

THE ECONOMICS OF AIRPORT OPERATIONS

ADVANCES IN AIRLINE ECONOMICS

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ADVANCES IN AIRLINE ECONOMICS VOLUME 6

THE ECONOMICS OF AIRPORT OPERATIONS

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CONTENTS

LIST OF CONTRIBUTORS	vii
EDITORIAL MEMBERS	xi
ABOUT THE EDITORS	xiii
CHAPTER 1 INTRODUCTION <i>John D. Bitzan and James H. Peoples</i>	1
CHAPTER 2 LIGHT-HANDED REGULATION OF AIRPORT SERVICES: AN ALTERNATIVE APPROACH TO DIRECT REGULATION? <i>Margaret Arblaster</i>	15
CHAPTER 3 TWO-SIDEDNESS AND WELFARE NEUTRALITY IN AIRPORT CONCESSIONS <i>Tiziana D'Alfonso and Valentina Bracaglia</i>	49
CHAPTER 4 ESTIMATION OF ALLOCATIVE EFFICIENCY IN AIRPORTS FOR A PRE- PRIVATIZATION PERIOD <i>Soraya Hidalgo-Gallego, Valeriano Martínez-San Román and Ramón Núñez-Sánchez</i>	69
CHAPTER 5 AIRPORT–AIRLINE ARRANGEMENTS: AN INTERPRETIVE REVIEW OF INDUSTRY PRACTICES AND RECENT STUDIES <i>Xiaowen Fu and Hangjun Yang</i>	97
CHAPTER 6 AIRPORT AND AIRLINE RELATIONSHIP OF MULTIPLE FUNCTIONAL STRUCTURES <i>Katsuya Hihara</i>	123

CHAPTER 7 PRICING OF AIRPORT OPERATIONS <i>Gisle Solvoll and Terje A. Mathisen</i>	153
CHAPTER 8 THE COST STRUCTURE OF THE AIRPORT INDUSTRY: METHODOLOGICAL ISSUES AND EMPIRICAL EVIDENCE <i>Anna Bottasso and Maurizio Conti</i>	181
CHAPTER 9 AIRPORT CHARGES – INTERACTIONS BETWEEN AIRLINES AND AIRPORTS <i>Terje A. Mathisen, Finn Jørgensen, Pål A. Pedersen and Georgina Santos</i>	213
CHAPTER 10 SPATIAL EVOLUTION OF AIRPORTS: A NEW GEOGRAPHICAL ECONOMICS PERSPECTIVE <i>Tay T. R. Koo and Andreas Papatheodorou</i>	235
CHAPTER 11 THE HETEROGENEOUS IMPACT OF AIRPORTS ON POPULATION AND EMPLOYMENT GROWTH IN CITIES <i>Marquise J. McGraw</i>	261
CHAPTER 12 THE EFFECT OF INTERNATIONAL AIRPORTS ON COMMERCIAL PROPERTY VALUES: CASE STUDIES OF TORONTO, ONTARIO, CANADA AND VANCOUVER, BC, CANADA <i>Jeffrey P. Cohen and Mike Brown</i>	313
CHAPTER 13 AIRPORT CONGESTION AND AIRLINE NETWORK STRUCTURE <i>Xavier Fageda and Ricardo Flores-Fillol</i>	335
CHAPTER 14 LOW-COST CARRIERS AND AIRPORTS: A COMPLEX RELATIONSHIP <i>Paolo Beria, Antonio Laurino and Maria Nadia Postorino</i>	361
CHAPTER 15 BENCHMARKING WORLDWIDE AIRPORT CONNECTIVITY WITH DEMAND DATA: GLOBAL HUB COMPETITION, NEW PLAYERS, AND THE HIDDEN POTENTIAL OF SELF-CONNECTIVITY <i>Pere Suau-Sanchez, Augusto Voltes-Dorta and Héctor Rodríguez-Déniz</i>	387
INDEX	425

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CHAPTER 1

INTRODUCTION

John D. Bitzan and James H. Peoples

Airports serve an essential role in domestic and international travel, facilitating the origination, termination, and connections of air flights. Airport services enhance regional, national, and global connections, increasing the mobility of people worldwide and enhancing local and regional economies. Although, there is a large amount of literature that examines airline costs and productivity, consumer welfare from air travel, and the influence of economic regulation of airline services, there is much less literature that examines airports. This is important, as airport operations play a critical role in influencing airline travel. This volume examines the role that airports play in economic development and land values, the regulation and economic efficiency of airports, airport pricing and competition, and the role played by airports in influencing airline operations and networks.

It is well known that air travel allows businesses to efficiently transport products and people over long distances, and enhances connections and mobility of people worldwide. For businesses, access to airport service lowers the costs of obtaining resources and of selling products in other locations. This, in turn, enhances their competitiveness in other markets. Moreover, air service also enables firms from other locations to more easily access regional markets, thereby enhancing price competition and benefitting consumers. The important role that airports play in influencing regional economies and land values is one area explored in this book.

In addition, the book focuses on the crucial role of airports in the scope of airline services. Because airline efficiency, pricing, and networks are influenced

by airport operations, a full understanding of air services requires an understanding of airport issues, such as regulation, efficiency, pricing, capacity decisions, and competition. This is especially important given major changes that have occurred in the way airports are operated. Since the mid-1980s, as part of a broader move toward privatization, many airports throughout the world have been privatized (Poole & Edwards, 2016). According to the U.S. Government Accountability Office, 450 airports worldwide have been at least partially privatized (U.S. Government Accountability Office (GAO), 2014). Moreover, these airports are increasingly relying on non-aeronautical services, such as car rentals, retail sales, and food sales for large portions of their revenues. As a result, it is important for governments to carefully consider new regulatory alternatives to traditional methods, such as rate of return regulation and price cap regulation. This book examines changes in airport business models and various approaches to government oversight in light of these changes. Further, the book examines airport efficiency, airport pricing, airport competition, and airport–airline relationships. Chapters in this book volume contribute to our understanding of the economic impact of airport operations by using contemporary empirical methods grounded in transportation economic theory.

Chapter contributions can be grouped into four categories: (1) chapters examining the changing nature of airport operations and implications for the role of government; (2) chapters examining the efficiency, structure, and pricing of airport services; (3) chapters that directly examine the effects of airport operations on local and regional economies; and (4) chapters examining airport competition and the role airports play in influencing airline operations and networks. Chapters examining the changing nature of airport operations discuss a new approach to regulation called “light-handed” regulation, the implications of increased non-aeronautical revenues for regulation of airport pricing, the impact of privatization strategy on airport efficiency, and innovative commercial arrangements that have been made between airports and airlines. Theory suggests that regulation can introduce market distortions that hamper efficiency, choice of operating structure, and pricing of services. The increased commercialization of airports suggests several potential benefits from these new more market-based approaches to airport oversight. Further explorations of these market outcomes are examined in the second set of chapters. These chapters include analysis of social welfare implications of various airport fees and the ability of airlines to pass-on airport fees, the cost structure of airports, and a discussion of a new approach to examining airport policy debates, called new geographical economics. Such analyses are significant, in part, because they contribute to our understanding the potential and limitations airports face as economic drivers. The third group of chapters reveals how well airport operations have enhanced regional and economic growth by examining the effect of this service on cities, land values, as well as considering the potential of airport endogeneity by examining airport dependency from an economic geography perspective. The final group of chapters explores airline–airport interactions,

and how these interactions influence economic efficiency and the welfare of society.

In sum, this volume provides a nuanced and thorough analysis of the economic impact of airport operations.

THE CHANGING NATURE OF AIRPORT OPERATIONS AND THE ROLE OF GOVERNMENT

As mentioned above, airports are increasingly operated as commercial entities. Worldwide, many airports have been privatized. According to [Young \(2014\)](#), over \$6.2 billion in airport revenues were generated by for-profit airport groups in 2009, with the largest fully privatized airports in Copenhagen, Denmark and Brussels, Belgium ([Young, 2014](#)). Moreover, although most U.S. airports are not privatized, almost 40% of the largest 100 airports are managed by port or airport authorities ([Young, 2014](#)). Thus, airports are operated much more like businesses than like government entities ([Young, 2014](#)). Airports rely heavily on non-aeronautical revenues for growth and survival, including generating revenues from rents paid by concession tenants (food shops, restaurants, etc.), parking fees, rental car operations, rental of airport land, and advertising ([Airports Council International, 2013](#)). According to the Airports Council International, more than 45% of U.S. airport revenues were generated from non-aeronautical sources, such as parking and ground transportation, rental cars, retail shops, and food and beverages ([Airports Council International, 2016](#)).¹

In the context of these changes that have taken place, the initial chapter by Margaret Arblaster examines a different approach to regulation, called “light-handed regulation.” Arblaster suggests that the consideration of the appropriate form of regulation for airports has increased in importance due to their increasing commercialization. She notes that traditional regulatory approaches for airports have included things like rate of return regulation and price cap regulation. However, as is well known, these types of regulations lead to various problems, such as inefficiency, overcapitalization, and a lack of innovation. Arblaster discusses an alternative approach, called “light-handed regulation,” where the government allows free negotiation of prices between airports and airlines, with the threat of regulatory intervention should the airport abuse its market power. Arblaster reviews the experiences of Australia and New Zealand, where “light-handed regulation” has involved required information disclosure and sometimes negotiate-arbitrate regulation. She finds that the effectiveness of “light-handed regulation” depends on three important factors: (1) how credible is the threat of stronger regulatory intervention if poor performance is identified? (2) how much transparency is provided to airport users under the regulatory approach (more transparency decreases the likelihood of

poor performance)? and (3) how high are administrative and compliance costs associated with the regulatory approach? In the cases of Australia and New Zealand, she finds an important tradeoff: While New Zealand's new enhanced information disclosure requirement is likely to be more effective in preventing an abuse of monopoly power by airports, it also imposes a high regulatory burden.

Just as the changing nature of airport operations may present opportunities for less prescriptive forms of regulation, it may also change the way airport services are priced. Through a review of the relevant literature, Tiziana D'Alfano and Valentina Bracaglia show that the increased use of non-aeronautical services (concessions) for airport revenues has important implications for the pricing of airport services. The authors point out that the implications of increased revenues from concessions on the pricing of aeronautical services depend on whether the complementary relationship between concession services and aeronautical services runs one way or two ways, and whether the overall demand for concession services is independent of traveling. Through reviewing the literature, the authors show that if the demand for concession services increase when aeronautical charges decrease, but the demand for aeronautical services is unaffected by concession charges, then having concession revenues tends to put downward pressure on aeronautical charges. This is because airports can attract more passengers to their airports through the reduced aeronautical charges, therefore increasing concession sales. On the other hand, when the complementary relationship between concessions and aeronautical services is "two-sided," this can exert upward pressure on aeronautical charges. For example, if a passenger needs to rent a car at their destination, a lower car rental price can increase the demand for air service to that destination, increasing the aeronautical charge. The authors also point out that when more of the demand for concession services is independent of traveling (e.g., you would consume food whether traveling or not), the difference between profit maximizing and social welfare maximizing prices for aeronautical services is reduced. Based on a review of literature in this area, the authors find: (1) there is no generalized finding on either of these issues (two-sided complementarity and welfare neutrality), (2) the two may be interrelated, and (3) these should be examined on a case by case basis, as they are often determined by the type, ownership, and size of airport. Moreover, these issues have very important implications for the desired nature of airport regulation. For example, if the complementary relationship between concessions and aeronautical services is "one-sided" (demand for aeronautical services is unaffected by concessions prices) and demand for concession services is independent of traveling, then the need for economic regulation of airport pricing may be limited. This suggests an important area for future research.

As highlighted Soraya Hidalgo-Gallego, Valeriano Martínez-San Román, and Ramón Núñez-Sánchez, the motivations for privatizing airports worldwide vary widely. One motivation that has been highlighted by many researchers in

the airport industry and in other industries is the potential for private entities to improve efficiency over government involvement. Hidalgo-Gallego, Martinez-San Roman, and Nunez-Sanchez measure the change in allocative efficiency that occurred for Spanish airports from 2009 to 2014, in the period just prior to their partial privatization. The authors note the Spanish government's efforts to privatize Aena, a firm that manages 46 airports throughout Spain, ranging from those in Madrid and Barcelona that each handles about 40 million passengers per year to small airports that handle less than 500,000 passengers per year. As described by Hidalgo-Gallego et al., the initial focus of privatization by the Spanish government was to privatize the largest airports (Madrid and Barcelona) and encourage decentralized airport management. However, the newly elected government in 2012 changed the privatization plan to include partial privatization of the whole system, with a focus on improving the smaller regional airports. In evaluating the changing allocative efficiency during this pre-privatization period (2009–2014), the authors find several interesting results. First, they find an improvement in allocative efficiency as a result of the move toward privatization. Second, they find important differences between the periods coinciding with changes in government philosophy regarding privatization. During the first period, when the focus was on privatizing the largest airports, there were big improvements in allocative efficiency. During the second period, when the focus was on partially privatizing the entire system, allocative efficiency did not improve. Interestingly, when allocative efficiency change is broken down by airport group, it is shown that there were large improvements in allocative efficiency for the large airports when they were the primary target of privatization, while the allocative efficiency of these airports decreased when the focus of privatization shifted toward the entire system. These results suggest that the success of privatization in improving airport efficiency depends on the way that airports are privatized. The results may also be interpreted as showing an important benefit from managing airports individually, rather than as a group.

As the increasing commercialization of airports has created opportunities for new forms of regulation, has changed the way that airport services are priced, and has resulted in many privatized entities, it has also resulted in new opportunities for various cooperative relationships between airlines and airports. In Chapter 5, Xiaowen Fu and Hangjun Yang note there are major financial challenges for airports now, with requirements that many be free from government subsidy at the same time that there is a demand for more services. This, along with other changes in the industry has resulted in airlines and airports engaging in a number of innovative commercial arrangements. Fu and Yang review the literature on airport–airline arrangements, identifying common types of arrangements, methods used to assess the impacts of such arrangements, and findings of recent studies regarding their effects. Some interesting airport–airline arrangements identified by Fu and Yang include (but are not limited to): (1) airlines being designated as “signatory airline” at an airport,

where they pay residual airport costs (after subtracting other airport revenues from costs), but also maintain more control of airport operations and may realize lower charges, (2) direct airline investment in terminal facilities, allowing them to control such facilities, (3) long-term usage contracts, allowing airlines to lock-in favorable terms, (4) airport issued bonds backed by airlines, allowing airlines to have exclusive or near-exclusive use of specific facilities, (5) sharing of airport non-aeronautical revenues with airlines as an incentive to generate more traffic, (6) load factor guarantees, where airports guarantee a certain load factor on new services provided by an airline, (7) airport–airline consortiums, where groups of airlines jointly finance various airport facilities, (8) information sharing and joint marketing by airlines and airports, and (9) various incentive programs given by airports to encourage traffic growth. Fu and Yang identify several potential benefits of these arrangements, such as internalizing the positive externality between non-aeronautical services and aeronautical services, increasing service quality, enabling more investment in capacity, allowing sharing of risks between airlines and airports, and increasing airport traffic. However, they also note that these arrangements lead to concerns over their ability to harm competition. Fu and Yang note that the overall economic impacts of these types of arrangements vary depending on market structure and the type of arrangement. They suggest that although these arrangements should be assessed on a case by case basis, they are likely to be more beneficial to society with more competition in the airline or airport sector and with more transparency on the nature of the airport–airline arrangements. Fu and Yang suggest that only limited empirical research has been carried out in this area. As government fiscal pressures increase and airports become increasingly commercialized, this is certainly an important area for future research.

One of the particularly interesting types of airport–airline arrangements identified by Fu and Yang is the risk-sharing relationship, where the airport guarantees a certain load factor to the airline to attract service. In Chapter 6, Katsuya Hihara examines an airport–airline relationship between All Nippon Airways and the Noto Airport in Japan. This airport is in a less populated area of Japan and was built in 2003 to provide better access to Tokyo, which was previously a 7 hour trip without air service. The new airport has been able to provide twice a day service to Tokyo through a load factor guarantee arrangement between All Nippon Airways and the airport. The load factor guarantee arrangement is particularly innovative and effective in that it is structured so that risks of low traffic and the gains of high traffic are shared by the airline and the airport. In many of these contracts, the risks of the low traffic are shared by the airport, but the gains from the high traffic are not shared by the airport. The All Nippon Airways-Noto arrangement is set up so that the airport pays the airline when the traffic is low and the airline pays the airport when the traffic is high. Hihara highlights several benefits of this arrangement, such as enhancing the efforts of the airport and the airline to achieve the common load factor goal, the signed commitment by the airline to serve the airport

for at least a year ensuring continued service, and the ability for the arrangement to be adjusted to achieve a stable load factor goal. He also proposes a framework to assess the risk-sharing balance between the airport and airline in this type of arrangement, and he examines this type of arrangement using contract and principal agent theories. Hihara shows that if this type of arrangement is designed the right way, it can increase the effort levels and the benefits to both airline and airports. Moreover, it can ensure continued air service to low traffic density areas without requiring government subsidies.

EFFICIENCY, STRUCTURE AND PRICING OF AIRPORT SERVICES

While airports worldwide are becoming increasingly commercialized entities, and often various airport–airline arrangements exist, there are still parts of the world where airports are primarily government owned and where airport charges are closely regulated. In Chapter 7 of this volume, Gisle Solvoll and Terje Mathisen examine airport charges in Norway, where the state-owned company Avinor operates most of the airports. Using data on Avinor operated airports, they estimate the marginal cost for each passenger and air traffic movement, and examine the changes in charges that would occur if the current charges were changed to be based on marginal costs. They find that a switch to marginal cost pricing would result in lower charges per air traffic movement and higher charges per passenger in Norway. Moreover, they also find that revenues would be substantially reduced for Avinor. Solvoll and Mathisen extend their analysis to examine social welfare implications of using marginal cost pricing and making up revenue losses with general taxation. They find that there is a social welfare gain from marginal cost pricing when the costs of general taxation are zero, but there is a social welfare loss from marginal cost pricing when the costs of general taxation are 20%. The authors also demonstrate the changes in per passenger charges and air traffic movement charges that would occur if a Ramsey approach to pricing were used, where rural airports are charged higher fees than more heavily used airports. They note, however, that this type of approach would be difficult to implement in Norway, where the Ministry of Transport has directed that charges be the same for all airports. Solvoll and Mathisen provide an interesting analysis of airport charges that might be applied to airports elsewhere.

In the changing airport environment discussed earlier, an understanding of airport costs is crucial. As Anna Bottasso and Maurizio Conti (Chapter 8) point out, a wide range of policy and management issues require a detailed understanding of airport costs. For example, while new approaches to regulation such as “light-handed regulation” are being considered worldwide, the main rationale for regulation of airports is based on the idea that they are

natural monopolies – i.e., they meet the condition of cost subadditivity. Understanding airport costs are also crucial in regional decisions involving airport expansion or building new airports, and in decisions on creating specialized airports. In addition, whether airports are private or public, intelligent pricing decisions depend on an understanding of costs, as do decisions on mixing aeronautical with non-aeronautical services and international services with domestic services. However, as Bottasso and Conti point out, even though these and several other policy issues rely heavily on understanding cost structure, more attention in the literature has been devoted to efficiency determinants, using data envelopment analysis (DEA). They suggest that more research is needed that identifies cost structure using an econometric approach. In a comprehensive study, Bottasso and Conti examine the importance of carefully measuring inputs and outputs in estimating airport costs, and identify measures of multi-output scale and scope economies and their relationships and the methodological issues associated with trying to identify cost subadditivity. They also discuss the merits of using flexible functional forms, and review the empirical literature on airport costs. Bottasso and Conti's review yields several important findings, including: (1) a consensus on scale economies in airports does not exist, though a broader consensus might be reached by more studies using airport fixed effects and variable cost functions or input distance functions, (2) there is very little evidence on economies of scope for airports, (3) the translog cost function should be abandoned in favor of more flexible forms that allow the inclusion of zero outputs, and (4) given the increased commercialization of the industry, more attention needs to be given to the potential endogeneity of outputs. They also suggest that an area of future research (in addition to those above) may be to extend airport cost analysis to consider externalities. Bottasso and Conti's chapter is an important read for anyone considering an analysis of airport costs. Moreover, given the important unresolved issues they identify, and their important policy implications, there is much room for more research in this area in the future.

Accurately depicting airport cost structure is critical to understanding fee determination of airlines because of airlines' abilities or lack thereof to pass-on airport costs to passengers in the form of higher fares and fees. In Chapter 9, Terje A. Mathisen, Finn Jørgensen, Pål A. Pedersen, and Georgina Santos examine airline carriers' abilities to "pass-on" airport costs to passengers using an economic model of supply and passenger demand that allows for airport managerial objective heterogeneity and airline market (route) structure heterogeneity. Airport fees are determined given airport managerial objectives that include profit maximization, passenger welfare maximization, and management utility maximization. Airline pass-on rates influenced by airport fees are determined for monopolistic and duopoly airline market (route) structures. Within this theoretical framework, the authors observe a wide range of potential pass-on rates. The lowest rates arise for a monopoly airline market structure with a linear passenger demand function where 50% of the airport fees are passed on

to passengers, while the highest rates arise for a monopoly airline structure with a power demand function where over 100% of fees are passed on. These authors apply their model using information from small and mid-sized Norwegian airports, which allows for examining the influence of managerial objectives on passenger fares. Their findings show that airport fees can vary widely depending on the objectives of the airport authority, market structure, airline and airport costs, and demand. They conclude that the decision making process on airport fees should include consideration of passenger demand and airline market structure.

The preceding chapters note the significance of airport performance and pricing as determinants of passenger demand. Passenger demand for airport service, however, is not limited to these determinants as the theory of economic geography suggests that the physical landscape of a location promotes economic activity that can facilitate air transport demand. Within the economic geography literature, these natural resources are called “first nature causes” of regional economic activity. This literature observes that regional economic activity is also influenced by factors associated with human actions and economic incentives such as economies of scale and transport costs, known as “second nature causes” (Gonzalez-Val & Pueyo, 2010). In Chapter 10 in this volume, Tay Koo and Andreas Papatheodorou focus on the “second nature” component of geographical economics, which is identified as new geographical economics (NGE), to frame the airport policy debates on issues such as the decision to invest in an airport system that serves a region using a single hub or relying on several airports. The analysis of this chapter is rich with examples revealing the benefits of using NGE to help guide the policy discussion on airport development and provides a path toward future research opportunities for deriving empirically testable hypothesis on airport operations.

AIRPORT EFFECTS ON LOCAL AND REGIONAL ECONOMIES

While regional and local amenities affect airport operations, these amenities on airport operations, these amenities are not exogenous since airports also influence a locality’s amenities by promoting local and regional economic development (Kasarda & Appold, 2014). In Chapter 11, Marquise McGraw contributes to the literature on airport influence on local economies by examining the role of airports as sources of employment and population growth. His approach provides a more precise analysis of airports’ local economic effects by considering the possibility of airport economic impact heterogeneity. His chapter’s research design includes analysis spanning the 110 years recent history of aviation in the United States, starting in 1900. He applies a synthetic control empirical approach to compare employment and population growth across

localities. The benefit derived from using this empirical methodology, in part, is it allows examination of airports' heterogeneous influences on local labor markets. His findings suggest that when controlling for airport heterogeneity, airport operations contribute to local employment and population growth ranging from 0.2 to 0.6 percent annually. In addition, he finds airports benefit cities more when they are in close proximity to major research universities, are near state capitals, and when they are located in temperate areas. In contrast, his findings did not reveal appreciable differences in impacts across regions or by type of airport governance. He interprets these results to suggest that while investment in airport infrastructure can promote local employment growth, the full benefits may not be realized without robust amounts of human capital developed by universities or in other ways to enhance the economic impact of airport infrastructure investment.

In addition to benefitting local economic development by promoting employment growth, airport operations can also contribute to the development of local economies by increasing the value of commercial property. In Chapter 12, Mike Brown and Jeffrey Cohen examine commercial property values located near Canada's two largest international airports at Toronto, Ontario, and Vancouver, BC. As noted in previous chapters, international air transport plays a vital role in the competitiveness of businesses in a globalized economy. Gains from the degree of connectivity an airport experiences, coupled with local business proximity to these airports, are reflected not only in local business performance but also in property values. The authors of this chapter empirically test this hypothesis and introduce a broader classification of aviation-dependent property to include hotels and corporate headquarters as examples commercial property that might be value-sensitive to location near airports. Their findings reveal the enhancement of commercial property value attributable to proximity to these international airports varies according to land use, with the greatest effects on commercial property occupied by aviation-dependent occupants. The authors note, though, that the description of such business should be broadened to include "non-aviation" related property that benefits from airport operations, even though their business is not directly related to aviation operations. The authors interpret these findings to suggest that regional competitiveness can be enhanced by accommodating "aviation-dependent" business to locate near airports even if their core business is not classified as "aviation-related" in the traditional use of this term.

AIRPORT OPERATIONS AND AIRPORT CONNECTIVITY

Chapters in the preceding three sections of this volume explore the changing nature of airports, examine efficiency and pricing issues, and reveal the significance of airports as determinants of local and regional economic development.

Complementing the work presented in these chapters, other research emphasizes the importance of airline connectivity in taking full advantage of the economic benefits of efficient and affordable airport services (Arvis & Shepherd, 2011; Morphet & Bottini, 2014).² The three remaining chapters examine different aspects of airport operations and airline connectivity in contributing to a complete analysis of the economic role of airports in the aviation industry.

In Chapter 13, Xavier Fageda and Ricardo Flores-Fillol examine the relationship between an airline's network structure and airport congestion by focusing on the relative advantages and disadvantages of hub and spoke networks and point-to-point services and by analyzing the effectiveness of slot-constraint regimes. The authors' theoretical framework allows for the comparison of two symmetric networks. Within this theoretical framework, the authors provide conditions in which congestion would be more profitable for either network, highlighting the importance of including empirical analysis to examine the issue of airport heterogeneity with regards to congestion. Their empirical findings show some evidence suggesting air carriers using a hub and spoke network are less reactive to delays compared to air carriers using fully connected configurations. They also find that airline companies operating in slot-constrained airports seem to react to higher levels of congestion by using larger aircraft at lower frequencies. Based on these findings policy recommendations are provided suggesting that slot constraints or other policies promoting direct connections at non-hub airports may present the appropriate incentive for airline companies in reducing airport traffic congestion.

Including secondary airports as part of an air carrier's network presents an additional option for addressing airport congestion. Widespread use of these airports grew with the stepped-up entry of low cost carriers (LCCs) following airline service liberalization policies in the late 1970s. In Chapter 14, Paolo Beria, Antonio Laurino, and Maria Nadia Postorino present a detailed analysis of improved accessibility and connectivity levels attributable to the use of secondary airports by LCCs. Their analysis includes a categorization of LCC – airport relationships into three themes: the LCC's relation with secondary and primary regional airports, the balance of power between LCCs and dominated and non-dominated airports, and LCC's relationship with airports that may or may not serve as the main base of the carrier. The framework for their analysis is based on a dynamic model of annual passengers carried at an airport and the geographic proximity to surrounding airports. Applying their model to 16 representative EU airports over a 10-year time span, the authors conclude that the relationship between LCCs and airports depend heavily on the role of the airport in its catchment area. Their concluding comments include the observation that the sole presence of LCC does not guarantee growing passenger demand, despite the opportunity of passengers to receive low fares. In addition, airports sharing catchment areas with other airports place themselves at risk, due to the mobility of LCCs, even if the area served by the airport experiences growth and provides access to a large pool of potential passengers. Such information

provides valuable insights for airports negotiating the terms for a profitable relationship with LCCs.

Chapter 15 of this volume continues the analysis of connectivity by observing the increasingly important role of Gulf carriers and their airport connections in other regions. Pere Suau-Sanchez, Augusto Voltes-Dorta, and Héctor Rodríguez-Déniz identify these carriers as super connectors because they have developed a network that provides passengers with greater travel options, and lower fares compared to incumbent carriers. The authors observe that where the real airport competition occurs in connecting traffic, the Middle Eastern hubs, such as Dubai, Doha, and Abu Dhabi, and Istanbul have gained market share at the expense of European hubs. They suggest that one reason European hubs may be losing connecting shares in long-haul markets is due to capacity and noise related operational restrictions, and the need to open secondary hubs. However, Suau-Sanchez et al., also find that despite the fact that Middle East hubs are leaders in connectivity in quantitative terms, they lag behind in terms of connecting times and geographical efficiency. They suggest that European and Asian hubs should capitalize on their strengths in terms of the passenger experience in marketing their services. The authors also identify a potential opportunity for airline hubs – the idea of “self-connectivity,” where flight transfers are booked by passengers when the flights are not coordinated by the airlines. Although this is often thought of in the context of connecting short-haul flights between LCCs, the authors note that self-connections are supported by London Gatwick and Milano Malpessa airports. In using a unique data set that combines supply data (airline schedules and seat capacity) with demand data (actual passengers making connections) they find significant potential for self-connectivity at major hubs throughout the world. They suggest that this may be an important revenue generator in the future. In addition to their in-depth exploration of hub competition and connectivity, an important contribution by the authors of this chapter is in providing detailed measures of the quantity and quality of connectivity and potential connectivity. These important measures are likely to play an important role in future analyses of airport competition. Moreover, the airline connectivity findings unveil a new dimension of aviation competition, which enhances consumer (passenger) welfare.

SUMMARY AND CONCLUDING OBSERVATIONS

While airports have traditionally been thought of as natural monopoly type, government run entities, the chapters in this book demonstrate the changing nature of airports and the wide variety of airport issues that have important implications for the economic futures of regions, nations, and the world. The chapters of this book examine four important areas of airport issues in this new

environment. The first set explores how the role of government might change when airports are increasingly run like for-profit businesses. Questions addressed in the first set of chapters include: (1) “are there alternative forms of regulation that might allow airports to perform better in the newly dynamic environment?” (2) “does the increased reliance on non-aeronautical revenues by airports suggest that airport price regulation should change?” (3) “can airport privatization increase efficiency, and does it matter how privatization occurs?” and (4) “are there commercial relationships between airlines and airports that may be beneficial for consumers?” The second set of chapters examines pricing, cost, and efficiency issues of airports. Questions addressed in this second set include: (1) “when airports are regulated, what is the best way to set prices?” (2) “what does airport cost structure suggest about appropriate airport pricing decisions, airport expansion decisions, decisions regarding the appropriate mix of services, and other decisions?” (3) “what portion of airport charges are passed on to passengers and how should it affect airport fees?” and (4) “is there an alternative way to understand the spatial effects of airport investment and policy?” The third set of chapters examines the effects of airports on regional economies, addressing two questions: (1) “what impacts do airports have on regional employment and population?” and (2) “how are commercially property values affected by proximity to an airport?” Finally, the last set of chapters addresses airport operations and airport connectivity. The chapters address the questions of: (1) “how do different types of air carriers react to delays, and what are the implications for dealing with congestion?” (2) “how has accessibility of local economies to other markets been enhanced by relationships between low cost carriers and their airports?” and “how is airport connectivity measured, and what does it suggest about the competitiveness of hubs worldwide?”

The chapters in this volume explore these questions in detail using state of the art economic theory and empirical methods. They provide significant insight into the state of the airport industry, its changes, and future areas of research. The volume is sure to provide researchers and those interested in the industry with new insights into airport issues, a better understanding of the state of knowledge regarding airport issues, and new techniques and ideas for further examination of airport issues.

NOTES

1. Airports Council International, *2015 ACI-NA Concessions Benchmarking Survey – Summary Results*, April 2016.

2. Morphet and Bottini (2014) define connectivity as an overall measure of the level of service—frequency of flights, reliability, and diversity of destinations—available to end users.

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