Market versus state in building the aviation value chain

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Abstract:
The aim of this paper is to analyze the liberalization of the aviation value chain and the remaining role of government policy. In particular, the role of sector-specific regulation of monopolistic bottleneck components of the air traffic value chain is analyzed. For competition on air transport markets and ground handling services to operate efficiently, non-discriminatory access to complementary monopolistic airport infrastructures must be guaranteed. In particular, the evolution of market driven slot allocation and the role of airport regulation is analyzed. Finally, the issue of airport subsidies is taken into consideration.

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1 Introduction

Institutional reform regarding the division of labor between the market and the state within the aviation value chain is an ongoing process worldwide. In the meantime the liberalization of markets for airline services has not only been established in EU member countries, but has also gained momentum worldwide. Nevertheless, this process towards competitive airline markets has been a time-consuming and path-dependent undertaking and, from the perspective of worldwide air transport, is not finished yet. After the complete opening of airline markets (including the abolishment of all remaining institutional barriers, such as the prohibition of cabotage) technical safety regulations and environmental regulations for aircraft and the application of consumer protection rules still remain necessary. Moreover, coordinated strategies like airport alliances or codesharing are characteristics of competitive airline markets and are subject to the evaluation of competition policy.

As the goal of liberalizing the markets for airline services comes closer to being achieved, the focus of government regulation shifts to the problems of infrastructure management and access to network infrastructure, and in particular to the future role of sector-specific regulation of the remaining network-specific market power. Non-discriminatory access to air traffic control activities as well as to monopolistic airport infrastructures for all active and potential providers of airline services is required to guarantee competition on the markets for airline services. The possible role of competitive bidding for air traffic control activities is considered under the precondition of technical regulations, such as the definition and enforcement of boundaries of air traffic control areas. Moreover, competition on the markets for ground handling services requires non-discriminatory access to complementary infrastructure facilities (“centralized infrastructure”). In order to avoid excessive levels of access charges, regulation on the monopolistic markets for airport slots is required. However, market driven slot allocation should not be hampered by regulatory micromanagement.

The paper is organized as follows: Section 2 starts with the characterization of the worldwide process of opening of airline markets. By means of application of
the disaggregated regulatory approach the competitive subparts of the aviation value chain can be localized and separated from the subparts characterized as monopolistic bottlenecks. In section 3 the institutional division of labor between sector-specific market power regulation and general competition policy is considered. In particular, the evolution of market driven slot allocation and the role of airport regulation are analyzed. Finally, the issue of airport subsidies is taken into consideration.

2 Liberalization of the aviation value chain and the remaining network-specific market power

In the following the aviation value chain is analyzed from the perspective of the layering scheme of network economics. In order to conduct a thorough analysis of competition potential and remaining regulatory necessities, it is important to differentiate between transportation services provided by airlines and ground handling service providers (level 1), air traffic control systems (level 2), and airport infrastructure (level 3).1

2.1 The gradual process of market opening for airline services

The process of market opening in the European Community has been implemented gradually between 1987 and the “third air transport package” in 1992.2 Since 1992 free market entry for European air carriers to intra-European air routes and free price setting has been the leading paradigm. Unlimited cabotage traffic rights granting to Community air carriers the unlimited right to operate

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1 A more general layering scheme for network industries is developed in Knieps (2006, p. 11).

within the domestic borders of another EC country were guaranteed from April 1997 onwards.³

In 2008 a Regulation was passed integrating the regulations of the “third air transport package”⁴. An airline company that has obtained an operating license from a Member State (in accordance with technical and financial conditions) is considered to be a Community air carrier and has the right to provide airline services throughout the European Union, not only between all the Member States, but also within each Member State, such that in the European Union member states all countries grant cabotage rights to each other.⁵

In the meantime, international aviation relations with third (non-EU) countries with the goal of opening access to cross-border markets (“open skies” agreements) became widespread. “From 1992 to October 2012, more than 400 open skies agreements had been concluded involving 145 States, representing 76 per cent of the ICAO membership, … Nevertheless, granting of cabotage rights … is still the exception, registered only within the European Union (EU) and by a few other States in other regions of the world” (ICAO, 2013a, p. 1).

A controversial issue for the EU and its member states was the question whether after the completion of the EU internal airline market the authority to bargain with third countries would remain with the individual member states and to what extent the EU would have the authority to negotiate “open skies” agreements with non-EU countries resulting in binding contracts for the whole EU area. The starting point was the infringement proceedings in 1998 of the Commission against seven Member States regarding bilateral “open skies” agreements with the United States. “Nationality clauses” in bilateral agreements which reserved rights for a country’s own airlines were considered to be illegal, due to the EU “open skies” regulations which forbid discrimination between home airlines and

³ EEC No. 2408/92, Article 3.
⁵ Regulation (EC) No 1008/2008, Article 4 and Article 15.
airlines from other EU countries and thereby also forbid discrimination between any EU carriers (community air carriers) flying from their home country to a third country. In particular, the Court of Justice of the European communities concluded in 2002 that the freedom of establishment\(^6\) guaranteed by the Treaty was in conflict with asymmetric treatment of home airlines and airlines from other EU countries and moreover that bilateral agreements including a “nationality clause” would affect the common rules the EU had included in its internal legislative rulings.\(^7\) In 2004 a Regulation was passed requiring that all existing bilateral agreements between Member States and third countries that contain provisions contrary to Community law should be adapted to become fully compatible with Community law. Standard clauses developed jointly between the Member States and the Commission enable easier implementation.\(^8\)

During the last decade the Commission has taken an increasing role in the process of bargaining of “open skies” agreements with third countries. In June 2003 the Council authorized the Commission to negotiate a global “open skies” agreement with the United States which has been applied since 2007.\(^9\) The Commission was also given other negotiating mandates regarding “open skies” agreements with the objective of forming global agreements with other regions of the world. Moreover, efforts are being made aiming at the creation of a Common Aviation Area with neighboring countries (Commission of the European Communities, 2005; European Commission, 2012).

\(^6\) EU air carriers are permitted to create an establishment in any EU Member State without national ownership and control restrictions and can be owned by any EU interest (European Commission, 2012, p. 11).

\(^7\) In eight separate cases initiated on December 18, 1998 the Commission brought actions before the Court of Justice against the United Kingdom, Denmark, Sweden, Finland, Belgium, Luxembourg, Austria and Germany (Cases C-466/98, C-467/98, C-468/98, C-469/98, C-471/98, C-475/98, C-475/98, C-476/98). Joined opinion of Mr Advocate General Tizzano was delivered on 31 January 2002, European Court reports 2002, p. I-09427. Judgment of the Court of all cases of 5 November 2002.


2.2 The theory of monopolistic bottlenecks

In the following the theory of monopolistic bottlenecks is applied in order to localize those elements of a liberalized aviation value chain where neither active nor potential competition can fulfill the function of disciplining the active supplier. The theory of monopolistic bottlenecks is central to the disaggregated regulatory approach in terms of localizing network-specific market power in connection with the effort of determining the minimum basis for regulation (Knieps, 1997, p. 327; Knieps, 2011, p. 18). The aim is to come up with a coherent economic framework consistent with network economics which can be applied to all network sectors and which provides justification for ex ante regulatory measures. For the competitive parts of the aviation value chain application of the general competition law is sufficient. The conditions governing a monopolistic bottleneck are met when:

1. The facility is necessary for reaching customers, i.e. if there is only one active provider available. This is the case when a natural monopoly exists in the relevant range of demand and a single provider is able to provide the facility more cheaply than several providers.

2. At the same time the facility cannot reasonably be duplicated as a way of disciplining the active provider, in other words when there is no potential substitute. This is the case when the costs of the facility are irreversible.

Consequently, network-specific market power is only to be expected in those subparts of a value chain of a network industry that are characterized by a natural monopoly and irreversible costs. Although irreversible costs are no longer relevant for decision-making by established enterprises, as far as potential competitors are concerned irreversible costs are a crucial factor, insofar as they must decide whether to invest such irreversible costs or not. Established firms therefore have lower decision-relevant costs than their potential rivals. This means that there is room for strategic maneuvering, with the result that inefficient production or economic profits no longer necessarily enable newcomers to enter the market. The market power of the firm that owns such a monopolistic bottleneck is therefore stable, even if all market players are fully informed, all users are
prepared to switch to another provider, and small price adjustments have an effect on demand.

In the absence of irreversible costs, however, and as a result of the disciplinary effect of potential competition, incumbent carriers do not possess stable market power, regardless of the size of the relevant network operator’s market share. Inefficient providers will be replaced by a new entrant due to the pressure of potential competition. In this case there is no need for regulation to limit the active operator’s control over the market.

2.3 Competition potential on the markets for airline services (level 1)

As long as airlines have non-discriminatory access to complementary infrastructures, providing symmetrical access conditions for all active and potential services providers, the markets for airline services are competitive.\textsuperscript{10} Liberalized airline markets (including required inputs from the aviation value chain like the manufacturing of aircraft, maintenance, repair and overhaul activities of aircraft or fuel supply) do not possess the characteristics of a monopolistic bottleneck and consequently no network-specific market power exists. Even if airline services in some regions were provided in the form of a network characterized as a natural monopoly (due to their associated bundling effects) this would not imply that there was network-specific market power. High profits recorded by one airline company would have the immediate effect of attracting entrants. There is no danger of preventing competitors from entering the market as long as the decision-relevant costs for transport services are similar for established undertakings and for potential rivals. Since irreversible costs associated with providing airline services on an airline network play no significant role, the use of aircraft is not

\textsuperscript{10} The legal concept of absence of discrimination does not conflict with economically desirable price differentiation (traditionally also called “price discrimination”) as long as these tariffs are offered to all active and potential market participants. For the welfare improving effects of (optional) non-linear pricing structures see Willig (1978). Price differentiation should be allowed not only for airlines but also for airports, because there is heterogeneous demand for non-storable capacities and fixed costs are relevant, so that marginal cost pricing does not allow cost-covering.
confined to certain lines; they are just as mobile geographically as trains or lorries. Whereas the theory of contestable markets examines the role of potential competition with identical cost functions for both active providers and potential rivals (Baumol, 1982; Panzar, Willig, 1977), effective competition on the markets for airline services does not only mean potential competition. There are many facets of competition on the markets for airline services after all legal entry barriers are abolished. Active and potential competition exists on the airline markets. Often a newcomer enters the market with no intention of duplicating the established undertaking. What is also important is active competition achieved by means of technological and product differentiation, and the introduction of new products and processes. As a direct consequence of this, it is misleading to assume that newcomers have as their reference point the belief that ideally there can only be one transport network on the markets for transport services.

Indeed, one of the important features of the ability of competition to operate in free markets for airline services is that corporate strategies such as product and price differentiation, the build-up of goodwill and the development of an efficient distribution network, etc., can also be used for strategic purposes. Information problems (search costs, asymmetric information, etc.) can also play a role. This should not lead to the conclusion, however, that competition does not work in airline markets. As on any other markets which are basically constrained by active and/or potential competition, the burden of proof as to the existence of market power and as to whether such power is abused rests with the competition authorities. In contrast to general ex ante regulation, application of general competition law should be carried out only on a case-by-case and ex post basis.

Competition on international airline markets has created incentives for building strategic alliances in order to exhaust economies of scale and scope and to reflect consumer demands for global airline service networks. Three major airline alliances, Star Alliance, SkyTeam and Oneworld, are now achieving more than 60 per cent of global market share (measured in available seat-kilometers for total scheduled passengers). Thus competition is not only between individual
airlines but increasingly between airline alliances (ICAO, 2013b, p. 1). Since strategic alliance and code sharing are important efficiency improving competitive strategies in liberalized airline markets, the evolution of global airline alliances and joint ventures should not be prohibited per se by active competition policy measures. However, application of general competition law should be carried out on a case-by-case and ex post basis, if alliances result in anti-competitive behavior of collusion or price-fixing between airlines. Nevertheless, there is an ongoing debate on the international coordination of antitrust immunity policies for airline alliances (ICAO, 2013e).

2.4 Competition potential for air traffic control systems (level 2)

Air traffic control systems not only are tasked to guarantee traffic safety, but are also responsible for efficient allocation of airspace capacity. Although airport owners, airlines and air traffic control agencies can only jointly guarantee well-functioning air traffic, they are organizationally and institutionally separated. In Europe, the allocation of airspace is in the competence of the individual countries. Eurocontrol has no final authority, its board, the permanent commission, is composed of the transport ministers of the member countries. National boundaries and the objective of retaining the sovereignty of the individual countries have led to arbitrary inefficient horizontal divisions in the past and subsequent cost of delays.\textsuperscript{11} In the meantime, an intense reform process initiated by the European Commission in order to establish a single European upper airspace by merging the current national regions has been initiated.\textsuperscript{12} The move towards an EU infrastructure policy with the aim of developing trans-European networks –

\textsuperscript{11} Since neighboring air traffic control areas are providing complementary services, economies of scale in extending the geographical size of the areas seem plausible.

and the intended extension of the single European sky to countries which are not members of the European Union\textsuperscript{13} – automatically requires that interoperability shall be promoted between the individual state networks. There is a great need for coordination, particularly with regard to traffic control and monitoring systems.

Air traffic control systems do not constitute monopolistic bottlenecks due to the absence of significant irreversible costs. In particular, the computer software and know-how needed to develop air traffic control systems are not tied to any particular place. However, technical regulation by public authority is required, defining and enforcing control responsibility for traffic monitoring for exactly one provider within well-defined geographical limits for a set period of time. Clearly, active competition between different providers of traffic control systems within a control area cannot work. An individual airplane can only be monitored by one institution at a time if accidents are to be avoided. Responsibility for traffic monitoring must remain in the hands of a single provider for a set period of time. Competition via auctioning of traffic control systems may evolve. The subject of such an auction mechanism could be the predefined geographical traffic control area for a set period of time (Knieps, 2006, pp. 15 f.).

Since the number of active firms providing air traffic control services within a control jurisdiction by its very nature can only be one, a market structure similar to a natural monopoly situation arises, where the active provider has no active competitor.\textsuperscript{14} The question arises as to whether there could nevertheless be a competitive bidding process where the contract would be awarded to the bidder able to offer the traffic control service at the lowest prices, while at the same time covering the costs involved. Due to the absence of irreversible costs, competitive bidding to find the most efficient traffic control agency for a well-


\textsuperscript{14} The question whether air traffic control within a well defined control jurisdiction can be characterized as a natural monopoly, meaning that the cost function is subadditive – so that a single provider can produce at lower costs than several providers – is pointless, due to the necessary technical regulation of a single control competency within one control area.
defined control area can be expected to work.\textsuperscript{15} If bidding took place to serve larger cross-border areas well defined and enforced by the public authorities involved, the provider with the most innovative software and control system might also be successful in providing traffic control services in other countries.

2.5 Monopolistic bottlenecks in the markets for airport capacities (level 3)

Airports are multiproduct enterprises. Take-off and landing slots are required such that airlines can guarantee a specific flight schedule. Moreover, additional aviation infrastructure (e.g. baggage sorting, fuel-distribution systems) is necessary for the supply of complementary ground handling services (e.g. passenger handling, baggage handling, ramp handling, and aircraft maintenance). In contrast, non-aviation infrastructures (parking areas, restaurants, shopping areas) are provided for non-aviation services.

For the case that two or more airports exist in the relevant range of demand (e.g. London) competitive airports do not create regulatory problems of network-specific market power. As long as only one airport exists to provide airport capacities in the relevant range of demand, airports possess the characteristics of a monopolistic bottleneck as providers of aviation infrastructure required for take-off and landing slots and ground handling services. This is already the case, if only for a subset of airlines for whom access to slots during a specific time interval is essential for providing scheduled flights. In order to guarantee a safe and efficient flight service, non-discriminatory access to ground handling infrastructure is essential, providing symmetrical access conditions for all active and potential services providers. Although non-aviation infrastructures can enjoy location rents, they nevertheless do not fulfill the characteristics of network-

\textsuperscript{15} That competition can still function in the form of a bidding procedure, if the market is served by only one active firm, is shown in Demsetz (1968). The lack of competition between active firms can be substituted by potential competition, even if production in a market is in the hands of only one firm. Asymmetries among bidders due to irreversible costs, however, disturb the bidding process (Williamson, 1976).
specific market power, because non-aviation facilities are not essential for providing airline services.

2.6 Competition potential in the markets for ground handling services (level 1)

Ground handling services do not fulfill the characteristics of a monopolistic bottleneck production structure. After liberalization potential competition is possible due to the absence of irreversible costs, but also active competition between different providers for each category of ground handling services seems possible. The markets for ground handling services on European airports (above a minimum size) were (partially) opened for competition in 1996 by Council Directive 96/67/EC. Entry by third parties into four categories of ground handling services consisting of baggage handling, ramp handling, fuel and oil handling and freight handling may be limited by member states in such a way that at least two providers for each category of ground handling service should be allowed to provide an effective choice for the airport users. In the meantime a draft regulation requires that at least three ground handling companies should be allowed to enter.

The precondition for the opening of ground handling service markets to competition is nondiscriminatory access to the complementary airport infrastructure facilities consisting of “centralized infrastructures”, such as baggage sorting, fuel-distribution systems etc. Suppliers of ground handling services and self-handling airport users must be granted the right of non-discriminatory access to the required airport infrastructure. Possible suppliers on liberalized ground handling services markets are airports, airlines and independent handlers. In or-

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order to avoid cross-subsidization between ground handling services and other activities accounting separation must be implemented.\textsuperscript{19} Regarding (non-EU) third countries, reciprocity requirements are allowed\textsuperscript{20} in such a way that the liberalization and subsequent regulations valid within the EU are only obligatorily applied to ground handling providers of third countries, if no discrimination between EU and third countries providers takes place.

The implementation process of Directive 96/67/EC has raised several complex regulatory issues, in particular regarding the provision of non-discriminatory access to central airport infrastructure and the procedure for tendering out the right to provide ground handling services with a restricted number of providers. The large conflict potential among the parties involved is already indicated by several formal infringement procedures by the Commission against Member States regarding the proper adaptation of the Directive concerning selection of ground handling suppliers, non-discriminatory access to airport infrastructure, etc. (e.g. Niemeier, 2010, p. 20).

3 The evolution of market driven slot allocation and airport regulation

Regulating those parts of airports characterized as monopolistic bottlenecks remains an important task after full market opening of airline services. This requires, above all, symmetric access to the monopolistic bottleneck areas for all active and potential providers of airline services to allow (active and potential) competition to fully develop. For competition on the markets for airline services to be effective the conditions of access to the monopolistic bottleneck components of airport infrastructure must be the same for all (active and potential) service providers. If established undertakings have preferential access to scarce infrastructure capacities, they enjoy unwarranted advantages over others that can result in their gaining control over markets that would otherwise be competitive. In January 1993 the Council of the European Communities adopted a Regulation


on common rules for the allocation of slots at Community airports\textsuperscript{21} which established a legally binding framework applicable in all Member States. Although the stated objective of this regulation is that the allocation of slots on congested airports should be based on non-discriminatory principles, these rules prevented the introduction of a fully functioning market for airport slots.

3.1 Slots as marketable commodities

Due to the growth in air traffic, shortages of airport take-off and landing slots can be observed at a growing number of airports, so that the challenge of airport capacity constraints and the search for appropriate solutions is becoming topical. In view of these capacity shortages, the public authorities are increasingly being asked to overcome the problem by developing more capacity. Many airports have invested in additional airport capacities (e.g. new runways). Nevertheless, the scarcity problem of airport slots continues to increase (ICAO, 2013c). Investments on such a scale that slots lose their scarcity would be a waste of valuable resources. This is not the same as saying that airport investments (generally) should stop, but rather – according to a basic principle in transportation economics (Mohring, Harwitz, 1962) – that they should continue only for as long as the added benefits of capacity expansion are in keeping with the extra costs involved. This means that even in the context of economically optimal investment at busy airports capacity will still be in short supply at peak times. The allocation of scarce slots is therefore not only a transitional problem.

As soon as airport capacity is no longer available in excess it becomes necessary to specify and define which slots have become scarce and when. The very definition of a take-off or landing slot opens up a vast range of alternatives that can be crucial for potential transactions. If a take-off slot, for example, means only the right of a given airline to take off within a relatively long period of time, that right is worth much less than a guarantee that the airline can take off at a specific-

ic point in time without being subject to any delays. Some airlines on the other hand may prefer flexible operating times. Trading in slots therefore presupposes that take-off and landing rights have first of all been defined in a way that reflects both the needs of the airlines (and their passengers) and the operational and logistical possibilities of the airport operators.

The definition of slots contained in Article 2 of Regulation 95/93 leaves considerable room for manoeuvering (“the scheduled time of arrival or departure available or allocated to an aircraft movement on a specific date at an airport coordinated under the terms of this Regulation”). Here, too, it is ex ante coordination with no guarantee of punctuality, no rules on priority, and no means of enforcing the right to take off or land as a right of ownership.

This imprecise formulation of the right to use airport capacities does not provide incentives for airports to issue guarantees of punctuality (for specific flights) and accept the liability rules that would stem from such guarantees without at the same time benefiting from the scarcity rents. On the other hand, it is obvious that administrative management of capacities in short supply with no financial incentives for all the parties involved can produce a high degree of inefficiency.

3.2 Potential for trading of airport slots

The indicated objective of Regulation No. 95/93 is that the allocation of slots on congested airports should be based on neutral, transparent and non-discriminatory rules. Article 8 (1a) states the maintenance of ‘grandfather’ rights, according to which the air carrier that has operated a slot in the previous scheduling period has priority over other air carriers with respect to that slot in the next scheduling period. The Regulation also provides that carriers have an obligation to use 80% of the slots allocated to them. Regarding slots allocated out of the slot pool, preference is given to new entrants; 50 % of such slots must be allocated to new entrants (Article 10, paragraph 7). Thus, primary exchanges of airport capacities, e.g. slot auctions are excluded.
Article 8 (4) states that: “Slots may be freely exchanged between air carriers or transferred by an air carrier from one route, or type of service, to another, by mutual agreement or as a result of a total or partial takeover or unilaterally”. However, it remained up to legal interpretation whether secondary trading of airport slots including side payments was consistent with the Council Regulation. The interpretation of the term ‘freely exchanged’ became the central conflicting point in the Guernsey Transport Board Case. This case became a landmark case for the more general question, whether secondary trading of airport slots including side payments was consistent with the Council Regulation of 1993. According to the British High Court the meaning of the term ‘freely exchanged’ set down in article 8 (4) Regulation 95/93 does not exclude financial compensations in slot exchanges, due to the absence of legal prohibitions of side payments.

Since the British High Court Decision a continuing debate on the reform of airport slot allocation has evolved. In 2004 Regulation 95/93 was followed up by Regulation 793/2004. The process of slot allocation has been improved for example by a strengthening of the use-it-or-lose-it rule, which determines under what conditions unused slots are reallocated to newcomers. According to article 8a/1c of the new Regulation slots may be “exchanged one for one between air carriers”. Thus, the possibility of secondary trading in airport slots, including financial compensations, was again not mentioned explicitly. In 2008 the European Commission finally communicated that article 8a/1c of Regulation 793/2004 did not prohibit secondary slot trading. This new interpretation of the law by the Commission is a reaction to the evolving grey markets for secondary slot trading at congested airports. The reasoning in the Commission’s Communication pointing out the legal gap with respect to financial compensa-

22 R v Airport Co-Ordination Ltd. Ex P. The States Of Guernsey Transport Board; High Court of Justice, Queen’s Bench Division (Divisional Court), Maurice Kay J, 25 March 1999, European Law Reports 1999, pp. 745-754.


tions in secondary slot trading uses the same arguments already provided in the British High Court Decision in the Guernsey Transport Board Case.

At congested airports, slots do not possess the characteristics of a homogenous good, but differ in market value depending on time. Depending on the flight characteristics (e.g. scheduled business flights, charter flights) airlines have different willingness to pay for slots in a peak period. Thus, regulatory constraints enforcing a one-for-one exchange of slots prohibit welfare improving buying and selling of slots. In contrast to an exchange, the possibility of selling slots increases the opportunity costs of hoarding slots or using them for a less lucrative flight because of the scarcity rents which can be obtained from selling.

### 3.3 Optimal user charges based on scarcity rents

In the past, airport charges have basically depended on the weight of the aircraft, their function being to help finance the airports, not to control the way available capacities are allocated. Aircraft weight and flight distance are no indication of a flight’s (marginal) contribution to the shortage of slot capacity, nor of the costs that ensue for other aircraft. The decisive factor in this respect is the demand at a particular time for airport capacities. In the short term, airport capacities are essentially unchangeable. In the event of unforeseen capacity shortages, the typical solution is for airports to ration capacity on a first-come first-served basis.

Air carriers tend to ignore the constraints imposed on other aircraft and their passengers by an additional flight at a particular time (e.g. longer clearance times, longer delays, and longer flight times). To take these externality costs into account, one solution would be to levy a (time-based) congestion fee equivalent to the congestion costs incurred by all other flights as a result of the extra flight.\(^{25}\) If demand for infrastructure capacity still exceeds supply, the solution would be to charge a market price that includes not only the congestion costs but

\(^{25}\) A mathematical analysis of the allocation of slots at congested airports by means of efficient landing fees is provided in Morrison (1987).
also a scarcity rent. These are therefore capacity shortages where there is direct rivalry for take-off and landing slots.\textsuperscript{26}

The congestion charges or scarcity rents would need to be graduated according to the degree of capacity utilization during a day and depending on the season, insofar as capacity utilization for the same flight may vary. This would enable peak-time take-off and landing rights to be allocated more efficiently. Congestion charges operate like peak load prices, but are not to be confused with them since a (non time-based) congestion charge would still have to be levied, even if there was no change in capacity utilization over the period and no fluctuation in the level of the congestion costs. Another advantage of congestion charges with respect to the short-term ad hoc rationing of slots is that when congestion charges are high during peak periods there is no incentive to hoard slots. Given that, unless it can be proved that 80\% of the allocated slots have been used, slots in Europe are returned to the slot pool, the introduction of capacity-based congestion charges also reduces the negative effects of “grandfather rights”.

### 3.4 Auctioning of take-off and landing slots

As in the past, rather than being reallocated according to changing needs, take-off and landing slots in Europe remain in the hands of the airline to which they were initially allocated, even if that airline does not use them, or if another airline would put them to better use. Flight schedule coordination (ex ante) is carried out by the airport coordinators appointed by each individual country. The exchange and transfer of slots is allowed in the context of mutual agreements between air carriers. Voluntary airline associations worldwide also negotiate flight schedule adjustments to take account of airport capacity limitations and avoid unnecessary delays. Even if take-off times booked by airlines are in increasingly short supply, so far they have always been allocated free of charge. Economically, there is no justification for this, unless there is sufficient capacity

\textsuperscript{26} In contrast to this social welfare maximizing slot pricing (for a given airport capacity) marginalization of a profit maximizing airport owner would lead to a monopolistic markup.
for all airlines to be able to take off and land at any time. Otherwise, the airlines already well-established at a given airport have an asymmetrical competitive advantage over other airlines.

A more rigorous reform would be the abolishment of the ‘grandfathering rights’ of established airlines in favor of ex ante auctioning of take-off and landing slots. This shift of the property rights of airport capacities from airlines to airports would provide important incentives for airport owners. In contrast to administrative allocation procedures, economically efficient allocation mechanisms may evolve, applying congestion pricing and quality of service differentiation of airport capacities. Moreover, the revenues from the slot allocations could be used by airport owners as a contribution towards covering the decision-relevant costs of airport capacities including the capital costs of infrastructures.

3.5 Regulation of airport charges

A common framework regulation on airport charges applied to airports located in the Community that are above a minimum size has been introduced by Directive 2009/12/EC.27 According to recital (2), Member States are free to determine if and to what extent revenues from an airport’s commercial activities (retailing, property) may be taken into account in establishing airport charges. According to Article 3 member states shall ensure that airport charges do not discriminate between airport users. According to the transparency requirements (Article 7) airport management is obliged to regularly provide information to airport users on the methodology used for setting airport charges, the revenues from the different charges and the total cost of the services to be covered. These regulations do not prescribe a specific allocation mechanism, as long as the objective is to cover the decision-relevant costs of the airport. According to Article 10 (1) “The level of airport charges may be differentiated according to the quality and scope of such services and their costs or any other objective and transpar-

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ent justification”. Thus, airport management is not per se prohibited from applying efficient airport charges taking into consideration congestion and capacity scarcity in order to cover the decision-relevant costs.

Disciplining network-specific market power by ex ante regulation is typically considered to be a necessary task for regulatory agencies. In the context of airports the issue of dual till versus single till regulation has been controversially discussed. The basic difference between single till and dual till regulation is that single till extends the regulatory basis to components of the aviation value chain which are not characterized as monopolistic bottlenecks, because they consist of non-aviation revenues (retailing, property). While the single till approach has been widely applied in Europe, from the economist’s point of view the dual till approach has been favored. After all, regulation in network industries should focus on the areas of network-specific market power and not intervene in competitive parts of the value chain (Kunz, 1999; Niemeier, 2009, p. 17; Starkie, 2008, pp. 52, 123). Decision-oriented cost accounting as a basis for cost-based airport charges (pursued by Directive 2009/12/EC) requires the application of the dual till principle and subsequently separate accounting between aviation and non-aviation activities. If non-aviation activities are included in the cost basis, the principle of cost-based airport charges is violated. If revenues from non-aviation activities are used to cover (incremental) costs of aviation activities, this causes internal subsidization of the aviation services and the requirement of cost-based airport charges is not fulfilled. If in the long run revenues exceed decision-relevant costs due to the airport operator’s market power, the issue of price-cap regulation focussing on the level of airport charges and providing incentives for cost reductions becomes relevant (Niemeier, 2009, pp. 19 f.).

3.6 The role of public subsidies

The focus of the debate on the role of public subsidies along the aviation value chain is on subsidies for airport infrastructures. Traditionally, the provision of infrastructure investments in streets, canals, airports, and railway tracks has been considered a typical task of the state. As long as the usage of the infrastructure is
so low that there is non-rivalry of usage, market-based usage charges do not make sense and the state plays a significant role in guaranteeing its finance. There are still network infrastructures existing today where access charges do not allow cost covering. Hotelling (1938, pp. 260-263) already argued against toll collection as long as overcrowding of an infrastructure can be excluded. He concluded, that the total social surplus of an infrastructure rather than the revenues from the toll should be compared with the interest, amortization and maintenance costs in order to evaluate whether the infrastructure is beneficial from society’s point of view. However, Hotelling’s analysis is based on specific assumptions, ignoring the knowledge problem of measuring social surplus and the public choice problem of deficit spending when different possible projects under public budget constraints are involved. Therefore, it seems important that public subsidies to guarantee cost covering requirements of infrastructures with low demand should only be granted as a result of a transparent political process.

If two or more airports do exist in the relevant range of demand, due to competitive alternatives the problem of avoiding discriminatory access disappears; incentives do exist for efficient allocation of network capacities; excessive profits cannot be expected; and the subsidy problem disappears.\(^{28}\) Nevertheless, the question arises as to what extent significant subsidy problems occur in financing airport infrastructures characterized as monopolistic bottlenecks. Only when the revenues from aviation activities together with the revenues from non-aviation activities do not cover the total cost of an airport (incremental cost of aviation as well as non-aviation and economies of scope between aviation and non-aviation) does a public subsidy problem arise. It has often been assumed that in particular smaller airports have a large deficit problem which may require public subsidies. In this context it is interesting to note that analyzing the financial performance of the smaller UK airports Starkie (2008, p. 153) came to the conclusion that even small airports can be commercially viable. The underlying reasoning is that measuring the size of the airport by reference to “passenger numbers” would be

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\(^{28}\) The increasing role of airport competition including the market entry of new airports has been pointed out in ICAO (2013d).
inappropriate, instead “turnover” would be a more appropriate measure of airport size in order to take into account the diverse activities of small airports.

Although the overall profitability of an airport may vary and non-profitable airports cannot be excluded, the lesson is that a critical evaluation of the existence and of the size of a deficit based on decision-oriented forward-looking cost accounting (Knieps, 2003) is unavoidable as the reference point for initiating public subsidy proceedings. Only then is it possible to differentiate between profitable airports and airports operating at a loss. Since revenues increase under the application of optional non-linear pricing as compared to linear pricing, the entrepreneurial flexibility to apply price differentiation in airport user charges also reduces the need for public subsidies. Profitable airports should be subject to price-cap regulation. Non-profitable airports should be subject to politically desired subsidies to the extent that airport user charges do not cover the decision-relevant total costs. The question whether an (implicit) tax on profitable services of the aviation value chain or a subsidy from general tax revenues should be raised is up for democratic debate. Government subsidies are to be legitimized politically and fixed accordingly. Such a clear-cut separation of competences between regulation and policy then allows both efficient access charges and the transparent, politically desired subsidization of airport infrastructure deficits.

4 Conclusions

In this paper the aviation value chain has been analyzed from the perspective of the layering scheme of network economics. The analysis of competition potential and remaining regulatory necessities requires a differentiation between transportation services provided by airlines and ground handling service providers (level 1), air traffic control systems (level 2), and airport infrastructure (level 3). The results are summarized in the following table:
Table 1: The role of markets versus regulation

<table>
<thead>
<tr>
<th>Markets</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The opening of the markets for airline services and ground handling services invariably created considerable potentials for (active and potential) competition.</td>
<td>Technical regulation of safety and environmental issues for aircraft</td>
</tr>
<tr>
<td>Competitive bidding for air traffic control</td>
<td>Technical regulation of definition and enforcement of boundaries of air traffic control areas</td>
</tr>
<tr>
<td>Markets for airport slots</td>
<td>Regulation for airports with network-specific market power: Non-discriminatory access to airport infrastructures for all active and potential providers of airline services and ground handling services Price cap regulation</td>
</tr>
</tbody>
</table>

After the complete opening of airline markets technical safety regulations and environmental regulations for aircraft and the application of consumer protection rules still remain necessary. Moreover, coordinated strategies like airport alliances or code-sharing are characteristics of competitive airline markets and should not be prohibited per se by competition policy measures. The theory of monopolistic bottlenecks has been applied to localize network-specific market power. For competition on air transport markets and ground handling services to operate efficiently, non-discriminatory access to complementary monopolistic airport infrastructures must be guaranteed by sector-specific regulation. The legal concept of absence of discrimination does not conflict with economically desirable price differentiation as long as these tariffs are offered to all active and
potential market participants. The evolution of market driven slot allocation taking into account congestion and capacity constraints should not be hampered by regulation. Price differentiation should be allowed not only for airlines but also for airports. Regulation in airline industries should focus on the areas of network-specific market power and should not intervene in competitive parts of the value chain. Only if the revenues from aviation activities together with the revenues from non-aviation activities do not cover the total cost of an airport does a public subsidy problem arise. A clear-cut separation of competences between regulation and policy then allows both efficient access charges and the transparent, politically desired subsidization of airport infrastructure deficits.
References


International Civil Aviation Organization/ICAO (2013a), Expanding market access for international air transport, Worldwide Air Transport Conference, Sixth Meeting, Montréal, 18 to 22 March 2012, ATConf/6-WP/13, 13/12/12.

International Civil Aviation Organization/ICAO (2013b), Fair competition in international air transport, Worldwide Air Transport Conference, Sixth Meeting, Montréal, 18 to 22 March 2013, ATConf/6-WP/4, 4/12/12.

International Civil Aviation Organization/ICAO (2013c), Slot Allocation, Worldwide Air Transport Conference, Sixth Meeting, Montréal, 18 to 22 March 2013, ATConf/6-WP/11, 10/12/12.


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