Advances in Airline Economics
Volume 11

Airlines and the COVID-19 Pandemic

Edited by
Patrick S McCarthy

AIRLINES AND THE COVID-19 PANDEMIC

ADVANCES IN AIRLINE ECONOMICS

Series Editor: James Peoples

Recent Volumes:

Volume 1:	Competition Policy and Anti-Trust, Darin Lee
Volume 2:	The Economics of Airline Institutions, Operations and Marketing, Darin Lee
Volume 3:	Pricing Behaviour and Non-Price Characteristics in the Airline Industry, James Peoples
Volume 4:	The Economics of International Airline Transport, James Peoples
Volume 5:	Airline Efficiency, John D. Bitzan, James Peoples and Wesley W. Wilson
Volume 6:	The Economics of Airport Operations, John D. Bitzan and James Peoples
Volume 7:	Airline Economics in Asia, Xiaowen Fu and James Peoples
Volume 8:	Airline Economics in Europe, Kevin Cullinane
Volume 9:	The International Air Cargo Industry: A Modal Analysis, James Nolan and James Peoples
Volume 10:	Airlines and Developing Countries, Kenneth Button

EDITORIAL ADVISORY BOARD

SERIES EDITOR

ASSOCIATE EDITORS

BOARD OF EDITORS

This page intentionally left blank

ADVANCES IN AIRLINE ECONOMICS VOLUME 11

AIRLINES AND THE COVID-19 PANDEMIC

EDITED BY

PATRICK S. MCCARTHY
Georgia Institute of Technology, USA

United Kingdom – North America – Japan
India – Malaysia – China

Emerald Publishing Limited
Emerald Publishing, Floor 5, Northspring, 21-23 Wellington Street, Leeds LS1 4DL

First edition 2025

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-80455-505-7 (Print)
ISBN: 978-1-80455-504-0 (Online)
ISBN: 978-1-80455-506-4 (Epub)

ISSN: 2212-1609 (Series)

CONTENTS

LIST OF FIGURES AND TABLES

5. COVID-19 and Airlines: A Final Analysis Through the Lens of Complex Networks

6. Rebuilding Airline Networks in the Post-COVID-19 Era: New Network Configurations in Europe?

7. Competition Between Full-Service Carrier and Low-Cost Carrier and the Impact of COVID-19 Pandemic: Evidence From China

8. Measuring the Risk of COVID-19 Spread via the US Air Transportation Network

5. COVID-19 and Airlines: A Final Analysis Through the Lens of Complex Networks

6. Rebuilding Airline Networks in the Post-COVID-19 Era: New Network Configurations in Europe?

7. Competition Between Full-Service Carrier and Low-Cost Carrier and the Impact of COVID-19 Pandemic: Evidence From China

8. Measuring the Risk of COVID-19 Spread via the US Air Transportation Network

10. COVID-19's Effect on the Technical Efficiency and Productivity of US Airlines: An Industry Sectoral Analysis

11. Analysis of the Impacts of COVID-19 on US Airline Schedule Planning and Service Delivery, 2018 to 2022

12. Starting From the Backhaul: Evaluating the Effects of COVID-19 on Airline Traffic Flows

13. Global Airline Employment and the COVID-19 Pandemic: Impacts, Comparisons, and Implications for the Future

ABOUT THE EDITOR

Patrick S. McCarthy is an Emeritus Professor, School of Economics at Georgia Institute of Technology (2021–), Atlanta, GA. His research areas include transportation economics, regulation, and applied microeconometrics. He is the author of *Transportation Economics Theory and Practice: A Case Study Approach* (Blackwell Publishers, 2001), has published widely in academic journals, served on national committees, and received research funding from the Sloan Foundation, NSF, NIH, the FAA, Georgia DoT, and AAA Foundation for Traffic Safety. He has a PhD in Economics from Claremont Graduate University. He has held primary appointments at Concordia University (1976–1978), Purdue University (1978–2000), and Georgia Tech (2000–2020). He has held visiting positions in Singapore, Greece, Germany, and China.

This page intentionally left blank

ABOUT THE CONTRIBUTORS

Yusaf H. Akbar is a Professor of Management at Central European University in Vienna, Austria. He has published widely in peer-reviewed journals and has authored several books. His research interests are located at the intersection of business strategy, public policy, and business model innovation. Current research examines evolving sharing economy business models, non-market strategy, and dynamic capabilities, among others.

Kenneth Button is a University Professor Emeritus at George Mason University, USA. He was previously a Professor of Applied Economics and Transport at Loughborough University in England and has held a variety of visiting academic positions including at the Universities of British Columbia, California at Berkley, Bergamo, and Porto as well as the Vrije Universiteit Amsterdam, National University of Singapore, and the European University Institute. He was formerly an Editor of the Journal of Air Transport Management and of Transportation Research Series D: Transport and Environment.

Pol Fontanet-Pérez holds a doctoral degree in business strategy from the University of Vigo. His research focuses on air transport, particularly on the evolution of business models in relation to external shocks and climate change. He has experience working for the UN and the airline industry. He has several publications in peer-reviewed journals.

Xiaowen Fu is a Professor at the Department of Industrial and Systems Engineering, the Hong Kong Polytechnic University. His main research areas include engineering management, data analytics, transport and logistics, which cover issues such as competition policy and government regulation, efficiency benchmarking, operation management, transport demand modeling, and industrial organization. He has been the Principal Investigator of more than 20 research grants, the Guest Editor of 7 journal special issues, and the author of more than 100 journal articles. He is the Editor-in-Chief of the journal *Case Studies on Transport Policy* and has provided advisory and economic modeling services to many organizations such as the Boeing Commercial Aircraft, New Zealand Commerce Commission, Australian Competition and Consumer Commission, Government of British Columbia in Canada, Hong Kong Civil Aviation Department, Greater Bay Airlines, Japan Rail (East), and OECD. He is the Director of the Behavior and Knowledge Engineering Research Center, Vice President (Research) of the Air Transport Research Society (ATRS), Vice President (Research) of the Institute for Aviation (UK), Founding Chair of the

Maritime Economy and Policy stream of the World Transport Convention, and an Honorary Professor of the University of Sydney Business School.

Chun-Yu Ho is an Associate Professor of Economics at the University at Albany, State University of New York. Before joining the University at Albany, he was a faculty member at Georgia Institute of Technology and Shanghai Jiao Tong University. He also held visiting positions at Bank of Finland (Institute for Economies in Transition), Hong Kong Institute of Monetary Research, Fudan University, and the Chinese University of Hong Kong. He holds a PhD in Economics from Boston University. His research interests include industrial organization, health economics, and development economics.

Rusudan Kvantaliani is a Research Fellow at the Department of Economics and Business at Central European University in Vienna, Austria. In addition to her doctoral research activities focusing on the relationship between strategy formulation and entrepreneurial founders, she is a Serial Entrepreneur herself and the founder of Sugar Free. She is also a co-founder of Society of Women in Business.

Zoe Laulederkind is a Visiting Assistant Professor of Economics at Rhodes College in Memphis, TN. Her research interests include cost, productivity, and efficiency in the air transportation industry. She has previously coauthored several book chapters including *Productivity and Cost-Patterns in the All-Cargo US Airline Sector, Allocative Efficiency in the US Air Cargo Industry,* and *Plane to See? Empirical Analysis of the 1999–2006 Air Cargo Cartel.* Zoe's work on air transportation has been presented to the Transportation and Public Utilities Group, the Transportation Research Forum, and the Transportation Research Board. Additionally, Zoe has served as a reviewer for *Research in Transportation Economics.* At Rhodes College, she teaches Principles of Economics, Environmental and Natural Resource Economics, and Urban Economics. She also works as a faculty research supervisor to undergraduate students interested in transportation economics. Most recently, Zoe has been examining market concentration in the air cargo sector as well as economies of scope between various air transport services.

Xiaojie Liu is a PhD student of Economics at the University at Albany, State University of New York.

James Nolan (PhD, UC Irvine) is a Professor in the Department of Agricultural and Resource Economics at the University of Saskatchewan. For over 25 years, James has published research on a variety of modal transportation issues, covering airlines, maritime shipping, trucking, and railroads. His current focus is on freight and agricultural transportation topics. James was a former Co-Editor of the *Canadian Journal of Agricultural Economics*, he is a past President of the Transportation Research Forum, he is the current Editor of the *Journal of the Transportation Research Forum* (Elsevier), and is a Topical Editor (agricultural and food transportation) for the *Transportation Research Record.*

James Peoples is a Professor of Economics at the University of Wisconsin-Milwaukee. His research interests include analysis of production efficiency for different modes of freight transportation, as well as analysis of labor market activity in transportation industries. He has served as the President of the Transportation and Public Utilities Group. He is also the Series Editor of *Advances in Airline Economics*, and Editorial Board Member of the journal *Transport Policy*.

Aisling J. Reynolds-Feighan is a Full Professor of Transport Economics at University College Dublin, Ireland, where she has been a faculty member since 1989. She returned to Ireland after completing her PhD studies at the University of Illinois at Urbana-Champaign. She teaches transportation economics and graduate aviation economics courses at UCD. Aisling's research interests are in the nature and evolution of air and road transport network structures and the spatial, temporal, and industry implications for local, regional, and national economies. Over the last 35 years, she has worked with government agencies in Europe and North America and has been appointed to European Commission expert advisory panels to support evidence-based policy initiatives, reviews, and research. She was appointed by the Irish Government Minister for Tourism to the *Tourism Recovery Oversight Group* to monitor and advise on the Irish tourism sector's recovery from the COVID-19 pandemic. She is currently leading a research team on the *Transition to Commercial Vehicle Electrification Policy* as part of the Next Generation Energy Systems (NexSys) Program. NexSys is an All-Island Science Foundation Ireland Strategic Partnership Program focused upon the transition to a net zero carbon energy system.

Joseph B. Sobieralski is an Associate Professor of Human Resource Management in the College of Business at Embry-Riddle Aeronautical University. He received his PhD in Economics from Southern Illinois University, a Master's in Human Resources and Industrial Relations from the University of Illinois Urbana-Champaign, and a BA in Mathematics from Southern Illinois University. He holds an SHRM-CP certification from the Society for Human Resource Management and possesses an FAA Commercial Pilot Certificate with airplane single and multi-engine, instrument ratings, and Boeing 737 type rating. He has also served as an executive board member for an AFT Local Union and as a pilot in the US Air Force. His research focuses on labor, personnel, and sustainability issues in the aviation and transportation industries.

Pere Suau-Sanchez is a Full Professor at the Open University of Catalonia (Spain) and a Senior Lecturer at Cranfield University (UK). His research is focused on air transport strategy and sustainability. He has published academic papers in recognized international peer-reviewed journals, advised governments and leading aviation firms, and contributed to international press and media.

Xiaoqian Sun is a Full Professor at Beihang University, Beijing, China. Dr Sun has published on various aspects of air transport management, including airline network design/scheduling, multi-modal integration, accessibility, and pandemic-resilient

aviation. Currently, she is an Executive Committee member of the Air Transport Research Society (ATRS) and is the Co-Editor-in-Chief of the *Journal of the Air Transport Research Society* (JATRS).

Xosé H. Vázquez is a Full Professor of Management at the University of Vigo and serves as the Head Researcher of REDE, a multidisciplinary research group with interests in innovation, energy, and the environment. His work lies at the intersection of strategy, operations, and climate change and has found outlets such as the *Cambridge Journal of Economics*, *Harvard Business Review*, *Industrial and Corporate Change*, *Journal of Manufacturing Systems*, *Journal of Operations Management*, *Long Range Planning*, *Organization Science*, *Organization Studies*, or *Research Policy*.

Sebastian Wandelt is a Full Professor at Beihang University, Beijing, China. Dr Wandelt has published on the intersection of computer science and intelligent transportation systems, covering areas mainly related to combinatorial optimization, artificial intelligence, and data management.

Kun Wang is an Assistant Professor at Department of Industrial and Systems Engineering, the Hong Kong Polytechnic University. Before that, he was an Associate Professor in University of International Business and Economics, Beijing, China. He obtained a PhD degree from Sauder School of Business, University of British Columbia, Canada. His research interests include air transport economics and policy, aviation and high-speed rail competition and cooperation, and international shipping investment in emission control and adaptation to climate change-related disaster. Dr Wang is the Editor of *Transport Policy*, Editorial Board Members of *Transportation Research* Part A and Part D, *Journal of Air Transport Management*. He has published more than 80 articles on journals including *Transportation Research* Part A/B/C/D/E, *International Journal of Industrial Organization*, *Journal of Transport Geography*, and *Journal of Transport Economics and Policy*. He was awarded the "Best Paper Award (Topic Area A)" at the 2019 WCTRS conference at Mumbai and also won the "Best Graduate Student Paper" award at the US Transportation Research Forum (TRF) 58th Annual Meeting in Chicago. Dr Wang has also provided consultancy services for the organizations including Ministry of Transportation of China, Civil Aviation Administration of China, Beijing Municipal Government, Xiamen Airport, Manchester Airport Group, Umetrip, Variflight.

Xiangru Wu is currently a PhD student at the Department of Industrial and Systems Engineering (ISE), the Hong Kong Polytechnic University. She received her Bachelor's degree and Master's degree in Economics from University of International Business and Economics, Beijing, China. Her main research areas include aviation transport management, international service trade, transport intermodal competition, and policy analysis. Her research has been published in journals, including *Transport Policy* and *Journal of Air Transport Research Society*. She also attended and presented research work at 2023 Air Transport

Research Society (ATRS) Conference and the 14th Workshop on Computational Transportation Science, CTS 2023.

Yushuo Yang is a Senior Affiliate Researcher at CFA Institute. He conducts research in net zero and sustainability investment. Yushuo received a PhD degree in Economics from Georgia Institute of Technology. He received a Bachelor of Economics degree from China and a Master of Arts degree in Economics from Boston University. During his PhD, Yushuo's research fields included industrial organization, transportation economics, applied microeconomics, and econometrics. Yushuo holds Chartered Financial Analyst (CFA) and Financial Risk Manager (FRM) certifications.

Jules O. Yimga is a Fulbright U.S. Scholar and an Associate Professor of Economics at Embry-Riddle Aeronautical University-Prescott, where he also serves as the chair of the School of Business. His research interests include competition and policy issues in the airline industry, with emphasis on on-time performance, service quality, code-sharing, pricing strategies, and market power. He has written over 30 journal publications, the majority of which are single-authored. He earned his PhD in Economics from Kansas State University and has held a visiting position in Estonia with the Estonian Aviation Academy as part of the Fulbright U.S. Scholar program. As an aviation consultant, he provides economic modeling services to various organizations. He is the recipient of multiple "Scholar of the Year" awards and "Best Paper" recognitions at academic conferences such as the Air Transport Research Society and the Transportation Research Forum. Currently, he is a member of the Best Paper Award selection committee for the Air Transport Research Society and serves on the Board of Directors of the Arizona Business Aviation Association.

Anming Zhang is a Full Professor in Operations and Logistics and holds Vancouver International Airport Authority Chair Professor in Air Transportation at Sauder School of Business, University of British Columbia (UBC). Dr Zhang has published widely in the areas of transportation, logistics, industrial organization, and Chinese economy. Currently, he is the President of the World Air Transport Research Society (ATRS) and is the Co-Editor-in-Chief of Transport Economics and Management (TEAM).

Changhong Zheng is a PhD student at Beihang University, Beijing, China. Ms Zheng has published on several aspects of air transportation, including epidemic spreading and urban air mobility.

This page intentionally left blank

INTRODUCTION AND OVERVIEW

Patrick S. McCarthy

Georgia Institute of Technology, USA

The objective of Volume 11, Advance in Airline Economics, is to provide new insights on the multidimensional impacts of the COVID-19 pandemic on the aviation sector in general and airlines in particular. The billions of airline passengers combined with conditions associated with airline travel and airports create a conducive environment for the rapid spread of viruses. The COVID-19 pandemic impacted airlines, airports, and their operations significantly. Presently, the virus's threat to global public health, although a continuing concern, is significantly diminished.[1] As nations' economies are returning to prepandemic environments, this volume is timely for assessing the pandemic's diverse impacts on the aviation sector, how airlines reacted to the pandemic, worked with governments, and adapted its operations and business models.

COVID-19 OVERVIEW

In late December 2019, the World Health Organization (WHO) learned of reports from the Wuhan Municipal Health Commission on a cluster of viral pneumonia cases of unknown cause. In early January 2020, the organization reported that a novel coronavirus was the source of the outbreak. As cases began to appear throughout the world, on January 30, 2020, WHO declared that the novel virus was a public health emergency of international concern. The first death occurred on February 2. On February 11, 2020, WHO called the new disease the coronavirus disease 2019 (COVID-19) and named the virus that caused the disease SARS-CoV-2. A month later, on March 11, 2020, the WHO declared COVID-19 to be a pandemic.

The pandemic spread quickly, the outbreak was geographically broad, significant in its impact on the world's health and well-being, and diverse in affecting most if not all aspects of one's daily life. On April 1, 2020, and April 10, 2020, respectively, worldwide COVID-19 cases and deaths passed 1 million and 100,000. For the period January 5, 2020, through February 11, 2024, Table 1

Airlines and the COVID-19 Pandemic
Advances in Airline Economics, Volume 11, 1–18

ISSN: 2212-1609/doi:10.1108/S2212-160920240000011001

Table 1. Cumulative Cases and Deaths (January 5, 2020–February 11, 2024).

Cases (Millions)		Deaths (000)	
United States	103.4	United States	1,200
China	99.3	Brazil	702.1
India	45	India	533.5
France	39	Russian Federation	402.1
Germany	38.4	Mexico	335
Brazil	37.5	United Kingdom*	232.1
Republic of Korea	34.6	Peru	221.6
Japan	33.8	Italy	196.5
Italy	26.7	France	168
United Kingdom*	24.9	Indonesia	162.1
World	774.6	World	7,031

Source: World Health Organization (WHO), WHO COVID-19 Dashboard, COVID-19 cases | WHO COVID-19 dashboard.

Note: *Includes Northern Ireland.

reports the global cumulative impact of COVID-19 and the top 10 countries in terms of total cases and deaths. The pandemic's public health impact has been catastrophic, with over 774 million cases and over 7 million deaths. The United States and China experienced the most cases, 99.3 and 103.4 million, respectively, and more than twice as high as the next largest country, India. The United States also has the highest number of COVID-19-related deaths, 1.2 million, more than 50% higher than Brazil, the country with the next highest number of deaths, and much more than 50% higher than all other countries.

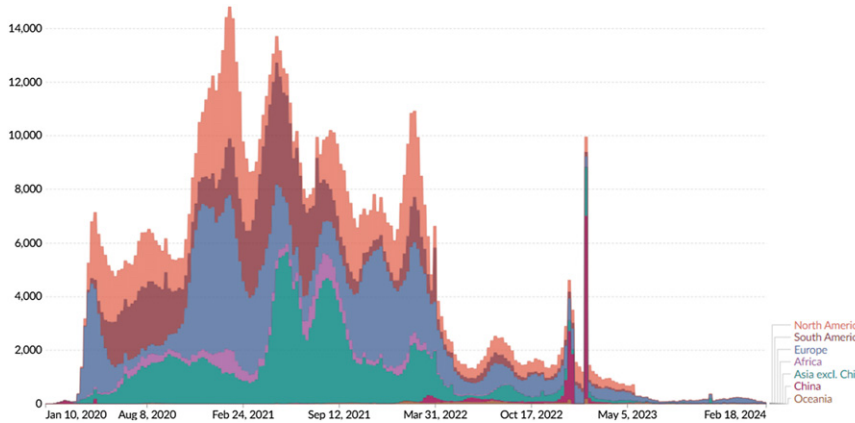

Fig. 1. COVID-19 Deaths, by Region, 2020–2024. *Source:* Our World in Data (Our World in Data).

Fig. 1 graphs the trend line of COVID-19 deaths by the world's regions, where the trends in North America, South America, Europe, and Asia, excluding China, are similar, but the magnitudes are much different. Because of China's 0-COVID policy and strict lockdowns, COVID-19 deaths in China are extremely low. WHO reports that COVID-19 deaths in China through February 2024 are 121.9 thousand.

Nations responded quickly and vigorously to the pandemic implementing policies that mandated or encouraged social distancing, wearing masks, practicing better hygiene, work-at-home, online education, and a rapid response in developing new vaccines to combat COVID-19.[2] As of November 26, 2023, 65% of the total population completed the initial vaccination protocol and 35% of the world's population received at least one booster dose (Our World in Data). The most recent WHO data on cases and deaths discussed above indicate that the world's collective efforts have succeeded in substantially reducing the public health threat that COVID-19 poses. For example, between the week of January 17, 2021, and the week of February 7, 2021, WHO reports 16 million cases and 394,700 deaths worldwide. In contrast, for the 28 days leading up to February 11, 2024, WHO reports 417,500 and 8,600 cases and deaths worldwide, representing 2.6% and 2.2% of cases and deaths in the same period in 2021 and 0.05% and 0.12% of the cumulative totals, respectively.

ECONOMIC IMPACTS OVERVIEW

The economic consequences following the onset of the pandemic were equally quick, dramatic, and diverse, affecting all sectors of the economy. Focusing on the United States, Fig. 2 graphs real gross domestic product (GDP) from October 2019 to October 2023 and three series from December 2019 to 2023, the national unemployment rate, University of Michigan consumer sentiment index, and the S&P 500 index daily close. The graphs highlight the immediate effect of the first months of the pandemic with steep falls in real GDP and the S&P 500 index. Further, reflecting a steep drop in employment, the unemployment rate spiked in early 2020. From the University of Michigan Consumer Sentiment Index, there is an immediate loss of confidence, consistent with the other indicators.

Also, of note from the macroeconomic indicators in Fig. 2 is the recovery from the pandemic. Real GDP and the S&P 500 Index returned to their prepandemic levels by the end of the first quarter, 2021. The unemployment rate returned to its prepandemic level by the end of the second quarter, 2021. Consumer confidence, on the other hand, has yet to return to prepandemic levels, down 20%–50% or more since the second quarter 2020, and reflecting among other factors continuing concerns with inflation, at least part of which reflects supply chain disruptions and COVID-19-related government assistance programs. Measured by the consumer price index (CPI) for all goods, the inflation rate in January 2020 was 2.5% rate, falling to 0.05% in May 2020. A surge in the rate followed, peaking in June 2022 at 8.9% and decreasing by December 2023 to 3.2%.

Fig. 3 reports four airline indicators for the US market, air transportation employees, the US carrier load factor for domestic and international departures,

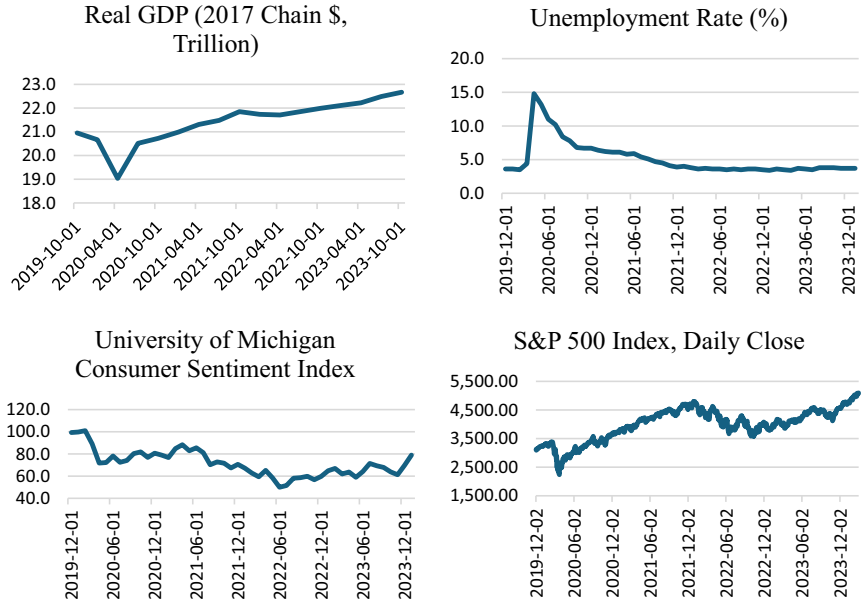

Fig. 2. Macroeconomic Indicators, End of 2019–End of 2023. *Source:* Federal Reserve Economic Data (FRED), https://fred.stlouisfed.org.

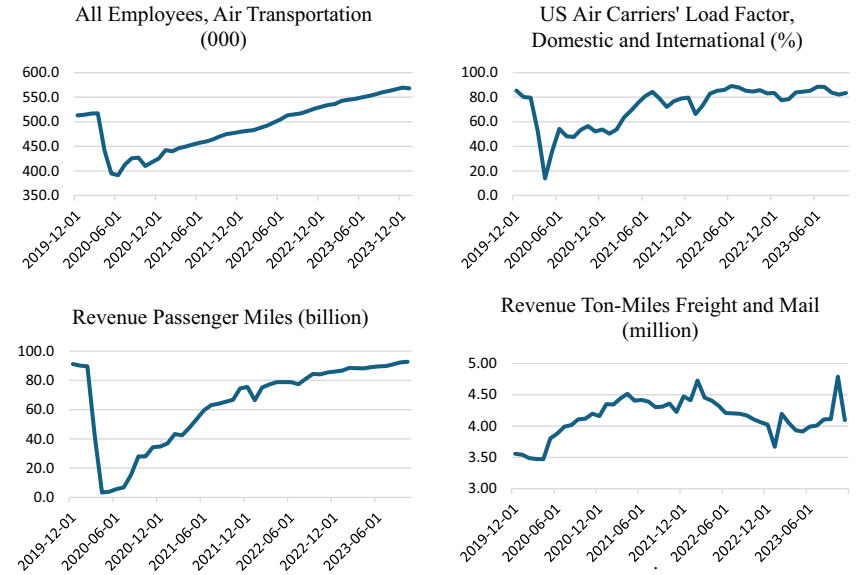

Fig. 3. US Airline Carrier Indicators, December 2019–June 2023. *Source:* Federal Reserve Economic Data (FRED), https://fred.stlouisfed.org.

revenue passenger miles, and revenue ton-miles for freight and mail. Except for revenue ton-miles, the shapes of the other three indicators are similar. With the onset of the pandemic, there is a sharp drop followed by a gradual increase that began mid-second quarter in 2020. The trend for air cargo, on the other hand, experienced a slight decrease in ton-miles, again picking up mid-second quarter 2020 but then falling in mid-second quarter 2022. The first three graphs are passenger-based which drives the deep decline at the beginning of the pandemic. However, the pandemic brought increased demands for various medical equipment and pandemic-related supplies that required air cargo shipping, thus mitigating a steep initial drop in shipments. With the successful implementation of various pandemic interventions, the demand for cargo shipments decreased around the second quarter of 2022. In general, the airline indicator trends in Fig. 3 are consistent with the macroeconomic indicators in Fig. 2, initially a sharp drop followed by a return to or surpassing prepandemic levels.

RESILIENCE

The Oxford English Dictionary defines resilience as "The quality or fact of being able to recover quickly or easily from, or resist being affected by, a misfortune, shock, illness, etc.; robustness; adaptability."[3]

The COVID-19 pandemic is devastating in its effect on global public health, on lives lost, and lives forever affected. Yet, the brief overview in the previous section suggests that the national economy and the aviation sector in the United States, and by extension most other countries, are resilient. The aviation indicators above suggest that, within a relatively brief time, the sector adapted to and recovered from the pandemic, that is, the sector could be characterized as having the quality of resilience or robustness.

From Fig. 3, if we compare the metrics at two points in time, for example, 2019-12-01 and 2022-12-01, then the US airline sector is resilient. To be more precise, this "before-and-after" comparison of pre- and postpandemic states of the world reflects static resilience in the industry. How US airline businesses react, adapt to, and recover from the pandemic over time reflects dynamic resilience. Whether static or dynamic resilience, from an economic perspective, an implicit assumption is the efficient use of resources, consistent with Dormady et al. (2022)'s definitions. Practically, however, transitioning from one to a new (ex ante uncertain) state after a disaster or catastrophic event takes time and often involves resource, decision-making, regulatory, and other economic inefficiencies.

Volume 11 provides new information and insights on the aviation sector's pandemic responses and transitions to a new normal. Chapters 2–4 examine the interplay between COVID-19 and heterodox economics (and more specifically new institutional economics, NIE), nonmarket strategies, and market uncertainty. Chapters 5–8 analyze airline network effects and provide important new insights on how airlines altered their networks, their evolution over time, and the

new competitive opportunities that the pandemic presented. Chapters 9–13 focus on airport and airline operations and operational performance, providing new insights on the effects of COVID-19 on airport costs, airline efficiency and productivity, scheduling capacity, backhaul flows, and employment.

INSTITUTIONS, AIRLINES, AND COVID-19

When faced with the COVID-19 pandemic and other major health events, nations rely on political, regulatory, legal, health, and other institutions as well as markets to manage the crisis. Particularly during the initial stages of a major health event, existing institutions should complement market mechanisms to develop strategies, identify policies, and enact regulations in order to cope with the crisis.

In Chapter 2, Kenneth Button provides an overarching framework for thinking about the interactions between airlines and major health disruptions. He adapts Williamson's (2000) framework of economic institutions in which neoclassical economics is but one part of a broader set of interacting institutions that include social theory (e.g., customs and traditions), political economy (e.g., institutional environment and formal rules), transactions costs (e.g., governance, legal environment), and resource allocation. In this chapter, Button discusses each component of this framework.

The analysis focuses on the economics of the airline industry and major health occurrences in the post–World War II era. Button analyzes the timelines of each health event and the role that air travel has in spreading diseases. He discusses in detail the spread of avian flu, SARS, Ebola, and COVID-19 and the role that simulation models such as susceptible-exposed-infectious-removed (SEIR), when combined with air transport data, can play in helping to identify disease spread.

Among Button's findings, deregulation has made the air travel market more market-oriented, yet insuring against pandemics is not possible. And the impact on airlines and airline markets is uncertain as this depends on the extent of spread and its duration. Market challenges from pandemics include impacts on operating profits and wealth, uneven effects on populations, routes, business models, and restrictive regulatory policies such as lockdowns and wearing masks. Institutional governance includes quantitative measures (e.g., restricting flights), qualitative measures (e.g., improve sanitary conditions), financial (e.g., subsidization), new forms of oversight, and restructuring. More broadly, Button concludes that the NIE and heterodox economics have a role helping to determine how the COVID-19 pandemic and other major health events affect airline-related institutions. Further, with such large economic disruptions, market-only adjustments and market coordinating transactions costs generate economic inefficiencies that move the market off the efficiency boundary.

In Chapter 3, Yusaf Akbar and Rusudan Kvantaliani focus on nonmarket strategies, bargaining and nonbargaining, that European airlines pursued to deal with COVID-19 pandemic's disruptive effects. Consistent with the NIE framework in Chapter 2, airline firms recognize that a combination of market and

nonmarket strategies enable them to manage the crisis more effectively and efficiently. Akbar and Kvantaliani discuss the state of the airline industry in Europe prior to the pandemic, focusing on passenger demands, network disruptions and route suspensions, financial losses and bankruptcies, and workforce reductions. This chapter discusses in some detail the types and amounts of government financial support, the bulk of which occurred in 2020. The government support included equity stakes (e.g., Air Baltic, Lufthansa), grants (e.g., Air France, Alitalia), loans (EasyJet, Finnair, Air Europa), and recapitalization (e.g., Nordica). Lufthansa and Air France received the largest support, 9 and 3.4 billion Euro, respectively. Finnair and Nordica received the smallest support, 48.6 and 30 million Euro, respectively.

To model airline nonmarket strategic approaches to the pandemic, Akbar and Kvantaliani employ a two-by-two matrix whose four cells are strategic actions: nonbargaining compliance, nonbargaining selective avoidance, bargaining partnership, and bargaining conflictual. An airline's strategic choice depends upon the size of the health effect (small, large) and on the size of the economic impact on the airline (small, large). The authors note that a concern on the part of the airlines is to maintain business legitimacy, that is, to pursue a strategy that reflects an airline's commitment to health and safety, thus avoiding a "delegitimization cascade" whereby an airline through a series of actions is seen to increasingly compromise its perceived legitimacy.

The authors employ this framework to illustrate specific airline strategic decisions. For example, in June 2020, British Airways, EasyJet, and Ryanair challenged UK government's 14-day quarantine policy for all individuals entering the United Kingdom, consistent with bargaining conflictual where the health benefit was low, but the economic cost to the airline was high.

Among the authors' findings, airlines are heterogeneous in their responses to the pandemic. Further, aligning nonmarket with market strategies is important in a world experiencing a major health event. Factors that are important to nonmarket strategic responses include an airline's financial health, scale of route networks, the company's ability to adapt to cargo carriage, and whether the carrier is a national flag carrier. The authors stress the importance of effective relationships with regulators and scenario planning to help manage the disruption more effectively.

Major unexpected events create uncertainty. COVID-19's sudden appearance, virulence, and rapid spread worldwide, the relative absence of information about the virus, and no known treatments and therapeutics, all created significant concerns for health officials and governments and broad-based uncertainty for communities and businesses. As discussed in Chapters 2 and 3, in such circumstances, private and public actors collaborate to recover as efficiently and effectively as possible. Equity markets respond negatively to market uncertainty. Uncertainties surrounding the pandemic and its effect on economies in general increase overall market risk. Further, those sectors, including the aviation sector, whose activities the pandemic substantially disrupt will experience greater pandemic-related uncertainty.

In Chapter 4, Chun-Yu Ho, Xiaojie Liu, and Patrick McCarthy analyze the impact of pandemic uncertainty on systematic risk and nonsystematic risk. The analysis estimates an extended capital asset pricing model (CAPM) that includes a pandemic uncertainty index (PUI). The pandemic beta from this model indicates whether the pandemic uncertainty affects airline stock excess returns. The analysis further explores whether the pandemic beta varies across airlines and whether it is correlated with pre-COVID-19 attributes of the firm.

Yahoo Finance is the source of the financial data. The sample period is March 2020 through February 2022, comprising 504 observations, the number of trading days during the sample period. The analysis uses data for 12 airlines, 3 FSCs and 9 LCCs, which includes the 5 largest airlines and 9 of the 10 largest airlines in the United States. The Pandemic Uncertainty Index (Ahir et al., 2022) is an index reflecting the percent of words (multiplied by 1,000) in the Economist Intelligence Unit country reports related to pandemic uncertainty and its variants.

The study finds that US airline stocks decreased more than the US stock market, reflecting greater uncertainty for this sector relative to the broader market. And the mean daily return range for the FSCs and LCCs was (−0.064%, −0.018%) and (−0.087%, 0.023%), respectively. The PUI, after spiking above 40 in March 2020, fluctuated below 10 thereafter.

Results from the extended CAPM model indicate that the PUI reduces airline stock excess returns and is heterogeneous in its effect. Further, the analysis finds that the greater is the pandemic uncertainty, then airline stock excess returns are more sensitive to the market return. The results further indicate that excess returns of airline stocks are more sensitive to the market portfolio return. Other results from a cross-section analysis indicate that, other than the first month after the onset of the pandemic, airline stock returns are weakly related to the pandemic, suggesting market resilience. The study also provides evidence that airlines with larger resources, for example Delta Airlines, are likely to be more resilient.

AIRLINE NETWORKS AND COVID-19

Airline networks are a defining characteristic of their business models. Whether a full service carrier (FSC), low cost carrier (LCC), cargo-only or combination carrier, airlines service a network of domestic and/or international cities. A global disruptive health crisis, the COVID-19 pandemic, significantly affected passenger and freight demands for air service. The effects, however, varied geographically, over time, and by government response.

In Chapter 5, Xiaoqian Sun, Changhong Zheng, Sebastian Wandelt, and Anming Zhang employ network science methodology to analyze the spatial-temporal evolution of COVID-19 and airline responses to the pandemic. This chapter takes a global perspective, analyzing airline networks associated with Asian, European, and North American markets. Building upon Chapters 2–4, Chapter 5 first discusses the interactions between COVID-19 and the aviation sector, the heterogeneous impacts, responses, and challenges facing the industry going forward.