people take to the sky: global air traffic grew by 4.9% year-on-year with the trend indicating further increases in aeroplane passengers (Mazareanu, 2020). The prospect for the commercial aviation industry could not look more sanguine.

However, the sky came crashing down on the industry on December 31st, 2019. A novel Coronavirus, subsequently identified as COVID-19 or SARS-CoV-2, which originated in the Wuhan region of China, quickly spread to other areas of the world. Globally, the virus took just over 60 days to reach 1,000,000 cases (Mishare, 2020). Within a matter of three months, the virus had been labelled a "pandemic" by the World Health Organization (WHO, 2020), indicating that this new disease had hit global proportions.

In an endeavour to control the spread of the virus, governments all around the world have implemented lockdowns to varying scales. As a consequence, all economic and social activity grounded to a sudden halt. The lockdowns implemented were estimated to result in a decline of 3% in the global Gross Domestic Product (GDP) in 2020 (Winck, 2020). However, the International Monetary Fund's Managing Director, Kristalina Georgieva, believed that even this extreme forecast is optimistic. As the virus progressed, more recent estimates from the World Bank expect the global economy to shrink by approximately 5.2% in 2020 as a result of the Coronavirus pandemic (Zumbrun, 2020).

Against this backdrop, it is evident that the commercial aviation industry has been one of the most severely impacted by the consequences of the lockdown measures and the contagious nature of the virus. According to Business Wire (2020), both international and domestic flights have been cancelled to avoid thus transmission of the virus, thus resulting in a steep decline in travelling. Many of the airlines still operating have cut up to 90% of their flying capacity (Ellis, 2020).

The year, 2020, is thus set to be the worst year for airlines ever, with forecasted losses of $84.3 billion (Jasper, 2020). Furthermore, airlines are predicted to lose $15.8 billion in 2021, as the level of traffic recovers slowly, and airlines reduce ticket fares to win business (Frost, 2020). These sudden changes for a previously burgeoning industry have been devastating, with significant ripple effects. As airlines and aeroplane manufacturers that are under pressure to cut costs are huge employers, 32 million jobs supported by the aviation industry have also been put at risk (International Air Transport Association [IATA], 2020). Travellers would also be affected, as the availability of fewer flights would also result in a reduction in global connectivity, such as travel between the USA and Europe (Denby, 2020b). These disruptions to air travel also get in the way of economic recovery, as this connectivity lies at the heart of the recovery of our global economy.

These unprecedented circumstances and the consequential rapid decrease in global demand have led to some airlines going bankrupt, particularly many budget airlines such as British carrier, Flybe. Airlines have been forced to make drastic changes including grounding and scrapping aeroplanes, cutting down most routes and re-allocating planes to carrying cargo (IATA, 2020). As stated by Boeing CEO, David Calhoun, “It will take two to three years for travel to return to 2019 levels and an additional few year beyond that for the industry's long-term growth trend to return” (as qted. in Slotnick, 2020a).

Clearly, the impact of COVID-19 on the commercial aviation industry is a pressing topic. In order to contribute to the discourse, a case study analysis that involved the quantitative and qualitative analyses of secondary data was conducted to delve into the impact of COVID-19 on the commercial aviation industry from different perspectives. Specifically, the comparisons of the cumulative effects of the changes in the passenger capacity over time and the analysis of the impact of potential predictive factors — the global ban on travel and the number of lockdown days — for different countries could be instructive in helping commercial aviation industries prepare for the challenging future days ahead. Moreover, the qualitative examination of the factors could also yield in-depth insights to strengthen the industry against future disasters as devastating as the COVID-19 pandemic.

Description of Research Study

Research Aim and Research Approach

The aim of this research study was to conduct a case study analysis of the impact of the COVID-19 crisis on the commercial aviation industry (specifically passenger-carrying airlines) in various countries from different regions of the world, from January to April 2020. As defined by Yin (2009), the case study involves the “investigation of a contemporary phenomenon within its real-life context” (p. 13). More than just a descriptive approach, it seeks to establish “a relationship between a phenomenon and the context in which it is occurring” (Gray, 2014, p. 267).

For this research study, secondary data were gathered for the quantitative and qualitative analyses. First, the percentage changes in international passenger capacity from originally planned of 13 countries in several different regions of the world during the four months from January to April were compared through the generation of a bar graph and descriptive statistics. The descriptive data provided an overview of the trends of how the commercial aviation industries had been affected in the different countries by month. A Two-Factor ANOVA without Replication was also run to determine whether the effect on the cumulative percentage changes in international passenger capacity by country and month were statistically significant. The first set of related hypotheses were as follows:

- *Null hypothesis:* There is no significant effect of country and month on percentage changes in international passenger capacity from originally planned, in selected countries, from January to April.

- *Alternative hypothesis:* There is a significant effect of country and month on percentage changes in international passenger capacity from originally planned, in selected countries, from January to April.

Second, the cumulative number of lockdown days and cumulative number of days of global travel ban (independent variables) were regressed against percentage changes in international passenger capacity from originally planned by month (dependent variable) during the January–April period to determine their predictive impact. The accompanying hypotheses were stated as follows:

- *Null hypothesis:* The cumulative number of lockdown days and cumulative number of days of global travel ban in a country have no impact on percentage changes in passenger capacity from originally planned, in selected countries, from January to April.

- *Alternative hypothesis:* The cumulative number of lockdown days and cumulative number of days of global travel ban in a country have an impact on percentage changes in passenger capacity from originally planned, in selected countries, from January to April.

Should the cumulative number of lockdown days and cumulative number of days of global travel ban prove to be statistically significant, the equation generated could serve to provide a predictive tool for determining the percentage changes in passenger capacity in the foreseeable future, as the COVID-19 crisis continues unabated.

Finally, qualitative data were gathered to generate a multi-faceted perspective of how the commercial aviation industry was affected by the differences in the development of the COVID-19 crisis and the accompanying policies in different parts of the world.

Data Collection

The first set of data on the percentage change in international passenger capacity was obtained from OAG, a global travel data provider with the world's largest network of schedules and travel status data. The data were adjusted by the International Civil Aviation Organization (ICAO), a specialized agency of the United Nations.

The data show the percentage changes in international passenger capacity from what was originally planned. The targeted months of January through April were particularly relevant for mapping the effect of COVID-19, as the virus had started exerting an international impact from January 2020 onwards (WHO, 2020). This variable was chosen as the dependent variable as it is a good representation of the impact that COVID-19 had had on airlines by taking into account factors such as flight cancellations and the fall in demand for air travel.

The second and third sets of data — the cumulative number of lockdown days and cumulative number of days of global travel ban at the end of each month from January to April 2020 — were obtained from a number of different sources:

- *The New York Times*
- Japan National Tourism Organization
- Singapore's Ministry of Foreign Affairs
- *The Straits Times* (Singapore)
- *Wikipedia*
- *The Local France*

These variables were selected as likely predictive factors because the number of lockdown days and cumulative number of days of global travel ban of the different country would affect travel possibilities for each country with the resultant effects on the aviation industry.

Data Analysis

Descriptive statistics and an accompanying two-factor ANOVA were run to compare the cumulative percentage changes in international passenger capacity from originally planned across selected countries from different regions from January to April and establish their statistical significance. Next, a regression analysis was conducted to determine whether the cumulative number of lockdown days and cumulative number of days of global travel ban exerted an impact on the changes in passenger seat capacity and the extent of this impact. An equation could then be formulated to predict the impact of the COVID-19 situation on the civil aviation industry in the immediate future in response to such policies. Finally, the analysis of qualitative data provided the necessary contextual elements to supplement the quantitative analysis in order to construct a rich and complex picture of the effect of the COVID-19 crisis on the commercial aviation industries of different countries across the world from January to April.

Findings and Discussion

In this section, all the results stemming from the statistical analyses, as outlined in the "Description of Research study" section, are presented and examined in detail. The effects of the cumulative number of lockdown days and cumulative number of days of global travel ban in a country on the percentage changes in international passenger capacity from planned are discussed. In addition, the various implications for the commercial aviation industry are considered. The raw data may be found in Appendices A and B.

As mentioned in the "Description of Research study" section, data for percentage changes in international passenger capacity of 13 countries were compiled for the months of January to April 2020. These 13 countries were chosen from various regions in different parts of the world, in order to offer an authentic depiction of the trajectory of the COVID-19, as its peak impact on the countries varied from region to region in terms of the timing. These data are in percentages (not numbers) to help properly gauge how deeply the respective countries' commercial aviation industry was affected, as the industry is far larger in some countries than those of others, owing to various factors such as population and their economy.

As shown in Figure 1, there was no decrease from planned capacity in most countries in the month of January. We can attribute this to the low number of COVID-19 cases in the world, with China being the primary country afflicted China (WHO, 2020). This means that the virus did not pose a considerable threat to the travel industry at that stage.

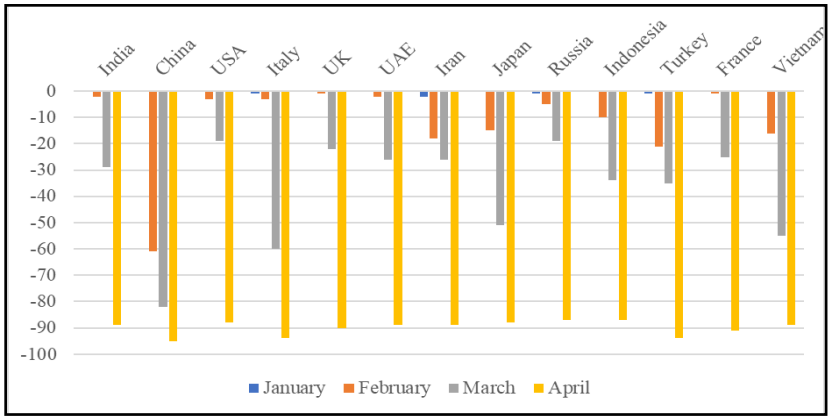

Figure 1. Changes in International Passenger Capacity from Original Planned (%).

Another pattern that can be discerned is that all of the countries with at least a 10% change in capacity in February are located in Asia, as they are located within the geographical proximity of China. With some of their citizens already contracting Coronavirus, travel to China was gradually being circumscribed (Mozur, 2020). By that point, China's capacity had already decreased by 60%, with major international carriers suspending flights to the country. Although the WHO had cautioned against such travel restrictions at the time due to their ineffectiveness and long-term counter-productiveness, the US banned the entry of non-US citizens from travelling from China (with some exceptions), effective February 2, along with multiple other countries that also announced similar restrictions around the same period of time (Kessler, 2020).

The exponential growth in the number of COVID-19 cases worldwide between January and April is also reflected in the graph. As is visible, by the end of April, all 13 of the countries represented here had a reduction in capacity of around 90% — a testament to the exponential effect of the pandemic.

Next, descriptive statistics of the percentage changes in international passenger capacity were generated for each country (see Table 1).

Table 1. Descriptive Statistics of Mean Percentage Changes in International Passenger Capacity by Country.

India		*China*		*USA*		*Italy*	
Mean	-30	Mean	-59.5	Mean	-27.5	Mean	-39.5
Standard Error	20.74849392	Standard Error	21.03370311	Standard Error	20.59328369	Standard Error	22.73946643
Median	-15.5	Median	-71.5	Median	-11	Median	-31.5
Standard Deviation	41.49698784	Standard Deviation	42.06740623	Standard Deviation	41.18656739	Standard Deviation	45.47893285

UK		*UAE*		*Iran*		*Japan*	
Mean	-28.25	Mean	-29.25	Mean	-33.75	Mean	-38.5
Standard Error	21.19895831	Standard Error	20.77408241	Standard Error	19.0804219	Standard Error	19.66596044
Median	-11.5	Median	-14	Median	-22	Median	-33
Standard Deviation	42.39791662	Standard Deviation	41.54816482	Standard Deviation	38.16084381	Standard Deviation	39.33192088

Russia		*Indonesia*		*Turkey*		*France*	
Mean	-28	Mean	-32.75	Mean	-37.75	Mean	-29.25
Standard Error	20.04162335	Standard Error	19.43954303	Standard Error	20.00572835	Standard Error	21.37902009
Median	-12	Median	-22	Median	-28	Median	-13
Standard Deviation	40.08324671	Standard Deviation	38.87908607	Standard Deviation	40.01145669	Standard Deviation	42.75804018

Vietnam	
Mean	-40
Standard Error	20.00416623
Median	-35.5
Standard Deviation	40.00833247

Among the countries sampled, the average percentage change in capacity in China (M=-59.5, SD = 42.07) is clearly the largest. This large difference between China and the rest of the countries is clearly a consequence of the virus originating in the country and the consequential lockdown and travel restrictions starting from the beginning of the year. Essentially, within this period, China had the greatest number of lockdown days.

On the other end of the spectrum is the US with the smallest average changes in capacity (M = -27.5, SD = 41.19). This is representative of the delayed, but extremely rapid, growth in the number of COVID-19 cases in the country, as well as the reportedly slow response of the government to the crisis. Due to the government's slow response in implementing restrictive measures, the US would go on to lead the world in the total number of COVID-19 cases, a startling trend that was mirrored in the industries' drastic reduction in percentage changes in capacity from March to April (see Figure 1). Corley (2020), in his analysis of the stringency of COVID-19 responses numerous countries, concluded that "America was extremely slow to escalate its policies relative to the other countries."

A similar pattern can also be observed when looking at countries in Europe. The average changes in capacity are comparatively lower due to the virus spreading in the continent at a later stage (WHO, 2020). The exception to this is Italy (M = -39.5, SD = 45.48), where COVID-19 spread particularly quickly (Godin, 2020).

A Two-Factor ANOVA without Replication was conducted to determine whether the effect on the cumulative percentage changes in international passenger capacity in terms of the country and month were statistically significant.

Table *2*. Two-Factor ANOVA Without Replication, by Country and Month.

Summary	Count	Sum	Average	Variance
India	4	-120	-30	1722
China	4	-238	-59.5	1769.666667
USA	4	-110	-27.5	1696.333333
Italy	4	-158	-39.5	2068.333333
UK	4	-113	-28.25	1797.583333
UAE	4	-117	-29.25	1726.25
Iran	4	-135	-33.75	1456.25
Japan	4	-154	-38.5	1547
Russia	4	-112	-28	1606.666667
Indonesia	4	-131	-32.75	1511.583333
Turkey	4	-151	-37.75	1600.916667
France	4	-117	-29.25	1828.25
Vietnam	4	-160	-40	1600.666667

January	13	-5	-0.384615385	0.423076923
February	13	-158	-12.15384615	266.6410256
March	13	-483	-37.15384615	367.474359
April	13	-1170	-90	7.333333333

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Rows	3655.192308	12	304.599359	2.709376693	0.010322695	2.032703133

Columns	61747.23077	3	20582.41026	183.0782009	7.54121E-22	2.866265551
Error	4047.269231	36	112.4241453			
Total	69449.69231	51				

As shown in the table above, there were statistically significant main effects, in terms of country, $F(12, 36) = 2.71$, $p = .01$, and month, $F(3, 36) = 183.08$, $p < .01$. Considering both p-values are under 0.05, we can reject the null hypothesis and come to the conclusion that the country and month did, in fact, have significant impacts on percentage changes in international passenger capacity in the selected countries from January to April. Moreover, the far larger sum of squares (SS) for the month (SS = 617474.2) than for the country (SS = 3655.19) quantifies the far greater variability in the cumulative percentage changes in the passenger capacity from originally planned across the months than across the countries, which accurately reflects the drastic changes that occurred from month to month. Ultimately, although there were still considerable differences in the sense of how each country, depending on its location in the region, was affected by COVID-19, the variations between the countries were mitigated by similarities in the aviation industries' responses to the Coronavirus situation due to the reality of global travel. Essentially, the impact of the COVID-19 virus on travel, once it reached pandemic proportions by March, would hit global travel on a large scale, which would not be restricted to any particular region.

Finally, a regression analysis was run to evaluate the predictive impact of the cumulative number of lockdown days and cumulative number of days of global travel ban (independent variables) on percentage changes in international passenger capacity by month (dependent variable) during the January–April period.

Table *3*. Full Regression Analysis of Lockdown Days and Global Travel Days (Cumulative).

Regression Statistics	
Multiple R	0.9145461
R Square	0.8363946
Adjusted R Square	0.8297168
Standard Error	15.227759
Observations	52

ANOVA					
	df	SS	MS	F	Significance F
Regression	2	58087.344	29043.672	125.2505167	5.47073E-20
Residual	49	11362.348	231.88465		
Total	51	69449.692			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-10.73849	2.6084093	-4.116872	0.000146891	-15.98028156	-5.496692	-15.98028	-5.496692

Global Travel Ban (Cumulative)	-1.259206	0.190033	-6.62625	2.51726E-08	-1.641091785	-0.877321	-1.641092	-0.877321
Lockdown Days (Cumulative)	-0.981555	0.141857 2	-6.919313	8.84607E-09	-1.266627589	-0.696482	-1.266628	-0.696482

As can be seen in Table 3, both the cumulative number of days of global travel ban, b = -1.26, $t(49)$ = -6.63, $p < .01$ and the cumulative number of lockdown days, b = -0.98, $t(49)$ = -6.92, $p < .01$ are statistically significant factors. They also explain a statistically significant proportion of the variance in the percentage changes in the international passenger capacity, $R^2 = 0.84$, $F(2, 49) = 125.25$, $p<.01$ (see Table 3).

A predictive equation can thus be derived from this regression analysis as follows to predict how such restrictive policies would affect the percentage change in the international passenger capacity in the future:

$$-10.74 - 1.26 * (cumulative\ number\ of\ global\ travel\ ban\ days) - 0.98 * (cumulative\ number\ of\ lockdown\ days) = \%\ Change\ in\ International\ Passenger\ Capacity\ from\ Originally\ PLanned$$

Conclusion

As previously stated, both alternative hypotheses were correct. The ANOVA proved that the actions taken by governments did, in fact, play a significant role in determining the effect of COVID-19 on the commercial aviation industry in their respective country. Furthermore, an observation of the decrease in capacity over through the months of January to April revealed numerous patterns that could be traced back to the spread of the virus around the world. Through regression analysis, a predictive equation was also able to be generated and could prove useful to those attempting to gauge the continued impact of COVID-19.

While the aforementioned quantitative analysis certainly led to an array of conclusions being drawn, the study has some limitations that should be addressed. The study utilized a limited set of data as the rapid escalation of the crisis meant that a lot of data were incomplete and not updated at the time of writing. Additionally, the dynamic and difficult to predict nature of the spread of the virus suggests that the predictive equation generated is not likely to be highly accurate for an extended period of time. Therefore, the statistical analysis must be accompanied by a look at relevant literature to better suggest actions to be undertaken by affected parties.

Based on the presentation and discussion above, it is evident that the COVID-19 pandemic has inflicted a devastating impact on commercial aviation. In particular, as the virus reached its peak impact in April, the exponential declines in the percentage changes in the international passenger capacity is undeniable. Moreover, it is also clear that the governments' responses all over the world, in imposing global travel ban and lockdowns, accounted for 84% of the impact on the percentage change in the international passenger capacity from originally planned.

Against such a backdrop, as the commercial aviation factor confronts a health situation and government responses — both aspects that it has little control over, the commercial aviation landscape has been experiencing drastic changes. One of the outcomes is the cessation of operations or filing of bankruptcy. Virgin Australia went into voluntary administration (Chapter 11 bankruptcy) on April 21 after the airline's request for aid from the Australian government was denied. Flybe, a UK regional airline that flew about 40% of the domestic flights in the UK, also entered into administration on March 5th (Slotnick, 2020b).

Second, the sudden plummet in demand has made it difficult for airlines to comply with previously established laws. For instance, airlines have been flying almost empty aeroplanes, as European law requires airlines to fill

their landing slots at least 80% of the time, or they will lose them (Asquith, 2020). The slots are prized and valuable because they give an airline the right to take off and land at a designated time from a particular airport, particularly in the case of busy airports; as such, airlines are willing to pay a hefty sum for them (Hayward, 2020). For now, as the airlines are incurring high costs without offsetting revenue, the European Union has temporarily suspended this rule in order to ease pressure on carriers (Katz, 2020). Airlines in the US are also maintaining scheduled air transportation services, dubbed "ghost flights", due to the absence of passengers, as part of the condition of the bailout package issued by the US federal government (Slotnick, 2020c). As a result of these pressures, airlines have been forced to deviate from the industry's thumb-rule of having liquidity of 25% of annual revenue, or at least 3 months of revenue (Duff, 2020).

To make up for these losses, airlines have begun to focus on the transport of cargo. Before the Coronavirus pandemic, passenger aircraft carried 45% of the world's air cargo (Ostrower, 2020). However, as airlines were forced to cancel flights and put their aeroplanes into storage, air cargo capacity dropped by 23% in March 2020. This had been partially countered by the urgent demand for personal protective equipment and other medical supplies, with air cargo demand falling only by 15% (IATA, 2020). Since passenger aircraft have extra capacity due to the steep fall in demand, some airlines have resorted to placing cargo inside cabins and fastening it to seats. Some have been bringing medical supplies to regions where it is desperately needed during these trying times (Denby, 2020a).

One saving grace for airlines during the spread of COVID-19 has been the declines in oil prices due to a price war between Russia and Saudi Arabia, the two largest producers of oil in the world. Although the nations started to collaborate with one another in limiting output according to demand in order to control oil prices back in 2016, Russia's refusal to reduce its output triggered Saudi Arabia's increased production and price slashing, with the aim of pricing Russia out of the market ("Saudi-Russian Price War Sends Oil and Stockmarkets Crashing", 2020). Since "[f]uel costs not only take a huge chunk out of an airline's revenue, they are notoriously volatile" (Grabianowski, 2009, p. 2), a fall in the price of jet fuel has helped somewhat to decrease the airlines' operating costs. Nonetheless, due to the steep declines in airline revenue, this decrease in operating costs merely leads to slightly smaller losses (Denby, 2020).

The ICAO (2020) has highlighted a few possible scenarios for recovery such as a V-shaped path or a U-shaped path. A V-shaped path simply represents a quick recovery while a U-shaped path would mean a prolonged slump. Based on the current situation, with no viable vaccines still in sight to guarantee the safety of travel (Kannan, 2020), the trajectory of recovery may be more gradual than rapid.

For a start, according to the IATA (2020), since the domestic markets would open first, the average trip length would fall radically. This would thus lead to the decline of RPKs (Revenue Passenger Kilometres) by 55% in comparison to 2019. Moreover, to promote air travel by ensuring passenger safety, airlines would also have to invest in additional measures, which include: 1) sanitisation of the plane, 2) enforcement of mask-wearing of passengers and crews alike, 3) the suspension of food and drinks distribution during flights (Ray, 2020), and 4) replacement of air in the plane at short intervals, along with the installation of HEPA filters to capture particles (Wichter, 2020).

Further exacerbating their financial situation is that airlines would have to fly with the middle seats empty in order to maintain distance between travellers. Leaving the middle seat empty would result in airlines not being able to utilise a large portion of the plane's total capacity, which would mean increased costs for airlines (Pearce, 2020).

As a result, researchers pointed out that airlines would likely respond in the following way. Initially, due to the excess capacity, combined with low fuel costs and the return of low-cost carriers to the market, fares may decline (Pearce, 2020). However, as Walton (2020) pointed out, the numerous recent airline bankruptcies, closures and the storage of aircraft could slow down the recovery of supply, therefore potentially leading to high monopoly pricing. Therefore, air fares are likely to be low initially, but eventually become costly as a consequence of significant restraints on capacity utilisation (Pearce, 2020). Cost increases to passengers could be as high as 52% on average (Vox, 2020).

Multiple experts and airlines have claimed that COVID-19 has had a worse impact on commercial aviation than the September 11 attacks on the World Trade Center, the SARS virus outbreak, or the 2008 financial crisis. As the air transport industry is a major contributor to global economic prosperity, which supports $2.7 trillion in global

economic activity and provides 65.5 million jobs (IATA, 2018), it may be vital for policymakers to continue to monitor the situation. The bailouts of the industries by the governments such as the US, the UK, and Australia of the flagship carriers may be just the start of this support (Ellis, 2020). As mentioned by Asquith (2020), rules such as the landing slot requirements must be relaxed to allow airlines to recover.

Carriers themselves will need to re-evaluate routes and repurpose their existing fleet as the industry undergoes changes and lockdown restrictions relax. One example of fleet repurposing is some airlines' temporary shift to cargo operations. Ganeriwala (2020) has also outlined how the airline industry can transform itself to recover from COVID-19. The first change is that airlines must have flexible cancellation and re-accommodation policies, which would motivate more travellers to start flying again. Finally, apart from basic measures to ensure health and wellness such as frequent deep sanitisations of the aircraft and airports are crucial, additional steps could also be taken. One idea is for airlines to implement the use of 'Fit to Fly' certificates, which would mean mandatory and perhaps automated health checks to determine whether or not a passenger has already contracted the virus.

COVID-19 has posed unprecedented challenges to commercial aviation and will continue to have an impact long after lockdown measures are alleviated. Given the importance of aviation in the modern world, it is crucial to mitigate the situation. Airlines must be responsive to changes to government policies and work towards preserving cash while ensuring that they are ready to meet the gradually recovering demand. In addition, the steps taken to ensure passenger safety need to be sustainable for the near future. If the commercial aviation industry is to make it out of this crisis successfully, it is clear that concerted action and integrated policies, with the support of all stakeholders including governments and passengers, are required.

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