

Chapter 1

Introduction and Overview

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The growth of air transport during the last decades indicates that this industry plays a key role for regional economies and the integration of the world economy as a whole. However, this development poses a great challenge to airlines, airports, regulators, and politicians. A particular problem is that demand growth for air transport services does not go along with a respective growth of airport capacity. For that reason many airports all around the world are short of capacity in relation to demand.

There are different ways to deal with limited airport capacity or, respectively, excess demand. One possibility is to allocate capacity on a first-come-first-serve basis with airlines queuing for runway access. Most airports' capacity in the US is allocated by first-come-first-serve which has its advantages, since it requires a minimum degree of regulatory intervention saving public resources. Furthermore, airlines are not discriminated by other criteria than by time of arrival. Consequently, competition between incumbent and newcomer airlines is possible. However, the airline's decision on airport usage does not take into account the additional queuing times imposed to other airlines. An excessive use of airports leading to serious congestion problems is often the consequence.

Congestion and congestion costs can be managed by different measures to reduce demand. In principle, these measures can be of two types: quantitative restrictions, such as the airport slot system, or pricing. Pricing systems involve setting prices at levels which adjust likely demand according to the airport's capacity. An important difference between these two approaches is that with set prices, the allocation of airport capacity is always based on the willingness to pay of airlines. In contrast, when quantitative restrictions are used, some methods of allocation must be employed. These methods can be based on willingness to pay but in practice they are usually not.

The International Air Transport Association (IATA) is the trade association of international airlines. Around the world, the resolution of the excess demand problem is generally based on the use of the IATA slot system, with administrative allocation of the available slots. The most important principle is the 'grandfather'-principle which allocates airport capacity by historical use. Airlines are granted to use runways at specified times in the future which they already have used in the (recent) past. In other words airlines continuously retain the possibility to use a specific airport at a specified time, which is called a slot. Other administrative

procedures applied in the air transport industry include lotteries which allocate runway capacity by chance or allocation by market share. The latter is often employed in order to stimulate competition between airlines by providing new entrants with a preferred status compared to incumbents.

It follows that the current system for the allocation of airport capacity strongly relies on administrative rules, which are frequently criticized by economists. Alternatively the move to more market oriented instruments is recommended in order to force an allocation relying on the airlines' willingness to pay. Why though do economists consider the willingness to pay to be a critical measure on which slot allocation should be primarily based on?

The answer is: the airline's willingness to pay for a slot is taken to be a valid indicator of the contribution from using the slot to social welfare. In other words, allocation of slots to an airline with a high willingness to pay for airport capacity is normally considered to generate the largest benefits to society. If that is true then allocation of airport resources on the basis of the airlines' willingness to pay would automatically allocate airport capacity to those airlines that make the best use of it from a welfare perspective.

The task of his book is to address the most relevant topics which need to be considered and analyzed in order to achieve an 'ideal' system of allocating airport capacity. For the reasons mentioned in the previous paragraph, the focus is often on market oriented instruments that allocate airport capacity according to the airlines' willingness to pay as basic elements for a new allocation system. Some of the key questions addressed in this book are summarized in the following.

An important issue addressed in this book is the comparative analysis of different systems used across the world for the allocation of scarce airport capacity. These include systems of airport slots as applied, for instance, in the EU and the first-come-first-serve approach which is common practice in the US. Another issue is the design of airport slot systems: could allocation of airport capacity be enhanced by trading and auctions? Is it possible to design an efficient auction mechanism which addresses the specific requirements of the airline industry? Furthermore, a fundamental element of airport slot systems is the determination of slot limits. This, however, is a complex problem which requires balancing the individual airline's needs and the effects additional use of airport capacity has on all other airlines and passengers due to congestion.

An alternative option to allocate airport capacity is the use of posted prices that adequately mirror scarcity. In spite of their potential advantages, such prices are very rarely used to ration scarce airport capacity. What are the economic effects and difficulties from moving to a greater reliance of posted prices instead of slot systems or a first-come-first-serve approach? Furthermore, airports are usually considered to have market power and, thus they face economic regulation. In this case, what are the implications of the economic airport regulation on capacity allocation? Instead of dealing with scarce airport resources one could also consider investments into new airport capacity as possible means to address congestion problems. The challenges here are to identify the optimal extent of airport investments and to build an environment that is in support to necessary

and useful airport investments. Finally, lessons are drawn from current experiences and theoretical as well as empirical analysis for future reforms.

The book consists of six parts.

Part A, ‘The Current Slot Allocation System’ focuses on describing how the slot system works. The contribution by *Ulrich* includes a detailed description of the current systems to allocate runway slots among airlines. It is written from the perspective of an airport coordinator and depicts the different milestones that are passed until the final allocations of airport slots are reached. The contribution by *Menaz and Matthews* provides an overview of the different economic perspectives on airport slot allocation. It also includes an assessment of the current European system in allocating slots and examines various other types of allocation methods. In particular, the relative merits of pricing, auctioning, secondary trading and administrative arrangements are considered. Furthermore, the authors draw on their knowledge of the literature and experience of the allocation of scarce capacity within the rail sector. Contribution three is a primer on airport slots by *Gillen*. The purpose of this paper is to provide an introduction to and basic functioning of airport slots; what they are – definitions, how they are allocated and the various types of slot transactions. A brief description of the major factors that have contributed to the status quo of slot allocation is also presented. Furthermore, a comparison between the US and EU markets as well as differences that exist within the EU, such as between the UK and the rest of EU, is provided.

Part B, ‘Congestion, Slots, and Prices’ pays particular attention to the problem that the slot system seeks to address, namely that of reducing congestion. The first contribution is on slot constraints which are imposed at many busy airports to curb demand for airport capacity thereby reducing congestion costs. However, while much attention is given to the problem of slot allocation, little attention is paid to ensuring that slot capacities are set efficiently. In view of this *Forsyth and Niemeier* present a theory of how slot capacities can be set optimally. Furthermore, a test of whether slot capacities/congestion levels are set optimally at several airports is developed and applied to US and European airports. This shows that authorities on the two continents appear to make very different choices between slot availability and delays. The third contribution, by *Janic*, investigates the potential to model the effects of charging airport congestion fees to airlines. The author develops a model capable of estimating congestion as a matter of charging for it. Moreover, the model can be used to estimate the feasibility of additional aircraft/flight operation pricing conditions under congestion. The former two papers considered slot constraints or congestion pricing exclusively. The contribution by *Czerny* compares slot constraints and congestion pricing under uncertainty. In principal, both instruments can lead to the same efficient allocation of scarce airport capacity. However, the author demonstrates that uncertainty about demand and congestion costs has a significant impact on the welfare performance of the two different regulation instruments. Furthermore, it is argued that the network character of the air transport industry tends to favour slot constraints while a possible negative correlation between demand and

congestion costs favours the use of congestion pricing. The choice of regulation instruments is, therefore, not straightforward. Alternative measures especially designed to deal with demand uncertainty are also presented. The subsequent contribution by *Forsyth and Niemeier* focuses on the role of slots in reconciling price regulation, as often implemented, with the efficient allocation of the airport's capacity. It outlines the characteristics of efficient price structures and explores the question of how regulation can set up incentives airports to choose either efficient or inefficient price structures. It also provides empirical evidence on price structures and regulation, showing that the actual price structures of most busy airports induce an inefficient allocation of slots.

Part C, 'Airline Strategies and Competition' investigates how airlines act in a slot constrained environment. The contribution by *Bauer* explores the slot usage behaviour of airlines. It discusses the four commonly alleged malpractices: overbidding, late-handback, seasonality and no-shows. Moreover, it shows that alleged malpractices often arise from operational necessities forcing airlines to use the flexibilities that the current slot regime offers in order to operate profitably. The contribution by *Gillen and Morrison* provides a theoretical approach to framing the competition issues arising from airport slots from an economic perspective. An international survey of how competition issues have been addressed by regulatory authorities is also presented. The authors conclude that the provisions in competition law dealing with the abuse of dominant position, and merger guidelines to protect against the anti-competitive effects of slot concentration appear adequate to protect competition.

A number of the world's major airports have a high proportion of their capacity utilized by a single airline, or alliance of airlines. In the third contribution to this chapter, *Starkie* discusses the tension between the advantages and disadvantages of slot concentration. The analysis incorporates recent developments in the theory of congestion pricing that, it is suggested, have an important bearing on the balance of the argument. It is also argued that higher fares at slot constrained airports do not constitute a prima facie case for abuse of market power. A part from the exploitation of a dominant position, a number of other possible reasons, which may lead to higher air ticket prices at major hubs, may in fact exist. Contribution four by *Gillen and Tudor* presents an event study methodology to assess the effect of monetary slot transactions on investors' reactions. In general, the authors find that slot transactions involving monetary compensation do not have much impact on stock prices. However, they conclude that this does not necessarily indicate efficiency of current slot allocation systems and that new industry developments could be steered in the wrong direction should loyalty to the current system be left intact. *Spitz* analyzes the value airlines put on flights at congested airports. His contribution contains a discussion of factors affecting conventional slot valuations, provides an economic analysis of how slot controls may affect carrier profitability, and presents estimates of valuations from recent sales and valuation studies. It also presents a new method to value flights that is based on network opportunity costs. Additionally, the results from applying this method at LaGuardia Airport in New York are compared to conventional slot valuations.

Part D, 'International Experiences' concentrates on the regulatory environment in the EU and the US. The first contribution by *Kilian* assesses the legal aspects of slot trading by outlining the regulatory regime the EU introduced in 1993. The paper also turns to the challenges EU policymakers have faced since and addresses the ongoing reform discussion and the legal problems a market based approach to slot allocation could create. It demonstrates that from a legal point of view, many questions remain open. Contribution two by *Kasper* analyzes the current as well as the potential future role of secondary markets for the allocation of take-off and landing slots at US airports. As measures to reduce airport delays, increases in available airport capacity and the use of market based demand management systems are suggested. Three alternative options are analyzed in more detail: congestion based landing fees, auctions, and secondary slot markets. It is suggested that the most effective measure for the allocation of scarce runway capacity would be the extended use of secondary slot markets which allows airlines to trade slots permanently.

Part E, 'Auctions and Alternatives' analyzes allocation regimes not or only rarely used in practice. In the first contribution by *Button* the potential benefits of auctions and the experiences with auctions in other industries are evaluated. Moreover, it provides a comparative analysis of slot auctions and alternative allocative mechanisms, such as modifications of administrative rules, capacity expansion, congestion charging, and secondary markets. The potential forms of slot auctions are also explored. Different topics regarding the design of a slot auction are discussed in more detail including the 'ownership' of slots, interdependence of slot values, frequency of slot auctions, design of slots, duration of the slot auctioning process, and the coordination with terminal and stand capacity. The second contribution by *v.d. Steinen* explores the issues of slot ownership and disposition rights. It is proposed to change the legal status of slots from that of public entitlements to private leases. To accomplish change and transition the introduction of a fee for making or holding a reservation of runway capacity reflecting its cost and value of operating time is suggested.

Part F 'Reforming the slots system' provides lessons that can be drawn from current experiences or from theoretical as well as empirical analysis regarding changes of regulation regimes. The first contribution by *Button* focuses on how airport take-off and landing slot allocation procedures have implications affecting the levels and the distributions of economic rents. The actors in the game are the airlines, airports and politicians (including the executive as well as legislators). It shows that the ultimate distribution of economic rents is essentially a political decision, as is any form of allocation, but that the form of specific procedures influences the nature of the benefits created and who enjoys them. Contribution two by *Sørensen* describes the legislative process concerning slot allocation and on air transport in general since 1977 and until 2001 in the EU. It provides a detailed picture of the development of legislation in this area and defines the key issues that influenced the way the legislation was developed and adopted in Europe. The discussion also includes possible ways of reforming the existing system. The final paper by *Forsyth* rounds off the discussion of the book, and comments on issues not covered in earlier papers. It begins by identifying a range of efficiency problems

which need to be resolved in the context of busy airports, and follows this by making an assessment of how well current slots systems handle these. Then some of the choices between options are reviewed: a slot system versus the US delay system, slots versus prices, and alternative ways of improving slot allocation. The slot system has significant implications for the ways in which airline and airport markets work, and these are sketched out in a section on the political economy of slots. In the final sections some unresolved issues, worthy of further study, are identified, and some key policy conclusions are outlined.