



Airport Regulation Investment & Development of Aviation



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INTRODUCTION

This report is based on the workshop organised to examine *Gateway Airport Investment and Development of Airline Services for a Global Economy* at the ITF's 2009 Forum on Transport and Globalisation. The workshop focussed on financing airport infrastructure through airport charges in light of the competitive interaction between airports and airlines. Participants discussed the circumstances in which pricing and investment should be regulated and how this might be most successfully done.

The workshop brought together airlines, airports and regulators to explore ways to improve the functioning of the aviation industry to ensure adequate airport infrastructure. The exchange focussed on ensuring that in the future airport charges foster airport and airline development that best serves the interests of both air passengers and the wider community.

The panel of speakers at the workshop was as follows:

- Moderator** *Jeff Shane*, Hogan and Hartson LLP, former Under Secretary for Policy, US DoT
- Introduction** *Hans-Martin Niemeier*, University of Applied Sciences, Bremen
- Regulators** *Hartmut Spickermann*, Federal Ministry of Transport, Germany
Nick Fincham, Civil Aviation Authority, United Kingdom
Catherine Lang, Federal Aviation Authority, USA
Ulrich Stockmann, MEP, Rapporteur on airport charges, Transport and Tourism Committee
- Airports** *Stefan Schulte*, Fraport AG
Normand Boivin, Aéroports de Montréal
Dominic Schuster, Sydney Airports Corporation Limited
Jos Nijhuis, Amsterdam Airport Schiphol
- Airlines** *Karl-Rudolf Rupprecht*, Deutsche Lufthansa AG
Candan Karlitekin, Turkish Airlines
Tim Clark, Emirates
David Hamm, Delta
- Rapporteur** *David Thompson*, Independent Expert

This publication compiles the conclusions drawn up by the ITF secretariat at the workshop and a fuller report on the conclusions of the discussions written by David Thompson, together with the paper by Stefan Shulte and paper commissioned for the basis of the discussions from Hans-Martin Niemeier. All of the presentations made at the workshop can be viewed on the ITF website at <http://internationaltransportforum.org/2009/forum2009.html>. The ITF is very grateful for the rich input to the discussions from the panel of speakers but takes full responsibility for the views expressed here.

Summary of Conclusions

Transport infrastructure is essential for economic growth. Adequate airport capacity, where it is needed most, is crucial to allowing the global economy to grow.

Present regulatory arrangements are not efficient because the airline and airport markets have changed enormously over recent years. There is scope to do much better.

The challenge is to create conditions for efficient infrastructure development in a sector where in some circumstances some airports have market power and might abuse this position. Though market power may exist in some circumstances it is not inherent to any particular category of airport and probably not present in most airports. Diagnosing where there is the potential for market power abuse requires an evidence-based, case-by-case examination of the scope of, and scope for, competition in the current circumstances, airport by airport.

It is important that regulatory intervention only occurs where it is actually needed as it is costly in terms of administrative effort and altering the market.

Aviation requires economic regulation and to be fully effective this requires a regulator that is independent and accountable, operating under a transparent set of rules and objectives. The regulator should have the flexibility to apply regulation where necessary, and only where necessary, reflecting variations in market power across markets and over time.

The purpose of economic regulation is to protect consumers from abuse of market power, where dominance cannot be dealt with through general competition law. This should be its only objective.

The number of airports that require regulation could be reduced by increasing competition through more open skies agreements and a gradual extension of the use of market-based approaches to the allocation of landing rights. Purely administrative allocation of slots carries the risk of creating disincentives for investment in airport capacity and robs the market of information on the value of capacity at busy airports where slots are scarce.

All regulatory controls on the pricing of aviation services carry the risk of getting investment incentives wrong. This is particularly true of cost plus regulation. Price caps have the advantage of leaving pricing structures to the airport but are less transparent. In either case regulation should be based on forward costs, not historical costs, in order to provide for incentives for investment. A number of regulators are beginning to experiment with this key reform.

It follows that prices for aviation services should be able to rise above current costs in periods of scarcity of capacity when capital needs to be raised for investment. They can also be expected to fall below costs when there is excess capacity, although for long term agreements with airlines average costs remain relevant.

Close cooperation between airlines and airports is essential to meeting demand and providing good quality services. Agreements between airlines and airports on pricing, investment and levels of service are frequently employed to manage business risks. Such agreements can carry risks of discrimination in the access to airport facilities given to other airlines, although instances of this are unusual. The agreements need to be transparent and subject to monitoring by regulators.

Alliances between airlines, with some of the members holding such agreements with airports, account for an increasing share of the world passenger market and merit increased monitoring by regulators. National competition authorities hold sufficient powers to address international alliances but regulators need to pay attention to the impact of alliances in international as well as national markets, on a case-by-case basis.

Liberalisation of aviation markets has contributed to accelerating globalisation. This combined with privatisation of most airlines and now many airports has changed aviation markets rapidly and profoundly. Regulatory models have tended to evolve more slowly and need reform if they are not to become a drag on global growth.

Much remains to be learned for improved regulation and there is much to be gained from exchanging experience between regulators, airports and airlines around the world.

REGULATION OF LARGE AIRPORTS: STATUS QUO AND OPTIONS FOR REFORM

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“Practice, which is evolving rapidly, continues to outstrip theory, providing challenges to the profession in modelling, testing, and proposing superior and workable alternatives.”

(Newberry, 2003)

Executive Summary

Over the last 25 years the governance structure of airports has changed in many parts of the world. Privatisation and commercialisation of airports together with the intense airline competition have put the airline/airport relationship under stress. The OECD has invited all stake holders to engage in a **rational dialogue** on airport regulation. Economics can provide criteria for such a dialogue. Regulation should be designed to increase **economic welfare in a fair and democratic process**.

- Airport users should be protected from prices above competitive levels.
- Airports should produce technical and cost efficiencies.
- Airports should ration demand efficiently.
- Airports should invest an optimal amount.
- Regulation should be based on a legislative democratic mandate and should not be dependent on special interests.
- The regulation should be a fair, accessible and open process without high bureaucratic costs.

Currently airports do not perform well in terms of cost efficiency, allocative efficiency and investment behaviour.

- There is evidence of **poor cost control**, particularly at partially privatised airports. The cost reducing potential of outsourcing terminal operation and ground handling has not been fully exploited, particularly at many European airports.
- **Allocative efficiency** requires different pricing regimes depending on cost characteristics and capacity utilisation.

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- For airports with **ample capacity**, weight based landing fees are not correlated to runway damaging costs. The weight based structure is an imperfect Ramsey pricing scheme. Both imperfections lead to an inefficient traffic mix.
- At **capacity constrained** airports capacity is rationed inefficiently. While the IATA system does not rely on queuing like the US system, it does not confer slots to users that could make the highest productive use of them. Market based slot allocation could result in double-digit billion welfare gains in Europe. Currently the slot limit is not set at a level where the marginal congestion costs equal the value of an additional slot. Most busy airports have kept their traditional weight based charges. This discriminates against large aircraft resulting in an inefficient traffic mix. A uniform charge per movement would be appropriate.
- **Over-investment** occurs in areas with lack of demand and under-investment at places with excess demand. This may be due to the non existence of price signals for excess demand as well as a lack of cost benefit approach at airport expansions.

Market power can arise from a **locational monopoly**, as it is often not possible to build airports next to a gateway airport due to planning restrictions. Another reason might be that airports are **natural monopolies with sunk costs**. Empirical evidence suggests that economies of scale might range from 3 to 12, perhaps even 90, million pax. It seems that market power is not held by the *airport industry*, but by *some airports*. Regulation must be complementary to a slow developing process of competition and not restrictive.

However, the intensity of competition even in Europe is not strong enough to make regulation completely redundant. The intensity of hub competition is limited by the high switching costs for airlines due to specialised investment and non-tradable slots. Competition between hub and secondary depends on traffic rights, aircraft technology and hub congestion. If catchment areas overlap, as in London or Bratislava/Vienna, competition might work well. The strength of airport competition has to be assessed on a case-by-case basis. It could be intensified by horizontal disaggregation of BAA, ADP and preventing airport alliances (ADP/Schiphol) and open skies.

If competition is often not strong enough, **regulation** is an important tool to increase economic welfare and needs to be **assessed**.

- **Regulatory institutions** need independence and democratic control as in the UK. The vast majority of European countries lack independent regulatory institutions, an indication of high internal rents as a dependent regulator undermines the position in case of conflicts with airlines.
- The **scope of regulation** is both too narrow and too large. It is too narrow in that the central infrastructure for ground handling is not covered. It is too large in that potential competitive activities are indirectly regulated by the single till principle. At busy airports, single till results in too low a level of airport charges and rents for slot owners.
- **Cost-based regulation** is dominant in Europe and elsewhere. It results in incentives for gold plating, high costs and inefficient price structures leading to allocative inefficiency. It is a major cause for the poor performance of airports.

- Although **price caps** are used only in hybrid forms, which set the cap on the cost base at the beginning of the regulatory period, they have substantially lowered price levels in Australia, UK, and at some European airports. Price caps leave the structure of charges unregulated, setting incentives to balance price structure in the direction of efficiently rationing peak and excess demand. Hybrid caps could be improved by benchmarking, with better data adjusted for the heterogeneity of airports.
- **Monitoring** is practised with mixed results in Australia and New Zealand. A major weakness is that the objectives are not clearly defined, with the risk of being practised as a loosely defined cost plus regulation. It needs an independent regulator with sufficient power to provide a credible threat to re-regulate.
- **Investment regulation** is of growing importance as major airports face persistent excess demand. The regulation of airport investment becomes more complex as prices do not carry information on the strength of excess demand. Slot rents are the consequence of scarce capacity and accrue to airlines under current slot allocation rules. Airports and regulators are ignorant of slot prices. Additional capacity often comes at a higher cost. Price caps must allow for higher charges and can lead to optimal investment but do not necessarily achieve it. A price cap might lead to underinvestment if regulators fail to provide credible guarantees against opportunistic behaviour.
- Regulation must be designed to be **compatible with airport competition**. Therefore it is necessary to establish independent regulators in order to avoid regulatory capture and create a fair playing field. Cost regulation as well as cost-based monitoring and revenue sharing agreements are not compatible with competition. These should be reformed as pure price caps which allow firms to react to competition by changing the price structure. Price caps set upper limits but firms can also lower price levels in order to compete.

In a **nutshell**, airport regulation is in need of reform. Regulate less, but more effectively, with fair and democratic processes and institutions. Use a credible threat of regulation. Second, regulate and increase competitive forces. Implement simple price caps with strong incentives for cost savings and efficient pricing and investment. Design a competitive landscape with open skies, less horizontal integration and slot markets.

Introduction

Over the last 25 years, the governance structure of airports has changed in many parts of the world. Today airports are no longer a homogenous group of public utilities, but a heterogeneous group with ownership structures ranging from state-owned to partial and even full privatisation, with regulatory systems ranging from cost regulation to price cap and even to complete deregulation and with different degrees of competition, ranging from pure monopolistic to oligopolistic markets. Airports, even publicly owned airports, have become more commercialised and more profit oriented. Thus, the upstream markets within the vertical air transport supply chain followed the trend set by the downstream markets, as the airline industry underwent these changes earlier and many (“downstream”) air transport markets are now characterised by fierce competition between airlines (Winston and de Rus, 2008).

These changes have put the airline/airport relationship under stress. The vertical relationships in the aviation industry do not resemble the smoothly operating supply chains of other industries. They are rather the opposite of the perfect supply chain that managers learn to operate in their MBA courses. This has led to a heated debate over airport regulation and the rules that determine the quality, quantity and price of airport services for airlines. IATA claims that airports are natural monopolies which are ineffectively regulated and which “are exploiting, in many cases, their natural monopoly position” (IATA, 2007, p. 2.). The ACI response to this is that airports are a competitive industry which should not be regulated at all. The Association of German Airports argues for example that today, in Germany, “airports are in tough competition and therefore the level of airport charges is determined by market mechanisms” (translation by author) (ADV, 2007, p 2).

The OECD has taken up this issue and asked for some scientific guidance. The objective of this paper is to provide criteria, information and concepts for an objective discussion and dialogue between airports, airlines, regulator, governments and the general public but with specific reference to gateway airports. The focus is on gateway airports which provide access to a country for international passengers and/or cargo. Therefore the analysis confines itself to the regulation of hubs and secondary airports. The latter are included because they provide some competition to hubs, although they are not gateways in the strict sense. On the contrary, no small airports, or airports that serve only regions with a low population density, or secondary airports within metropolitan regions, are considered.

In the first section the paper develops the criteria to evaluate regulation. It then provides an overview on the performance of airports. In the third section rationale for airport regulation are discussed. Thereafter the alternative to regulation will be analysed. Can competition among airports substitute regulation, or is the competition between gateway airports not sufficiently intense? In the fifth section, the strength and weaknesses of different regulatory regimes are evaluated and options for a reform are discussed. The paper closes with a summary.

1. Criteria for a dialogue on airport regulation

In a dialogue on airport regulation airlines, airports and other partners of the aviation industry argue from their own perspective and self-interest. This is not to be criticised or even condemned, as market economies rely on self-interest and managers rent seeking as a normal process of maximising shareholder value. However, entering a dialogue on public policy implies that it is not sufficient to argue only in one’s own interest, as a particular proposal might be beneficial to one party but more costly for another. Therefore it is necessary to define criteria

for a rational dialogue on airport regulation which are acceptable to all parties and to which not only lip service is paid.

Regulatory economics provides here a widely shared set of criteria (see Baldwin and Cave, 1999; Brunekreeft and Neuscheler, 2003; Forsyth, 1997; Kunz, 2000). The basic idea is that regulation should lead to the same results as perfect competitive markets. It will later become obvious that regulation can only achieve such results if regulators are perfectly informed, which they are typically not. Although only second best solutions are feasible this does not make the criteria useless as they define what a perfect system might achieve. Similar competition is not perfect in most industries, but competition policy tries to correct these imperfections to achieve outcomes for competitive markets.

The criteria of airport regulation consist of a set of economic welfare and institutional criteria.

Economic welfare

Airports maximise economic welfare under the following conditions:

- A. Airport users should be protected from prices above competitive levels. Charges should be set at marginal cost or, if marginal costs are below average costs, at prices minimising the welfare loss.
- B. Airports should produce technical and cost efficiencies; that is, they should use only the minimum of resources to produce a given level of output, and should select from these technical efficient combinations those which minimise the cost of producing this output level.
- C. Airports should ration demand efficiently. If demand exceeds capacity, output should be distributed to those with the greatest willingness to pay.
- D. Airports should invest an optimal amount; that is, the marginal benefit of additional capacity should equal its marginal costs.

In order to maximise economic welfare, it is necessary to price environmental externalities correctly. As this paper confines itself to economic regulation it does not deal with this issue and leaves it to environmental regulation. But it should be noted that at many large airports environmental externalities are ineffectively priced, leading to the problem of political acceptance for urgently needed new capacity (Gillen, 2000 and Niemeier, 2000).

Fairness and democratic acceptance

Regulation is a process in which the involved parties interact with each other and with the regulator. This process presupposes some notion of fairness and democratic acceptance¹. Regulation should fulfil the following criteria (Baldwin and Cave, 1999, Vass, 2005):

1. In this context fairness is not defined by the outcome. The outcome should be efficient, as defined above.

- A. Legislative mandate from elected legislature. Parliament should define objectives of regulation, such as above economic criteria.
- B. Independency and accountability to democratic bodies. The regulator should not be dependent on special interests. The function of regulator and ownership should be separated. Parliament should control the regulator if he fulfils his statutory obligations. It should not intervene directly in day-to-day business.
- C. The regulation should be a fair, accessible and open process. It should be carried out with expertise and aim at appropriate non-biased decisions.
- D. The legislative mandate is efficiently implemented without high bureaucratic costs.

These criteria are widely shared². The European Union and many other jurisdictions have accepted the criteria of efficient pricing in their principal concept of transport policy in general, and their airport policy in particular (European Commission, Transport Directorate, 1995).

2. How have airports performed?

Given the above criteria for economic efficiency, the question arises as to how well or poorly airports perform. This is a question which has only recently been studied by economists because of the changes in government regimes. These changes which make the airport industry so interesting for economists also make performance analysis so difficult.

2.1. Evidence on Cost inefficiencies

Obviously airports differ from one another depending on the economic characteristics of the markets they serve (and the markets which serve the airports) and the institutional framework within which they have to provide their services. Cost inefficient production might not always be due to bad performance by airport management; it may also result from imperfect markets and government regulation. For example inefficiency may result from:

- Legal and structural barriers to market entry that prevent competition (see section 3).
- Inadequate ownership structures that create inefficient incentives for management.
- Inadequate regulatory rules (e.g. how to provide security) that force management to produce inefficiently.
- Low-density hinterland that the airport serves which prevents management from fully exploiting potential economies of scale and density.
- Operational and environmental factors such as unattractive location, scarcity of land, bad weather and inefficient, but costly, environmental constraints.

2. It should be noted that objectives such as fair sharing of revenues, strengthening international competitiveness and creation of new jobs are not appropriate criteria for a dialogue on airport regulation, as they create unintended consequences which result not only in less efficiency and welfare, but sometimes even in higher unemployment and loss of competitiveness.

Some of these factors are beyond the control of management and politics either in the short, or long, run. For example, the takeoff and landing system is beyond managerial control in the short run, but in the long run it can be changed. Noise problems might be mitigated in the short run by noise surcharges, and in the long run by land use planning. Measuring efficiency requires a lot of data, particularly in order to establish the causes of inefficiency. Data problems are not easy to overcome; the measurement of capital and the degree of vertical integration being particularly difficult.

A number of studies attempted to measure airport performance using different methods³ to try to control the differences between airports that may have an effect on airport performance but which are outside the control of management (for an overview see Kamp *et al.*, Francis, *et al.* 2002). Of particular interest here are studies that take into account governance structures that vary between airports

- While Parker (1999) found no impact on the technical efficiency of BAA airports prior to, and following, privatisation, Hooper and Hensher (1997) for Australian airports, and Barros and Dieke (2007) for Italian airports, show that commercialisation and privatisation improves performance.
- Oum *et al.* (2006, 2008) compared worldwide airports with different ownership structures and concluded that public and fully privatised airports operate more efficiently than other ownership forms. Interestingly, the Continental European model of partially privatised airports failed.
- The Air Transport Research Society (ATRS 2008) investigated the impact of different management strategies. By outsourcing of services, such as the operation of terminals, airports achieve higher efficiency scores. Substantially different degrees of vertical integration can be observed between Europe and North America. Whereas the terminal operation and often ground handling is provided by the airport operator (e.g. Germany), both activities were contracted out in North America leading to higher performance ratings. Of course, there are large differences among European airports: German airports have so far achieved only low ranking (for a discussion see Kamp, *et al.* 2007).

Studies on the effects of privatisation on performance have not isolated the effects of different forms of economic regulation supporting, or rejecting, the hypothesis that incentive regulation tends to improve the airport's efficiency rather than cost-plus regulation. Here, further research needs to be done.

3. The underlying quantitative methodology varies with some studies using parametric approaches such as Stochastic Frontier Analysis (SFA) to estimate a production or cost function. For simplicity, a greater number included the non-parametric Data Envelopment Analysis (DEA), which constructs the efficient frontier with linear programming. A limited number of studies focused on Total Factor Productivity (TFP) using index numbers because input prices, in particular capital of, are rarely available for airports. The selection of inputs and outputs is different according to the data availability and research focus. Some studies include only physical data, such as the number of gates as an input and the number of passengers as an output, whereas other studies prefer to incorporate financial measures, such as operating costs and revenues.

2.2. *Allocative inefficiency*

Allocative efficiency requires that airport services are correctly priced. This requires different pricing regimes for airports depending on their cost characteristics and their capacity utilisation. Two broad cases can be distinguished. Airports might have ample capacity and have to cover fixed costs. Alternatively airports might have scarce capacity, either at peak times or all day long. Efficient pricing requires different price structures and levels (see below for the leading two regulatory cases). The evidence is that airports are inefficiently priced, in particular because airports have a weight-based landing fee and do not change the price structure should demand and cost conditions change.

Because of lumpy investment the demand curve might cut the average long-run cost function in the range of falling average costs (see below). Such airports have ample capacity and no rivalry exists for the users. For such airports first best marginal pricing is not feasible as marginal costs are below average costs. Airports must adopt second best pricing; that is, setting price and quantity at a level that maximise economic welfare subject to the airport at least breaking even. For simplifying the case of independent demand, the Ramsey rule is that the airport should mark up the price above marginal cost inversely to the price elasticity of demand. The traditional weight-based system can be interpreted as an attempt to find such a second best solution, because larger aircrafts with lower price elasticity pay more than small ones. However, two inefficiencies arise:

- Hogan and Starkie (2004) show convincingly that weight is not correlated to the damaging cost of the runway, taxiway and apron pavement and hence does not reflect marginal damage costs.
- The current weight based structure is an imperfect Ramsey pricing structure (Morrison, 1982) as “current fees increase too rapidly with aircraft size” and “do not increase with distance flown by the aircraft.” (ibid., p. 158, see also Martin-Cejas, 1997).

Both imperfections lead to an inefficient traffic mix and use of capacity with repercussions in the airline and aircraft manufacturing market. However, these welfare losses are smaller⁴ than the welfare losses at busy airports.

There are growing numbers of busy airports which face excess demand for a small part of the day, and very busy airports which face excess demand all day long. In both cases, rivalry exists for the users and the problem arises as to how to ration demand for a given capacity.

Allocative efficiency requires that scarce capacity should be given to those airlines with the highest willingness to pay and that, assuming intense airline competition,⁵ will make the best productive use of it. Excess demand can be either efficiently rationed by price or by quantity. Another option is to ration inefficiently through queues and administrative measures. So far, airports have implemented only inefficient options.

4. The welfare loss due to imperfect Ramsey pricing is small relative to the loss due to cost inefficiencies if demand is inelastic in countries with a low density of airports, such as New Zealand.

5. See Gillen and Morrison (2008) and Starkie (2008c)

At most US airports charges are weight based and, unlike in Europe and elsewhere, scarce capacity is given on a “first come, first served” basis. At high density airports, national (not international) slots are allocated through a secondary trading system in combination with administrative measures. Overall, this system has performed inefficiently. Morrison and Winston (2005) estimate an annual welfare loss of USD 6 billion for US-airports. While there is debate over the correct level of congestion charges, economists agree that peak and congestion pricing is one option to increase efficiency (Brueckner and Van Dender, 2008; Czerny *et al.* 2008).

In other parts of the world, airports have adopted the IATA slot allocation system. It has the advantage that congestion is not inefficiently rationed by queuing. This leads to less welfare decreasing congestion than the US system, as it coordinates ex-ante flights, but generally the slots are not given to users with the highest willingness to pay. In a study for the EU Commission, Mott Mac Donald (2006) estimated that secondary trading would lead to 7.2% more passengers, 17.1% more revenue passenger kilometers and 51.6 million more passengers, resulting in a gain in consumer surplus of + EUR 31 billion and producer surplus + EUR 1.2 billion at current rates in 2025. It is therefore necessary to reform the distribution mechanism through such methods as well designed auctions and secondary trading. While this aspect has been intensively discussed two perhaps equally important factors of efficient rationing have been overlooked. An efficient allocation of given capacity requires, besides an efficient slot allocation mechanism, the correct choice of slot capacity and an efficient structure of airport charges. Currently, the slot limit at airports is set by some administrative process involving airline and airports. The authorities will seek to provide enough capacity at an acceptable level of delay. Most likely it will not be set at an efficient level, where the marginal congestion costs equal the value of an additional slot (Forsyth and Niemeier, 2008). Most busy airports have kept their traditional weight-based charges. This discriminates against those airlines which can use scarce slots efficiently. In particular, large aircraft pay relatively more than small aircraft, causing an inefficient mix at busy European hubs. A uniform charge per movement in the case of excess demand would be efficient. Unfortunately, few airports have adopted such a charge (Forsyth and Niemeier, 2008).

2.3. Suboptimal investment

The inefficient allocation of given capacity has important implications for the long-term adjustment from building new airports and expanding existent ones. In both respects the airport industry has not performed well. There is abundant capacity in areas with lack of demand and underinvestment in those with excess demand. This is a situation which has persisted over decades, has become more severe, and has created a bottleneck for the rapid expansion of air transport (Button and Reynolds-Feighan, 1999; Eurocontrol (2006); Morrison and Winston 2008).

In competitive markets, excess demand drives prices up, makes these activities profitable and signals the level and timing of adjustment. This has obviously not happened in the airport industry, and relates very much to short term inefficiencies. There are no prices reflecting short time excess demand. Peak and congestion pricing is generally not practised by airports. Slots are traded at no European airport with the exception of London. While trading there seems to work well, prices might be still inefficient due to arbitrary slot constraints and an inefficient structure for charges.

The current IATA system has another negative implication. It breaks the linkages between short- and long-term adjustments. It has created rents which do not fall to the airport, but to the airline companies. Some of these rents must have been dissipated and used for cross-subsidising unprofitable routes or higher wages, as the major slot holders are not very profitable (Forsyth, 2008). The system has also created a quite stable coalition of slot creating airports and rent seeking airlines which, so far, has stopped any effective reform of airport pricing. Busy slot creating airports have abstained from efficiently pricing their assets and instead engaged in a political process of capacity expansion. The question of airport expansion is a political question, as it involves the assessment of environmental externalities such as noise and other local emissions. In this political process many airports have developed a “predict and provide” strategy based on the logic of “jobs versus the environment” (ACI, 1998). Airports hope that high growth promises, based on optimistic forecasts and employment effects generated by input output models, will lead to an acceptance of the negative effects of growth – namely noise and pollution – in the neighbourhood. However, such a strategy is logically flawed because expansion is a question of social net return on investment, which cannot be answered by input output analysis, but only by Benefit-Cost-Analysis. The strategy of airports, therefore, is very risky as not only the economics of airport extension but also the politics of airport extension become irrational. It is doubtful whether a political consensus on airport expansion will ever create an optimal amount of capacity for airports (Niemeier, 2001).

3. Why regulate airports?

There are basically two⁶ rationales: a theoretical and a more pragmatic one.

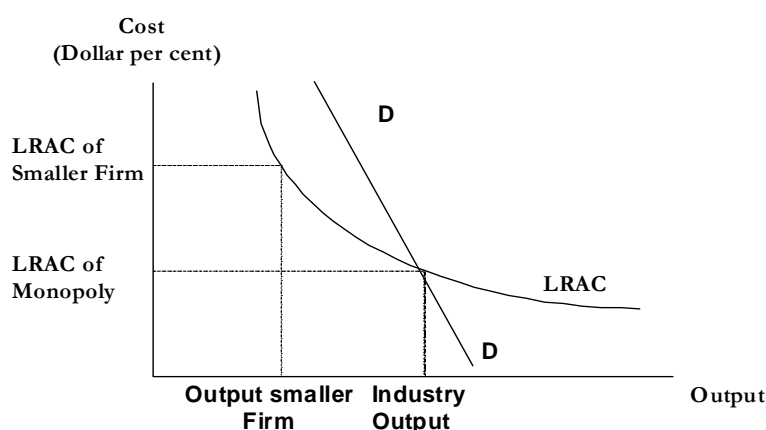
The pragmatic one argues that for most airports there are no close substitutes, as attractive locations are limited (Forsyth, 1997). It seems next to impossible to build a competing airport next to hubs like Frankfurt or Paris airports. Such airports have a *de facto* monopoly reflecting planning and environmental restrictions, and they have market power in the provision of aviation services which should be regulated.

The theoretical rationales are rooted in the general theory of market failure applied to public utilities and to airports (for an early treatment see Bator, 1958; for a recent textbook treatment see Church and Ware, 2000). Airports might have such production and cost characteristics that competition cannot work because they are natural monopolies that is an industry “whose cost function is such that no combination of several firms can produce an industry output vector as cheaply as it can be provided by a single supplier” (Baumol *et al.* 1977, p. 350). For the simple case of a single product (see Figure 1) this is the case if the demand curve D intersects the long run average cost curve LRAC in its decreasing part and because a portion of the fixed costs of airports are sunk.⁷ In such a case, the airport which

6. Positive network effects are another factor which has been discussed, but which is not very well researched. There are benefits to airlines and passengers to concentrate their operation at one airport, thereby creating economies of density due to higher frequencies, larger aircrafts and joint usage of common facilities such as lounges. As part of these costs are sunk costs e.g. costs of building up hub operations for the airlines, lock-in effects might occur and switching costs might be substantial. Although there are no estimates on this entry barrier they should not be overlooked. It may be that such positive network effects “create a more significant barrier to entry than do airport supply characteristics” (Australian Productivity Commission, 2001, p.105)
7. The concept of a natural monopoly can be extended for the case of multiproduct firms (see Baumol *et al.* 1997). Economies of scope occur when it is less costly to produce different services jointly than separately. However there are few estimates on the strength of economies of scope in

could attract more traffic realises economies of scale due to density, and would have such a cost advantage that it would drive out the other airport and have a monopoly. As a new airport requires specialised investment while the capital costs of the incumbent monopolists are sunk, this airport cannot be challenged by a new entrant. Such a natural monopoly is efficient as two or more airports would lead to higher average costs, but the efficiency gains might be lost due to market power. A profit maximising airport would charge prices well above average costs. Therefore the market power of the natural monopolist has to be reduced either by public ownership or, in the case of a private operator, by a regulator.

Figure 1. **Natural Monopoly**



Both rationales have to be carefully applied and thereby face major challenges. The pragmatic one faces the problem that it might misinterpret the performance of an airport. The profits of an airport might not reflect monopoly, but locational rents. It is not easy to disentangle location and monopoly rents, as planning restrictions might result from successful rent seeking of public or private airport operators. Nearby public airports are very often kept in one hand, which might reflect a preference for less competition. Private investors demand that the public should not allow new airports to be operated within the catchment area. As economists have traditionally taken planning decisions as given, these questions have not been well studied.

The theoretical rationale must acknowledge that there is no clear evidence on the shape of the long run cost function. Therefore estimates differ substantially at what level economies of scale are exhausted (see below table 1). Average costs might fall up to a level between 3 and

the airport industry. It is plausible that economies of scope might arise from the use of runways for scheduled, charter and freight traffic as well as from jointly offering aeronautical services (Australian Productivity Commission, 2001, p.102). Furthermore, rising average costs are consistent with natural monopoly (see, the discussion on weak natural monopoly in Church and Ware, 2000, p.759)

12.5, or even up to 90, million passengers, and hubs might experience diseconomies of scale. Furthermore, it is unclear if the cost curve is very flat so that the cost disadvantages of small airports may not be so large.

Table 1. **Economies of Scale at Airports**

Study	Observed period	Sample of Airports	Output	Method	Results
Doganis and Thompson (1973)	1969-70	18 UK airports	WLU	Parametric	L-shape cost curve with decreasing average costs up to three million.
Tolofari <i>et al.</i> (1990)	1979-1987	7 BAA airports	WLU	Parametric	Economies of Scale until 20.3 million WLU
Doganis <i>et al.</i> (1995)	1993	25 airports thereof 12 European airports	WLU	Parametric	L-shape cost curve with decreasing average costs up to five million
Salazar de la Cruz (1999)	1993-95	16 Spanish airports	Passenger	Non-Parametric	Decreasing average costs up to 3.5 million passengers, increasing from 12.5 million
Main, Lever and Crook (2003)	1988 –2001	27 UK airports	WLU and passengers	Parametric	Sharp decreasing costs up to 4 million passengers and 5 million WLU and weak decreasing costs up to 64 million and 80 million passengers.
Main, Lever and Crook (2003)	1998- 2001	44 airports of TRL data set	WLU	Parametric	L-shape cost curve with decreasing average costs up to 90 million WLU
Pels (2000)	1997	35 European airports	Air traffic movements (ATM) and Air Passenger Movements (APM)	Non-Parametric	Average airport with 12.5 Mio. APM passengers and 150 000 APM operates under constant returns to scale for ATM and increasing returns for PTM.
Vogel (2005)	1990 to 1999	47 European airports	Passenger	Non-Parametric	Increasing economies of scale of up to 4 million terminal passengers
Jeong (2005)	2003	94 US airports	WLU and passengers	Parametric	Economies of Scale present until 2.5 million pax or 3 million WLU
Martin and Voltés-Dorta (2007)	1991-2005	41 worldwide airports	ATM and WLU	Parametric	Economies of scale do not exhaust at any output level

It may also be the case that airport policy may change and new planning regimes might allow entry. ‘Natural’ does not mean that circumstances never change. Many former public utilities, especially within the aviation sector, have been transformed into competitive firms. The production technology can change and, in particular, the demand curve might shift to such a level that two or even more airports can be sustainable. Liberalisation may be possible and could lead to substantial welfare gains (Winston, 1993)

These problems have important implications for the design of regulation. First of all, it is important that *the airport industry as a whole* has market power, but only some airports have market power. Second, regulation should carefully assess the industry structure with their particular circumstances. If, for historical reasons as in the UK, there are many former military airports in one region and the public gives them for free to private investors, economies of scale are not an issue and airport competition might work so that regulation is only temporarily required, if at all (Starkie, 2008). However, this might be not the case in many regions of the world. Therefore, in the third place, regulation must be complementary to a slowly developing process of competition. A form of regulation should be designed which can be combined with competition. Finally, the rationale for regulation must be revisited in time: is it necessary at all?

Which airports should be designated and which airports should be subject to the threat of regulation?

4. How strong is airport competition?

With liberalisation of the airline market and the commercialisation and privatisation of airports, competition between airports has certainly begun to develop in many parts of the world. It has taken many forms (Air Transport Group Cranfield, 2002, Forsyth, 2006). In particular, low cost carriers are now serving many airports which did not play any role at all. Today, many small airports are competing for this type of traffic (Lei *et al.*, 2009). For some regions, such as the Manchester/Liverpool region or the Düsseldorf/Cologne region, airport competition has become (or at least could be) so intense that regulation is not necessary (Starkie 2008, Malina, 2009). In Australia, New Zealand (Forsyth, 2009c) and Greece (Papatheodorou, 2009) the distance between airports is too large. For gateway airports four forms of competition⁸ are relevant.

- a) Hub competition: Passengers and shippers can choose between different airlines to fly through different hubs to their long haul destination. Airports compete through the airlines to win this traffic. The intensity of hub competition has with a few exceptions (Schiphol versus ADP, Heathrow versus Gatwick) not been intensively studied (Burghouwt, G. and Veldhuis, J. (2006). If hubs were close substitutes, hub airports could easily win new hub carriers. While in the US some airlines have switched hubs, Europe has relatively stable hub and spoke networks (Burghouwt and de Wit, 2005). Hub competition is limited by a relatively high switching cost for airlines because hub operation is a specialised investment. In some cases air service agreements restrict traffic rights, making switching unattractive. Most relevant, as many hubs are slot coordinated, slot trading is not possible so that airlines are locked in (Wolf, 1999). Nevertheless, the alliance of Schiphol and ADP is an indication that airlines might shift traffic and airport managers try to reduce this competition (De Wit 2009, Forsyth *et al.*, 2009) Overall, hub competition is currently rather limited – partly because regulation of air service agreements prevents it from realising its potential.
- b) Hub and secondary hub: The intensity of competition (for example Heathrow versus Manchester, Fraport versus Munich versus Stuttgart versus Düsseldorf versus Hamburg) depends in particular on traffic rights, aircraft technology and hub congestion. Traffic rights may play an important, but very often underestimated, role. In many countries, particularly in Europe, only certain airports were designated as landing points in air service agreements. They gained economies of scale and scope in the past and are today offering high connectivity. Although today open sky agreements are not as important, as landing points are no longer specified (with the notable exception of Stuttgart airport in the bilateral with the United Arab Emirates) secondary airports are at a disadvantage (Gillen *et al.*, 2000). So far, no secondary airport in Europe has become a major hub – which might have happened if competition were intense.

8. Airports are competing in other markets with other firms. The shopping mall of an airport competes with the local shopping mall. How this affects competition among airports and how it might restrain monopoly power are questions demanding further research. See Starkie 2001 and 2002, Gillen, 2009

- c) Primary and secondary airport: There are few regions where a relatively large airport competes against a mid-sized secondary airport. For example, most recently Luton won traffic from Stansted (Starkie, 2009c). Vienna and Bratislava are competitors, indicated by the attempt of Vienna to buy Bratislava which was blocked by the *Slovak Competition Authority* (Forsyth *et al.* 2009). Overall, this type of competition is currently not strong enough as airport products differ and access costs might be high (Forsyth *et al.* 2009).
- d) Potential competition: In competitive markets with strong growth and persistent excess demand, entry would occur and competition would be intense. In Europe, only a few market entries were observed but not in areas with strong demand – with the exception of Manchester (Müller-Rostin *et al.*, 2009). Unlike the airline industry, potential competition has no disciplinary force.

In summary, Forsyth (2009) is certainly correct in his review on European airport competition that “there does not seem to be much evidence of strong competition between the airports of medium to large cities”. The intensity of competition even in Europe is not strong enough to make regulation completely redundant. However, it is necessary to assess the forces of competition on a case-by-case basis. Such an analysis should include the different types of traffic, for example cargo versus passengers and intermodal competition from high speed trains (see Mandel, 1999 and Kouwenhoven, 2008). It should also include the potentials of competition by horizontal disintegration in cases like BAA and ADP (see Starkie and Thompson, 1985), abstaining from alliances such as ADP/Schiphol Alliances, further liberalisation of air service agreements and by slot trading.

5. How to regulate airports?

As competition is currently not strong enough to limit the market power of airports in such a way that airports become cost and allocative efficient, the question arises if effective regulation can achieve this. Given the cost, but more important the allocative inefficiencies of airports (see section 2), regulation of airports might be more complex than regulation of other public utilities. Regulation is very often thought of as reducing the level of prices and thereby forcing the firm to become more efficient. This is certainly also an issue with airport regulation as airports show signs of gold plating and too high costs. But regulation of airports faces another problem. Reducing the level of charges at busy airports will increase the excess demand. Therefore regulation of airports faces the additional problem of rationing demand efficiently and setting incentives for investment. Hence the structure of charges, the allocation mechanism and the incentives for investment become a major issue for airport regulation.

This section analyses the strengths and weaknesses of airport regulation by analysing the institutional design of regulation, its scope, the different types of regulation, and specific problems such as incentives for optimal investment. Finally, the relationship between competition and regulation will be discussed.

5.1. Institutional design of regulation

The issue of good governance has been a major economic issue in developing countries but, surprisingly, when it comes to airport regulation in industrialised countries it remains an issue (for US airports see Morrison and Winston, 2008). The regulator and also the monitoring

agency⁹ should be independent but accountable to democratic bodies and regulation should be a fair, accessible and open process. These self evident principles have not been widely practised in Europe (see below) and are therefore part of the new directive on airport charges.

Table 2. Regulation of large European Airports, 2007

Rank	City	Code	PAX Mio	Regulation Form	single/dual till	Regulator	Private share %
1	LONDON	LHR	68,1	Incentive	single till	independent	100
2	PARIS	CDG	60,0	Incentive	single till	dependent	32.5
3	FRANKFURT	FRA	54,2	cost based	dual till	dependent	47.2
4	MADRID	MAD	52,1	Cost-based	single till	dependent	0
5	AMSTERDAM	AMS	47,8	cost based	dual till	independent	0
6	LONDON	LGW	35,2	Incentive	single till	independent	100
7	MUNICH	MUC	34,0	Cost-based	single till	dependent	0
8	ROME	FCO	32,9	Cost-based	dual till	dependent	97
9	BARCELONA	BCN	32,8	Cost-based	single till	dependent	0
10	PARIS	ORY	26,4	Incentive	single till	dependent	32.5
11	ISTANBUL	IST	25,6	Cost absed	n.a	dependen	14
12	MILAN	MXP	23,9	Cost-based	dual till	dependent	0.88
13	LONDON	STN	23,8	Incentive	single till	independent	100
14	DUBLIN	DUB	23,3	Incentive	single till	independent	0
15	PALMA DE MALLORCA	PMI	23,2	Cost-based	single till	dependent	0
16	MANCHESTER	MAN	22,7	Incentive	single till	independent	0
17	COPENHAGEN	CPH	21,4	Incentive	dual till	dependent	77.3
18	ZURICH	ZRH	20,7	no regulation			42
19	OSLO	OSL	19,0	Incentive	single till	dependent	0
20	VIENNA	VIE	18,8	Incentive	dual till	independent	50

Source: 2007 ACI-EUROPE, GAP data base.

So far, independent regulators have been established only in Austria, Ireland, the Netherlands, and the United Kingdom. Interestingly, very often countries are privatising their airports without addressing clashes of interest. In Austria, Vienna airport was privatised in three steps in 1992, 1995 and 2001. Up to the last step the central government held a major share and regulated the airport charges (for further discussion see Wolf, 2003). German airports are regulated by the federal states that have a minority or majority share in the partially privatised airports of Frankfurt, Hamburg and Hannover (Müller *et al.*, 2008).

A fair, accessible and open process requires at minimum a consultation process. In the past 15 years, an increasing number of European states have implemented a consultation on airport charges, and today it has become standard (ACI, 2003). There is still room for

9. Independency is important for all types of regulation, in particular for monitoring. See 5.3. below.

improvement, as often the airports fail to provide the necessary information to make a decision on airport charges transparent and plausible to the airlines. The standards of transparency in UK regulation, with parliamentary control and openness for the general public, are rarely met in continental Europe. One example is the recent price cap regulation of Aéroports de Paris, in which key figures, such as the value of the regulated asset base, were not made public (Morgan Stanley, 2006, p.4). It is also reflected in the minority share Lufthansa holds in their main hub Frankfurt in order to be better informed.

Given the likelihood of more intense conflicts between both parties, a dependent regulator undermines the position of (in particular privatised) airports. Therefore, the lack of support from many European airports for independent regulators is surprising and might be explained by short sighted behaviour, a lack of incentives or as an indication of high rents. All these explanations are clearly signs of inefficiencies and show how important it is to avoid regulatory capture (Stigler, 1971).

5.2. Scope of regulation

Regulation should be confined to those activities in which the airport has persistent monopoly power. This is the case where the airport services are essential for downstream users and cannot be duplicated without substantial costs. Traditionally, the starting and landing system with the apron and the passenger and freight handling terminals are regarded as such services. Non aviation activities and ground handling are seen as activities in which the airport might have some market power, but at least potential competition could discipline the airport (Kunz 1999b, Templin, 2009). Liberalisation of ground handling allowed self handling and third party providers to enter the market. Ground handling services should not be regulated, but central infrastructure services, such as baggage handling systems, should be part of the regulated activities. This is not an issue in countries like the UK, where airports do not offer ground handling, but in others like Austria, Germany, Italy, Spain and France. In Germany, the regulation of charges does not – with some notable exceptions like Düsseldorf – cover the central infrastructure fee, so that some airports which were not able to raise their charges found an easy way out by shifting costs to their users. At Amsterdam and Rome Fiumicino the central infrastructure fee is regulated, while in Paris Charles De Gaulle and Madrid Barajas this is not the case (Templin, 2009).

Besides the direct regulation of certain activities of an airport, all activities can be regulated indirectly through the single till principle under a price cap as well as under a cost-based regulation. It is one of the most debated issues among airports and airlines and the pro and cons in this debate are summarised in the table below (for an excellent overview see Starkie and Yarrow, 2001).

Table 3. **Single Till**

Pro	Con
Shifts monopoly rents to the users	No increase in efficiency
Non aviation revenues are created by airline passengers	Tax on non aviation
Windfall profits	No direct regulation of profits
Simple to control	Less information, but allocation of common costs is difficult
Improves Ramsey pricing	Decreases level of charges at busy airports

The single till passes potential monopoly rents from non aviation activities to the users through lower charges, but thereby it does not prevent the creation of market power. As most probably monopoly rents are lower than locational rents, the single till shifts rents without increasing efficiency. Airlines argue that non aviation revenues and passenger throughput are closely correlated and that therefore the revenues should be shared. However, this argument neglects the fact that the decision is taken by the consumer and the airport is the supplier of the services. The single till principle acts like a tax on the supply of airport services, as the airport has to pass parts of its revenues to the users. Therefore it reduces the incentives to develop the non-aviation business. The airlines fear that a shift from the dual to the single till principle raises charges and creates windfall profits for the airport. This is most probably the case, but regulation should not try to regulate profits directly as this reduces incentives for cost savings from which the airlines also gain. The single till is by no means easier to implement and control than the dual till. However, the dual till has the disadvantage of separating the regulated from the non regulated activities, which implies the need to allocate common costs in a pragmatic way. Subsequently it needs less information. At airports with ample capacity the single till might be part of Ramsey pricing to cover fixed costs. However at airports with excess demand at peak times it reduces the level of charges, thereby lowering the scope for the airport to ration efficiently by price differentiation. In these circumstances rationing can only be achieved by slot allocation. Relying on the inefficient IATA slot allocation schemes does not make much sense. Overall the arguments for a dual till carry more weight and seem to prove the principal that regulation should not intervene in workable competitive markets and to restrict itself to the monopolistic bottleneck.

The single till principle was recommended by ICAO and has been widely used in Europe, but this long tradition is slowly breaking up. In the UK, the CAA recommended a dual till approach in 2001. To general surprise, the Competition Commission rejected the proposal, on the grounds of dubious arguments (Starkie, 2008). Australian airports were price capped on a dual till principle (Forsyth, 2004). In Europe the price cap for Hamburg Airport was one of the first to be set on a dual till (Niemeier, 2002). Since then, more German airports have adopted the dual till – however on a cost plus basis resulting in higher charges without any efficiency gains.

The distortions due to the single till are only obvious at some airports. At ADP the retail and real estate business is, relative to other European Hubs, underdeveloped and ADP has roughly the size of London Heathrow to develop this business. The regulatory framework is a single till, with a vaguely defined option to take part of real estate and retail income out of the till

in the next regulation period from 2011 to 2015. Morgan Stanley (2006) values the ADP in different scenarios between EUR 38.1 and EUR 127.1 per share. The differences are mainly due to different degrees of non-aviation business left out in the till. These differences give a rough idea of the magnitude of the distortions caused by the single till principle.

5.3. *Types of airport regulation*

The central problem for regulation is that the regulator has asymmetric information about the demand and cost functions and that the regulator must design a contract to set incentives for the regulated firm¹⁰. While high powered regulation sets incentives for cost reductions and productive efficiency and an efficient price structure, low powered regulation does not. Given the information asymmetry, the regulated firm will provide the regulator with the information only if it can keep some of its informational rents. Therefore all types of regulation will not achieve first best outcomes. Also, so-called “light handed regulation”, a term used for monitoring, faces this asymmetry and should be evaluated as to whether it can set strong incentives for efficiency.¹¹

Traditionally, in Europe and elsewhere,¹² airport charges have been regulated on a rate of return or cost plus basis. This is a rather low powered type of regulation as it sets no incentive for cost reduction. Littlechild (1983) tried to overcome these deficiencies with price cap regulation. While the following discussion showed that many of the original claims of superiority were exaggerated and that there might be better regulatory systems, there remain important differences among the practical regulatory regimes for airports. The paper differentiates between cost based regulation, pure price caps, hybrid price caps, revenue sharing agreements and monitoring.

Cost based regulation.

The vast majority of authorities in Europe regulate airport charges according to principles of cost relatedness. The charges should create just enough revenues to cover total costs including the depreciation of capital and a normal rate of return on capital. The structure of charges should also be cost related, namely each charge should reflect its costs. Charges are supposed to be set to ICAO principles of cost relatedness.

The problems with cost based regulation are well known (see for example Sherman, 1989). Firstly, the incentives are set for *inefficient choice of inputs*. If the allowed rate of return on capital is above the cost of capital the airport has an incentive to expand the capital base to increase profits (Averch Johnson effect). Furthermore, there are high incentives for cost-padding leading to productive inefficiency. Secondly, cost based leads to an *inefficient price structure*. Under cost based regulation the airport has no incentive to adopt peak pricing, but

10. In addition, the airport also has asymmetry information about the regulator. The airport does not know how the regulator will regulate prices in the future on which the profitability of investment depends. See below 5.4.

11. In the following, the term “light handed” is not used because it is a rather misleading category. “Light-handed regulation” is a trendy expression, but also an empty one. However, price caps are light-handed constraints because they mimic competitive pricing ceilings and identify a wide range of pricing sets which are *ex ante* permissible” (Kunz, 1999 b, p 46)

12. The US system has some similarities with price cap, but does not set any incentives for cost efficiency. See Graham (2004), Gillen (2009).

instead may overprice off-peak demand and under-price peak demand in order to justify capacity expansion. The incentives at cost based regulated airports are leading to uniform pricing without peak and congestion pricing. Cost based regulation sets prices in such a way that relative prices will lose the function to give guidance to the question at what time and to what extent airports should be extended. When excess demand exists, it is not rationed away efficiently, but rather, expensive additional capacity is provided which raises environmental and political concerns. The question of airport expansion becomes more and more a political question. In short, cost based allocation is a cause of cost and allocative inefficiencies and not the solution.

Pure and hybrid Price caps

Price cap regulation sets charges over a certain period in accordance with the rate of inflation (PRI) minus productivity gains (X). Unlike cost based regulation, price caps do not regulate profits, but set incentives to cost reduction. The gains from cost reduction can be kept by the regulated airport within the regulation period and might be then passed to the users via lower charges. Quality might be monitored or regulated as cost reductions might be achieved by lowering quality¹³.

Pure and hybrid price caps differ in the way that the X is set in the price cap formula. The X should reflect the productivity growth of the regulated industry in excess of the rest of the competitive industry. Pure price caps set the X without reference to the costs of the regulated firm by benchmarking while hybrid set the X with reference to the regulated cost base. Hybrid price caps provide less incentives for cost reductions as for e.g. the regulated could be a high cost firm at the regulated period in order to raise prices and profits. Hybrid price caps have been used for UK airports, temporary for Australian airports and for some European airports. Overall the experience in terms of efficiency is positive, certainly better than cost based regulation (Graham, 2008, Forsyth, 2008). Price cap regulation is superior to cost based regulation because it is forward looking, while cost plus regulation relies on historic costs. The regulatory lag of typically 5 years is sufficient to set at least some incentives towards cost reduction. In addition, price cap regulation does not regulate the charges structure according to some arbitrary cost allocations based on historic costs. A well defined price cap sets incentives for Ramsey prices as well as for a reform of weight related charges at airports with excess demand.

The current practised systems of price cap regulation are certainly not perfect and could be reformed in many ways (see Forsyth 1997; Niemeier, 2002). One option is to set the X by benchmarking. This type of yardstick regulation has been successfully practised in the electricity (Netherlands, Norway, UK) and water industry (UK). The Irish regulator conducted a benchmarking but found, during the consultation process, that the results were not robust. Also, the CAA reached this conclusion and is using benchmarking only for specific processes to obtain information on productivity potentials, thereby trying to increase incentives for cost reductions. As there are no systematic reasons, preventing regulators from robust comparison benchmarking remains an interesting option (Bouf, and Léveque, 2004, Reinhold *et al.*, 2009).

13. See CAA, 2006, and Niemeier, 2002.

Revenue sharing arrangements

Revenue sharing arrangements in the European airport industry take the form that the level of charges is inversely related to the passenger growth over a certain period. These so-called sliding scales can be combined with price cap regulation, as in the case of Hamburg, Vienna and regional Austrian airports, but do not have to be. At the German airports Fraport and Düsseldorf, they are the result of a Memorandum of Understanding between Fraport and airlines on the level of airport charges for the period 2002 to 2006. Thereafter a public contract between Fraport and the regulator, in the case of Frankfurt the Ministry of Economic Affairs and Transport of Hessen, in case of the Düsseldorf the Ministry of transport of North Rhine Westfalia, was signed. (Klenk, 2004). In case of disagreement the charges would be fixed according to cost based regulation. Most interestingly this contract has to date not been renewed for Frankfurt airport, indicating that major investments might lead to hold-up problems and high transaction costs not easily reduced by long term contracts (see below).

The core of these contracts is a revenue sharing agreement. The average charge per passenger will be determined by the future passenger growth rate. Both parties agreed that with a projected growth rate, for example 4%, average charges could be raised by 2%. Note that these are nominal prices as the agreement is not related to the price level. In the case of a higher growth rate airlines participate with a 33% share in additional revenues. With lower growth rates the airport cannot fully compensate revenue losses through higher charges. Only 33% of the loss can be compensated.

Such agreements have the important advantage that they break with the tradition of low powered cost plus regulation. Within the contract period, the airport may behave as though it is subject to a price cap, though not of the CPI-X form. Furthermore, they seem to offer some stability if demand fluctuates, as in the current economic crisis. A demand shock leads to higher charges so that the airport can cover average costs and that the airport will not face bankruptcy, which would also undermine the political stability of regulation. However, there are disadvantages, too. Firstly, in cases of Frankfurt and Düsseldorf the incentives for cost reduction and for traffic increase are rather mild as the level of charges is stabilised at a high level reflecting more the limited countervailing power of airlines. Secondly, a flat linear sliding scale guarantees the airport nearly the same revenue irrespective of output. This reduces the incentives to change the historically grown price structure and to manage efficiently capacity problems. Thirdly, it most likely creates inefficiencies and non market clearing prices. Prices move in the opposite direction of demand shifts. This can only be efficient if short run marginal costs are decreasing. This might be the case for airports with ample capacity, but most gateway airports are highly utilised so that marginal operating costs are constant or rising and opportunity costs of delays are created. Sliding scales reflect more the behaviour of a sleepy monopolist preferring a stable revenue basis at whatever cost. They lead to inefficient price structures and to the unintended consequence that a macroeconomic recession is prolonged as charges do not fall and airlines cannot adjust to a new market clearing equilibrium.

Monitoring

Monitoring is a system of oversight with the threat of sanctions for poor behaviour. Monitoring differs from abolishing *ex-ante* regulation insofar as the behaviour of airports is closely followed. The most interesting examples are Australia and New Zealand (Forsyth, 2008). On 13 May 2002 the Australian transport minister decided to phase out price cap regulation and to adopt a more light handed regulation – namely monitoring of the main airports

for a period of five years – with an independent review and the right to reverse powers of price control in case of abusive pricing. In New Zealand the approach is more general and looser, as the relevant minister can undertake a review of pricing behaviour in any industry. In 1998 the airports of Auckland, Christchurch and Wellington were subject to a review of pricing. The Commerce Commission recommended price regulation of Auckland in 2001, but the ministry did not follow up and left airports unregulated.

The strength and weaknesses depend on three aspects. Firstly, monitoring needs a credible threat (Kunz, 1999). This is first of all an institutional question. Is there an independent regulator with sufficient information and democratic support? This might be the case in Australia and, to a lesser extent, in New Zealand (Australian Productivity Commission, 2001), but it is not in those cases in which an independent regulator has never been established. Secondly, the guidelines have to be clearly and precisely stated. This has been not the case and is criticised by Forsyth (2008). Thirdly, the incentives towards efficiency depend on whether the guidelines demand cost based pricing or are incentive based. Forsyth shows that both systems are vague in this respect, but nevertheless “generally perform well in promoting efficiency” (ibid, p. 96).

Adopting monitoring might be an attractive option for other countries but, as Forsyth points out, the situation in both countries is very special in many respects. Airports are not busy due to overinvestment in the past and neither do they compete for geographical reasons. Airline competition is not as intense as in Europe or the US. Under these circumstances, traditional weight based charges are fairly efficient and have not to be reformed to manage capacity. Therefore it remains to be seen if monitoring can set incentives towards efficient pricing if capacity is scarce and airlines oppose such changes as they cannot pass higher charges to passengers as easily as with ample airport capacity.

5.4. Regulation of investment

The assessment of regulatory options focused so far on the short run cost and allocative problems with given capacity. Given the expected strong demand regulation of investment becomes more and more important and creates a number of challenging problems (Forsyth, 2008, Guthrie, 2006):

- Risk of too low or too high demand. Uncertainty and risks of future demand is common to all industries, but airports and regulators face the additional problem that prices do not signal the strength of demand, scarcity rents are created for airlines but not for airports and that the inefficiencies of airlines usage of slots might be substantial. False prices affect the level and the structure of demand in terms of share of LCC versus FSA, choice of destination, aircraft size and so on. A vertically integrated air service provider would know these prices but, unlike in other network industries, these services are vertically unbundled in air transport. Regarding this problem, price caps and incentive based monitoring are superior to cost based regulation and revenue sharing agreements because of their incentives for efficient pricing especially if combined with slot markets (Niemeier, 2006).
- Cost of new capacity. The costs of adding new capacity are not known to the regulator but fairly well to the airport. Very often new capacity is costly. If the regulator triggers the new price level to the costs of new capacity, like for BAA and ADP, there are incentives for a price capped airport to invest. If the regulator underestimates these

costs the airport will not invest¹⁴. If the regulator overestimates the costs and sets the regulated charges too high overinvestment might occur (Forsyth, 2008).

- Hold up problem. Building new terminals or a new runway are long-term projects with sunk costs characteristics. The costs of adding new capacity are not known to the regulator but fairly well to the airport. Very often new capacity is costly. Price caps have a shorter period than the revenues stream of the investment. After the investment decision of the airport the regulator might opportunistically lower prices to short run marginal costs. Anticipating this risk the airport might under invest (Helm and Thompson 1991). Therefore the investment decision depends on the credibility of regulation (Vickers and Yarrow, 1988). Cost-based regulation guarantees a safe return on the assets, but leads to overinvestment and gold plating. Hence it is hardly superior. The hybrid price cap regulation of the CAA established a clear framework that clearly signals to the airports that the regulator will leave the airport a fair return on investment for cost effective investments (Andrew and Hendricks, 2004).

Overall, there is little conclusive evidence on the empirical question if price cap leads to underinvestment. The Competition Commission has argued that BAA has not pursued investment in new capacity at Heathrow aggressively enough. This could be interpreted as an example of underinvestment. Starkie also acknowledged the incentives for underinvestment, but argues that these effects were outweighed by three factors, namely the preference of the management to avoid congestion and quality problems with users, the preference of managers to be managers of large firms and the strategy to deter entry (Starkie, 2006). Starkie provides evidence for overinvestment at regulated UK airports. One reason why it is difficult to provide a definite answer is that capacity enhancing investments create a number of externalities. The investment is ultimately decided by politics, typically basing their decision not on cost benefit rationale, but on dubious impact analysis.

5.5. *Regulation and competition*

It was argued above that regulation should be compatible with slow developing competition among airports and this raises some interesting problems.

In general competition creates positive effects, but it does not have to. The notion of competition defined as “the racing of one person against another, with special reference to bidding for the sale or purchase of anything” (Marshall, 1920, p.5) does not imply good results, and competition has to prove its beneficial effects. Forsyth (2009) has argued convincingly that competition from new entrants might decrease welfare because economies of scale and scope are lost at the main airport. Competition might also result in tight oligopolistic markets with tacit collusion and constrained capacity due to planning restrictions. The hopes that a break up of BAA is the magic bullet are certainly unrealistic (Forsyth and Niemeier, 2009). However, airport competition can certainly increase welfare in many cases. Littlechild (1983) developed price cap regulation as an instrument to protect consumers, for a short time, from the monopolistic power of a privatised public utility. As it turned out regulation has had to play a longer role in the organisation of infrastructure of network industry. Nevertheless it seems reasonable to think of regulation as a temporary device to transform a natural monopoly into a more or less

14. An interesting example is the different approaches of the CAA and the CC in the UK. Yarrow (2009) defends the CAA and criticises the CC for price capping at lower long run incremental costs.

competitive industry. Starkie (2008) argues that the UK airport industry has been transformed into a competitive industry with the exception of Heathrow. Regulation was part of this transformation and can play an important role as it safeguards private investors from opportunistic behaviour of the state (Wolf, 2003) and reduces transactions cost in the form of conflicts and litigations among the partners of the aviation supply chain (Niemeier, 2004). This is certainly relevant for European countries with a relatively high density of airports, but not for Australia or New Zealand.

Firstly, price regulation and other forms of regulation have to be independent, democratic and fair. This is important in two respects.

- A. If airports are exposed for the first time to some form of mild competition they have the incentive to engage in rent seeking. Airports might influence regulation to receive subsidies, erect barriers to entry, or increase costs of rivals in order to keep the quiet life of a monopolist or to avoid reductions in revenues and profits. Rent seeking is not confined to private airports. Also public airports are quite successful. Competition needs a fair playing field and regulatory capture distorts it.
- B. The regulation of investment showed that the system must be credible in order to avoid underinvestment. Competition increases these risks. Generally competition creates risks that airports fail as traffic shifts from one airport to another and risk that airports become very profitable. In such cases regulators might come under strong pressure to intervene and regulate profits which sets negative incentives for efficiencies.

Secondly, increasing competition implies that regulators have to decide carefully over time which airports should be subject to regulation and which are left unregulated with the credible threat to reregulate. This decision is not a matter of size and not something to be determined uniformly over markets and across countries like in the EU. Furthermore, the decision on designation should not be taken by the regulator as he might have an interest in prolonging regulation unnecessarily. In a study for the Federal government of Germany, Wolf (1997) developed a simple system of checks and balances as early as 1997. Unfortunately this was never taken up or seriously discussed – a clear failure of policy. It would also have reduced direct regulatory costs (Niemeier, 2002).

Thirdly, the currently dominant form of airport regulation is not compatible with competition (Vogelsang 1998, Niemeier, 2003). Cost regulation does not set any incentives to compete for traffic through the price structure. This is also the case for cost orientated monitoring and for revenue sharing agreements. The latter tends to neutralise revenue losses from decreasing market shares due to competition. Price caps leave the structure unregulated and allows airports to react to competition by lowering prices for competing services. This form of competition is particularly relevant for competition among capacity constrained airports in London (Forsyth and Niemeier, 2009). Furthermore, price caps set only upper limits, and firms can lower price levels in order to compete, as Stansted has done in the past to win low cost carrier traffic from Luton (*ibid.*).

Fourthly, competition among airports in the long run relies on the ability to provide enough capacity for traffic from other airports. Therefore the regulation of investment, environmental management and planning restrictions become important. It might be necessary to provide more flexibility for negotiations between airlines and airports on investment and quality and to

price noise and other externalities efficiently. However, it certainly is not necessary to give the regulator, as the Competition Commission (2008a and b) suggests, more powers to intervene in the regulatory period for the reform of regulating London's airports, as this contradicts incentive regulation and might cause gaming (Forsyth and Niemeier, 2009).

6. Summary

Given the changes in governance of airports and the stress in the supply chain of aviation, it is time to engage in a rational dialogue on regulation of airports. Economics can provide criteria for such a dialogue. Regulation should be designed to increase economic welfare in a fair and democratic process. It is argued that airports have a large potential to increase welfare. Currently airports do not perform well in terms of cost efficiency, allocative efficiency and investment behaviour. There is evidence on X-inefficiency and poor cost control. At capacity constrained airports capacity is rationed inefficiently due to IATA slot distribution rules, inefficient price structures and suboptimal slot constraints. Over investment occurs in areas with lack of demand and underinvestment at places with excess demand, indicating a wrong timing due to the non existence of price signals for excess demand and a lack of cost benefit approach at airport expansions.

These welfare losses might be at least partially due to unregulated market power. Market power can arise from a locational monopoly, as it is often not possible to build airports next to a gateway airport due to planning restrictions. Another reason might be that airports are natural monopolies with sunk costs. There is some evidence that even airports are natural monopolies, as economies of scale might range from 3 to 12, perhaps even 90 million, pax. Some Hubs are most likely constrained by scarce land leading to rising marginal and average costs. This issue requires more research as the shape and form of the long run average is not known. This lack of knowledge leads to the conclusion that the airport industry as a whole does not have market power, but some airports do have market power. Regulation must be complementary to a slow developing process of competition and not restrict competition. The rationale for regulation must be revisited periodically to assess whether it is necessary at all, which airports should be regulated and which airports should be subject to the threat of regulation.

Regulation might be substituted by competition for certain types of market structure. In this paper, the strength of airport competition was assessed for large airports. While in the US some switching of hubs occurred, hub and spoke networks have been relatively stable in Europe. The intensity of hub competition is limited by high switching cost for airlines, as hub operation involves specialised investment and scarce slots cannot be traded. Competition between hub and secondary depends on traffic rights, aircraft technology and hub congestion. It appears to be increasing, albeit from a low level. If catchment areas between large primary and secondary airports overlap, like Luton and Stansted or Bratislava and Vienna, competition might work depending on access costs and product differentiation. Unlike with airlines, potential competition has hardly any force as only few market entries occurred, generally not in areas with strong demand. The strength of airport competition has to be assessed on a case-by-case basis. There is potential to increase competition by horizontal disaggregation of BAA and ADP, by preventing airport alliances such as ADP/Schiphol, through further liberalisation of air service agreements and through slot trading.

When competition is not strong enough, regulation is an important tool for increasing economic welfare. The need for regulation should be assessed on this basis. Regulation needs well-designed institutions. It needs independency and democratic control and backing. Only a

few countries have followed the UK regulatory model. The vast majority of European countries lack independent regulatory institutions, an indication of high internal rent as a dependent regulator undermines position in case of conflict with airlines.

The scope of regulation is too narrow as, for example, central infrastructure for ground handling is not covered and, at the same time, too large – as potential competitive activities are indirectly regulated by the single till principle. The rationale for dual till is a case of second best pricing to cover fixed costs in case of decreasing average costs. This is irrelevant if economies of scale are exhausted or marginal costs are rising due to factor scarcity. Hence the single till is most probably not relevant for large airports in metropolitan areas like London or Frankfurt. The dual till forces airports with ample capacity to Ramsey pricing by weight-based as well as more sophisticated charging schemes. Therefore the welfare gain of including non aviation revenues is limited and should be balanced against the risk of distorting other markets by taxing non aviation revenues. At busy airports, single till results in a too low level of airport charges and rents for slot owners.

Regulation has to address the problem that the regulator never has as much information on costs and demand as the airport. Successful regulation sets incentives for the airport to provide this information, allowing the airport to keep part of the information rent. The various types of airport regulation address this problem very differently.

Cost based regulation, which is the dominant form in Europe and elsewhere, sets incentives for gold plating, high costs and inefficient price structure leading to allocative inefficiency. It is a major cause of the poor performance of airports.

Although price caps are only used in hybrid forms, which set the cap on the cost base at the beginning of the regulatory period, they have substantially lowered price levels in Australia, UK and at some European airports. Price caps leave the structure of charges unregulated, setting incentives to balance price structure in the direction of efficiently rationing peak and excess demand. Hybrid could be improved by benchmarking with better data adjusted for the heterogeneity of airports. Unlike with other public utilities this is currently not possible, but this might change in the future.

Monitoring is practised with mixed results in Australia and New Zealand. A major weakness is that the objectives are not clearly defined, with the risk of being practised as a loosely defined cost plus regulation. It needs an independent regulator with credible threat to reregulate.

Revenue sharing agreements in the form of sliding scales try to cope with demand shocks by allowing higher prices with lower demand and vice versa. This is efficient only if short run marginal costs are declining, which is hardly the case at busy gateway airports. It stabilises revenues, thereby reducing incentives to manage capacity efficiently. Revenue sharing agreements seem difficult to achieve if airports invest in major new runways and terminals.

Investment regulation is of growing importance as major airports face persistent excess demand. The regulation of airport investment faces the major problem that prices do not carry information on the strength and magnitude of excess demand. Slot rents are the consequence of scarce capacity and accrue to airlines under current slot allocation rules. Unlike in other public utilities, air transport is not vertically integrated so that airports and regulators do not know slot prices. Additional capacity often comes at a higher cost. Price cap must allow for

higher charges and can but not necessarily lead to optimal investment. Price cap might lead to underinvestment if the regulator cannot credibly commit to not behaving opportunistically. So far there is hardly any evidence for this type of regulatory failure in the airport sector.

Regulation must be designed to be compatible with airport competition. Therefore it is necessary to establish independent regulators in order to avoid regulatory capture and create a fair playing field. Cost regulation as well as cost based monitoring and revenue sharing agreements are not compatible with competition. These should be reformed to pure price caps, which allow firms to react to competition by changing the price structure. Price caps set upper limits and firms can also lower price levels in order to compete.

To sum up, reform of airport regulation is needed. Regulate less, but more effectively, with fair and democratic processes and institutions. Use a credible threat of regulation. Second, regulate and increase competitive forces. Implement simple price caps with strong incentives for cost savings and efficient pricing and investment. Design a competitive landscape by liberalisation of air service agreements, less horizontal integration and slot markets.

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FINANCING AIRPORT INFRASTRUCTURE: THE FRAPORT PERSPECTIVE

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Aviation Market Characterised by Rapid Change

Global air traffic has been growing steadily during the last few decades. In 2008, airports around the world handled 4.5 billion passengers, 77.9 million tons of cargo, and 66.9 million aircraft movements. The Top 100 airports handled about two-thirds of the passenger volume and more than 85 percent of the cargo tonnage worldwide last year. From 1998 to 2008, these top airports recorded a 33.4% increase in passengers and a 30.6% gain in cargo – an average annual growth rate of 2.9% and 2.7% respectively – despite the crisis years of 2001 to 2003 which faced a decrease in dynamic traffic growth due to terror attacks, SARS and the Iraq war. Despite the current economic crisis, global passenger volumes are predicted to reach 11 billion by 2027. This represents an average rise of 4.2% per year and is being mainly driven by an international traffic growth of 4.5% p.a. (*Source: ACI statistics, Global Traffic Forecast Report 2008 - 2027*). Medium and long-term confidence in growth remains strong within the airport industry.

Liberalisation of the European aviation market has resulted in tremendous air traffic growth at European airports in the previous 20 years. In particular, hub airports like Frankfurt have been benefiting from a growing number of additional flight connections to and from European and intercontinental destinations.

Changing market conditions, global airline competition and increasing pressure on cost and revenue have significantly changed the international aviation business. This has led to greater competition among airports as well. Airport competition is intensifying due to the following trends: ongoing concentration in the airline industry (global mergers and alliances), new airline business models (low cost carriers), differentiated hub strategies (the trend towards multi-hubbing), increasing overlap of catchment areas supported by high-speed rail links between the airports, and the development of multinational airport companies.

European airports are no longer mere infrastructure providers but have become fully developed businesses. Faced with the necessity of financing their own operating and infrastructure development costs, European airports have had to diversify their revenue sources – relying not only on traditional aeronautical revenues made up of airport charges but also on real estate, retailing, parking, etc.

Privatisation has become an increasingly important trend in the airport industry, accelerating commercialisation, competition and introducing even more efficiency across the airport sector. In 2001, Fraport AG became the first German airport operator to privatise (Initial

Public Offering). Whether public or private, airport operators across Europe today follow comparable management and financial models. Moreover, both have to strike a balance between meeting shareholders' expectations and a wide range of public interests.

Intense Airport Competition in an Oligopolistic Airline Industry

Route liberalisation and airport privatisation have brought about effective competition among European airports. Today, all major European airports compete massively with each other to strengthen their hub position and/or to expand their airline portfolio. This severe competition leads to a loss of market power, particularly for hub airports focusing strongly on transfer traffic.

Hub functions are not dependent on their location, so they are not strongly dependent on airports. In principle, airlines can choose where to locate their hub, although this may cause switching costs. Furthermore, the trend of liberalisation of traffic rights to the point of worldwide open sky agreements are expected to boost this development giving more choice and freedom to the airlines. Against this background, it can be stated that at most hub airports the potential for "market power" lies mainly with the (home) carriers and less with the hub airport itself.

Apart from hub competition mergers and airline alliances tend to weaken the airports' positions by increasingly imposing pressure upon the airports, forcing them permanently to improve cost efficiencies through cost-cutting measures (always possible but ultimately limited because of the high capital intensity of airports) and by optimising operational processes. Attaining the best operational performance is of significant importance, particularly for hub airports that have complex infrastructure and product diversity, aligned with fast and reliable transfer processes for passengers and baggage. Short transfer times for passengers on the hub – shown as minimum connecting time in the computer reservations systems (CRS) of airlines and tour operators – is a crucial competitive factor both for the respective hub carrier and the airport. Sufficient runway capacity is needed as well as efficient terminal infrastructure to guarantee short transfer times.

Traffic growth in the air is contingent upon adequate capacities on the ground. Hub airports like Frankfurt are especially affected by current capacity bottlenecks, because airline network structures concentrate growth in global air transportation on the major air transportation hubs. The efficiency of hubs is crucial to the future. They need to be expanded according to market needs.

Strong Need to Build Airport Infrastructure

However, the fact is that current capacities at many European airports are substantially insufficient to meet the passenger and cargo demand expected within the next 10 to 20 years. This situation applies both for major European hubs (e.g. Frankfurt, London-Heathrow) and for many secondary airports facing a growing demand for intra-European and intercontinental point-to-point traffic.

Despite the current economic crisis European airports need to finance and build much needed infrastructure to cope with the expected passenger and cargo traffic demand of the next 20 years. Unless capacity can keep pace with this traffic growth, passengers, airports and airlines across Europe will suffer from congestion, delays and service reductions. Because airport infrastructure involves extremely long lead-time in terms of planning, financing and

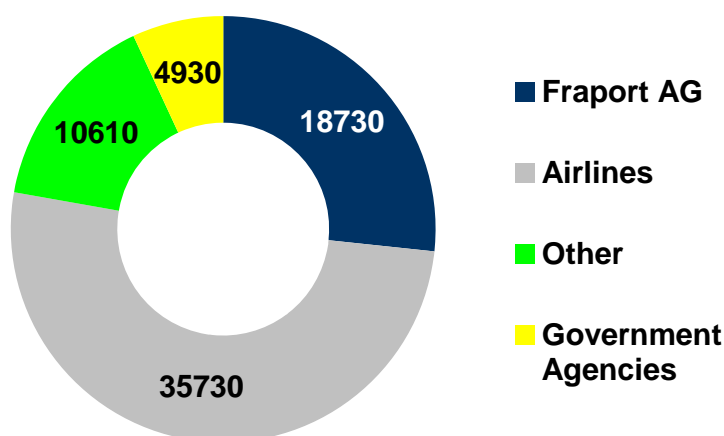
construction, it is essential that European airports keep investing to meet the future needs of airlines and passengers.

Positive Employment Effects

In Germany more than 850 000 direct, indirect and induced (catalytic effect) jobs are dependent on air transportation. In 2007, more than 300 000 people were directly employed within the air transportation sector.

More than ever, major airports today are economic engines driving the economies of their regions and beyond. The same also applies to the employment market. Prospering airports not only create jobs on site but also in the surrounding region. Between 1980 and 2007 the number of people employed at Frankfurt Airport more than doubled from 30 000 to some 70 000. The larger employer at Frankfurt Airport is Lufthansa with more than 35 000 people. Next is Fraport AG and its subsidiaries with more than 18 000 employees. Over the last 25 years, Fraport's workforce at FRA has grown statistically at between 3.5 and 4 percent per year. If one compares the employment perspectives of the expansion and non-expansion scenarios, the planned expansion of Frankfurt Airport is expected to create up to 100 000 additional jobs in the Frankfurt/Rhein-Main region and throughout Germany.

Figure 1. **More than 70 000 Employees at Frankfurt Airport**

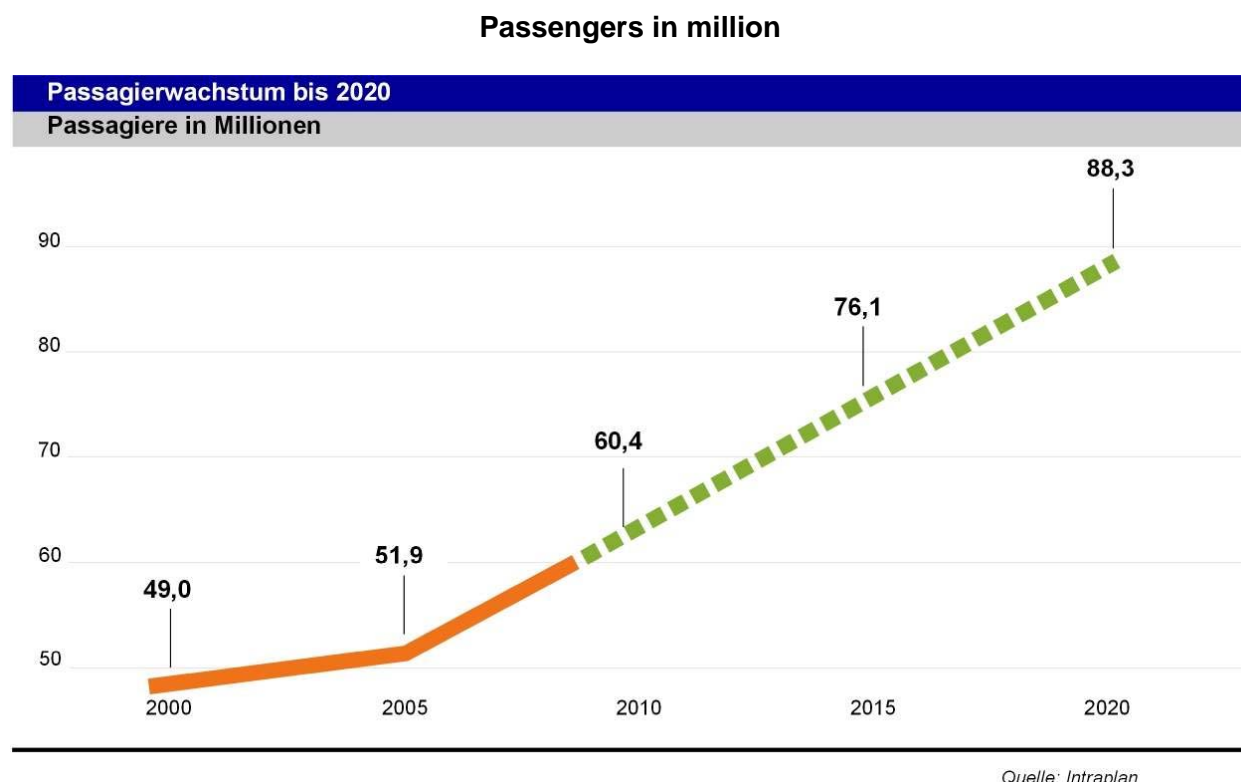


As of April 2009
 Source: Fraport AG

According to Intraplan Research Institute, a long-term forecast on the development of air traffic demand predicts that FRA will have about 88 million passengers by 2020. Compared to some 52 million passengers in 2005, this corresponds to an annual passenger growth rate of 3.5%. Cargo and mail tonnage is expected to increase by more than 70% to a total of 3.16 million metric tons in 2020. Annual demand for flight movements is expected to climb from 490 000 movements in 2005 to about 700 000 movements in 2020. These figures are not

expected to change, despite the current economic crisis. Based on past experience and statistical figures, it is more than likely that the recovery will lead to a traffic surge that brings international air traffic back to the forecasted growth path.

Expected passenger growth at Frankfurt Airport until 2020



Thus, Fraport AG is committed to its future development plans and will continue to invest some EUR 4 billion in FRA's expansion program through 2015. This includes the construction of the new Runway Northwest for landings and Terminal 3. Fraport is forging ahead with the most significant privately-financed investment project in Germany. Another EUR 3 billion are currently being invested in upgrading and expanding existing passenger facilities at Frankfurt.

What is our Challenge?

By far the biggest challenge for airports today is managing the capacity crunch to cope with future traffic growth by ensuring cost-efficient and timely provision of expanded airport infrastructure according to user demand. While airports are not labour intensive, their operations involve a very high proportion of fixed costs. Therefore, building new airport infrastructure creates a disproportionately high share of costs of capital being implemented as incremental costs, which are very difficult to cover by phased increases in airport charges.

In most cases, airlines are not paying the full cost of the airport infrastructure they use. They benefit from an under-recovery of capital costs at the expense of the airport operators. There is a growing trend of compensation losses from aeronautical revenue, since airports are often not able to achieve adequate cost recovery through aeronautical charges due to market

Responding to the airlines' claims, Fraport has increased airport charges only moderately in recent years, accepting that aviation costs by far could not be covered. Insufficient cost coverage through airport charges is also a fact at most other German airports, which could lead one to conclude that airport regulation is not necessary because market mechanisms – at least as far as the level of airport charges is concerned – seem to be operating effectively.

For this reason, it also can be assumed that the multiple call for definition of criteria for cost efficiency as part of airport price regulation is not providing the right direction, at least as long as the airports partially have to accept significant economic shortages in their aviation business. In addition, it must be stated that airlines and other airport users themselves have a significant impact on the design of airport infrastructure and handling processes by defining their respective requirements; therefore, they have a significant effect on the cost efficiency of airports.

Fraport is prepared to continue its efforts successfully to increase Frankfurt Airport's efficiency in the coming years and will reach this goal – without bureaucratic catalogues of efficiency and over-regulation – simply due to market needs.

Nevertheless, European airports need regulatory conditions to cope with the challenges of the rapid market changes.

- Without an appropriate return on assets no investment in necessary new airport infrastructure will be possible.
- Without pre-financing of expanded or new airport infrastructure through airport charges it is likely that in many cases airports will not be able to manage high incremental costs sufficiently and economically.
- Investors demand long-term security when financing airport infrastructure projects.
- Protecting airlines from the possible misuse of airport monopoly positions in original markets (does not apply to hub airports).
- Creating a level playing field for the competition among airports.
- Airports and Airlines need a framework for discussing airport charges.

Assessment about the New Directive on Airport Charges

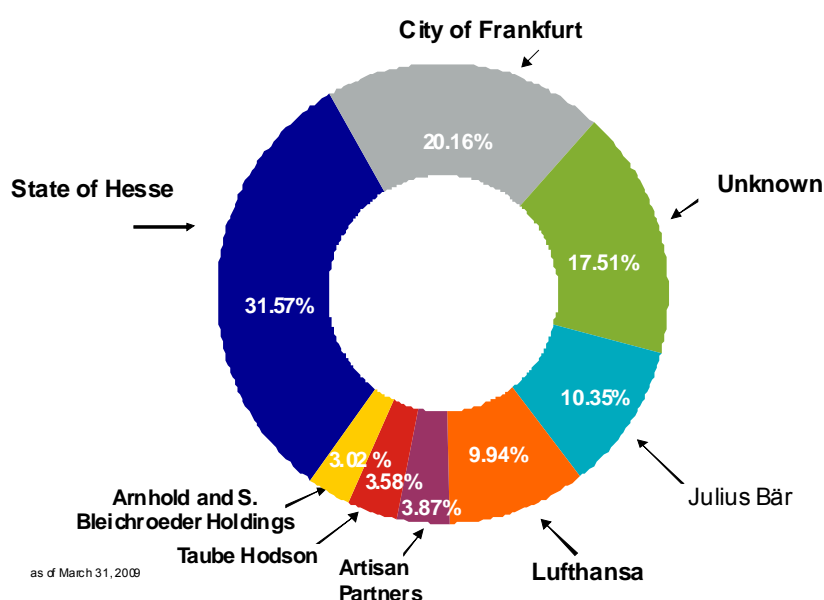
In this respect, Fraport welcomes the new EU Directive on Airport Charges, which has been adopted by the European Parliament and Council in March 2009. The directive is the template for setting airport charges within the EU member states and applies to all European civil aviation airports serving more than five million passengers per year. On the one hand, the directive contains important clarifications in terms of determining, consultation and approval of airport charges by making use of ICAO guidelines; on the other hand, it provides member states with the necessary flexibility for implementation into national law, taking into account the diversity of airport charges systems and different needs at the national level.

Basically this is the right approach. However, despite all clarifications the directive fails to recognise that airports need to have an incentive to finance and develop new infrastructure. A

stronger commitment of the directive in regard to the issue of pre-financing of airport infrastructure would have been desirable.

In Germany the setting of airport charges is subject to governmental approval according to Article 43a LuftVZO (Air Traffic Licensing Regulations) based on the German National Air Transportation Act (Luftverkehrsgesetz). Responsibilities are clearly defined: The Federal Ministry of Transport (Bundesministerium für Verkehr, Bau & Stadtentwicklung) acts as a supervisory body at the national level and the competences of the government agencies – performing monitoring and approval of airport charges – are performed at the state level. As for Frankfurt Airport, the Hesse Ministry of Economics, Transport, Urban and Regional Development (HMWVL) – which is the responsible government entity for aviation – is clearly separated and acts independently from the Hesse Ministry of Finance, which represents the state’s 30-percent shareholder interest in Fraport AG.

Shareholders of Fraport AG



Source: Fraport AG

There is no need to replace Germany’s well-functioning decentralised system of economic oversight by establishing a central supervisory authority for airport charges that would create inefficient bureaucracy and over-regulation.

Why Fraport Favours the “Dual Till”

In terms of the application of the so called dual till or single till principles, Fraport welcomes the freedom of choice for EU member states. Regarding the assessment of airport charges, Fraport clearly votes for the application of dual till, which means the strict separation between aviation and non-aviation and the relevant cost and revenue. Basically, Fraport considers the

dual till to be an appropriate projection for airport regulation, offering stronger economic incentives for investments in new airport infrastructure than the single till approach. The latter has to be declined, since it creates regulation where no regulation is needed. There is little incentive for the airport to maximise economic efficiency or to invest in commercial activities when the profits involved are systematically used to subsidise the airlines through lower charges. Only dual till makes the persistent under-funding of the aviation sector affordable, justifies the development of airport infrastructure and, first and foremost, allows commercially orientated “airport cities” to be created – for the benefit of all.

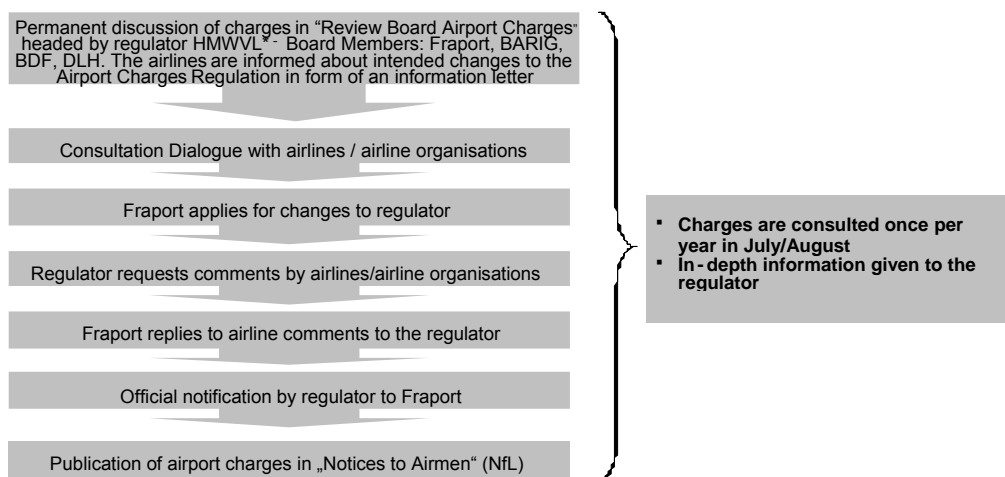
Following the dual till principle does not necessarily mean that cost coverage in aviation can be achieved. Even under a dual till regime an airport may be forced by the market not to recover fully its aeronautical costs by the respective charges.

Moreover, the dual till offers enough and even more flexibility for charges agreements between airports and their users. Fraport had agreed upon a mid-term agreement with the airlines on the level of airport charges for the period 2002 to 2006. Simultaneously, a contract under public law between Fraport and HMWVL has been effective. The average charge per passenger was determined by the future passenger growth rate agreed according to the traffic forecast for the period of the contract. Fraport and the airlines agreed that if the projected growth rate was met airport charges could be increased by two per cent on average. In the case of a *higher* growth rate, the airlines participated with a 33% share in additional revenues by lowering charges in the next period.

In case of a *lower* growth rate *one* third of the shortfall in revenue would be compensated by increasing charges in the following period. The other *two* thirds of the shortfall had to be compensated for by other income generated by Fraport: *i.e.*, from the non-aviation business. Without the dual till this agreement would have hardly been economically affordable and viable to Fraport.

Due to uncertainties – particularly for the cost development resulting from FRA’s huge investment program – both sides, airport and airlines alike, did not aim for a mid-term follow-up contract. Thus in 2007 Fraport returned to the process of setting charges, consultation and application on a year-to-year basis.

Consultation Process at FRA all Airlines are continuously involved



Source: Fraport AG

However, the so-called "Review Board Airport Charges Frankfurt", which was established in 2002 as part of the mid-term agreement, has been continuing up to now. Consisting of representatives of the airline associations, Lufthansa and Fraport and headed by HMWVL, the board is aimed at following up all relevant charging aspects at Frankfurt Airport in regular meetings throughout the year. It is obvious that the level of transparency on the issue of airport charges discussed in the gatherings of the board clearly goes beyond the information distributed in the regular consultation meeting on airport charges, which usually takes place once a year prior to the official charges application. From the Fraport perspective, the "Review Board Airport Charges Frankfurt" can be considered as well-functioning example of confidence and cooperation between airport and airlines – it clearly stands for more transparency, market-orientation and less regulation.

Conclusion: What are the Key Messages?

- Airports today are commercially operated businesses confronted by an airline industry that is increasingly consolidating and putting pressure on airports to lower their costs and prices.
- There is strong demand to build new airport infrastructure and facilities, which need to be financed by a sufficient level of airport charges. However, airports often are not able to achieve full coverage of their aeronautical cost basis.
- Airport regulation must provide incentives for the airports to invest in new infrastructure. In this regard, the new EU directive on airport charges falls short of the airports' expectations. Airport financing should be considered as a key issue in the course of implementing the directive at the national level.

- In terms of airport regulation, a well-proven decentralised system of economic oversight has been established in Germany. There is no need to replace this by implementing a national supervisory body.
- Given market realities any inefficient over-regulation must be avoided.

CONCLUDING REMARKS AND DISCUSSION

David Thompson

1. Introduction

The Workshop examined the development of gateway infrastructure for aviation. It focused upon financing airport infrastructure through charges in the light of competitive interaction between airports and airlines – considering the circumstances in which pricing and investment should be regulated and how this might most successfully be done so as to foster airline and airport development that best serves the interests of air passengers and the wider community.

The format of the workshop involved an introductory presentation (and paper) on key issues from Professor Hans-Martin Niemeier (University of Bremen) followed by three sessions presented by distinguished industry experts: the first setting out the views of regulators, the second the views of airports, and the third the views of airlines.

Workshop participants had also been able to consider a paper by Professor Tae Oum (University of British Columbia) providing a survey of the evidence on the impacts of liberalisation and regulatory reform in aviation, and also the report of an expert Round Table on “Competitive interaction between airports, airlines and high speed rail” organised by the Joint Research Centre of the International Transport Forum and the OECD in October 2008.

The purpose of this report is to summarise the key themes which emerged from the discussion of the various presentations and the emerging conclusions which these discussions suggest. It is not intended to summarise here the individual presentations or supporting papers (all of which are separately included in this volume), nor to set out a detailed record of the workshop’s discussion. Rather the focus is on the key themes and the emerging conclusions.

The structure of the report is as follows. The next section sets out the key themes which framed the discussion; these include:

- The critical role which transport links play in facilitating economic growth and providing for significantly improved welfare in both developed and developing countries.
- The risk that shortfalls in transport infrastructure capacity, in the face of rapidly growing demand over the medium term, will act as a brake on growth unless there is adequate investment in the right kinds of capacity.
- The risk that present institutional and regulatory arrangements have not kept pace with both the rapid pace of change in the aviation sector and with evolving best practice in economic regulation; and, collateral to this
- The risk that present arrangements may fail to deliver the required investment in a timely and cost effective manner.

The discussion also recognised the significance of aviation's environmental impacts – including noise and air quality, but particularly climate change – and the high degree of relevance to public (and private) policy making. The emerging conclusion from this discussion was that the best approach would usually involve specific environmentally – focused policy interventions of the type discussed in detail in the complementary workshop – Environmental Impacts of International Transport – rather than modification of policies on competition, pricing and investment in aviation.

The third section of the paper builds on this discussion of key themes to consider the opportunities for reform, in particular:

- Issues to do with the realisation of the benefits of enhanced competition and, related to this,
- Issues concerned with the regulation of market power;
- Issues concerned with making the best use of infrastructure capacity;
- Issues around incentivising investment in the right kinds of capacity, and delivering this in timely and cost effective ways.

The final section of this paper sets out some key themes emerging from this discussion and proposes some evolving conclusions suggested by the discussion.

2. Key themes framing the discussion

Transport infrastructure is important to economic growth in developed and developing countries

A substantial body of research evidence shows the prospective importance of transport infrastructure to productivity and economic growth. A recent review by Professor Nicholas Crafts (in the Oxford Review of Economic Policy, 2009) outlines the mechanisms through which investment in transport infrastructure can raise productivity in the transport using sectors of the economy. Some of these effects are direct and well understood – for example, where investment provides for faster and more reliable journeys, which in turn reduces the resources incurred in travel by passengers or goods. But some of these effects are more indirect – for example where investment improves connectivity and networking both within and between major cities in a country, or where investment materially reduces international trade costs (as suggested in a study by Anderson and van Wincoop (2004). These indirect effects are, correspondingly, more difficult to quantify with confidence and evidence is less comprehensive. Nevertheless, the results from the research studies which are reviewed by Professor Crafts show that investment in infrastructure has a positive impact upon output and productivity and that the less tangible indirect impacts discussed above can be important in particular market circumstances.

A growing body of research evidence has looked more specifically at aviation infrastructure and this shows a positive impact upon productivity and growth, through facilitating trade and increased connectivity (particularly between major business centres). For example, a study by IATA (2007) estimated that increasing a nation's connectivity by 10% could raise its GDP by 0.07% (with a relatively stronger impact in developing countries) whilst a study for the UK

(Oxford Economic Forecasting 2006) estimated that a 10% increase in business air travel could boost productivity by 0.6%. Professor Oum's paper reviews several studies which show the impact of reduced international travel costs in boosting trade volumes and looks also at studies which show the positive impact of improved air services within the US upon a region's employment (particularly in high tech service sectors). Whilst the exact impact of aviation infrastructure upon productivity and growth is difficult to quantify with confidence – and the existing empirical estimates remain highly uncertain – it is reasonable to conclude from the research evidence that these impacts are potentially significant.

These positive impacts upon productivity and growth will often be at their most significant for airports serving major metropolitan areas. This is because these airports are usually disproportionately important for business travellers (and particularly high value business travellers). In terms of the previous discussion, the direct effects of infrastructure investment in reducing business costs are likely to be greatest for these types of airport. But the indirect benefits for productivity and growth – improving connectivity between major cities and reducing international trade costs – are also likely to be of most significance for airports in major metropolitan areas.

Recognising all of this, however, is not the same as saying that *all* investment in aviation infrastructure is necessarily good for productivity and growth – or that all of the benefits for productivity and local economic development which are sometimes claimed for airport investment should be accepted uncritically. In cases where investment in new airport capacity is publicly funded (at least in part), or requires public regulatory approval, then there are well recognised risks of optimism bias arising as sponsors seek to press the political case for investment.

What all this suggests is that public policy decisions on infrastructure investment will be more likely to be successful in achieving worthwhile outcomes when based on robust economic evidence. There is now a reasonably good understanding of the key considerations:

- First, congestion (present or prospective) is a key driver of the benefit of additional capacity; absent prospective congestion, new investment is unlikely to show a good economic return.
- Second, the economic costs of congestion are large and these will be greater:
 - where travel alternatives are limited;
 - where business related travel is an important part of the market;
 - and where in addition, the localities served specialise in economic sectors for which connectivity is important.

Capacity shortfalls in the face of rapidly rising demand risk acting as a brake on economic growth, absent new investment

Aviation is a sector of the economy which, as is well known, has seen rapid demand growth; the paper prepared for the Workshop by Professor Oum and colleagues provides a detailed analysis. For example, between 1990 and 2007 total world demand (measured by revenue passenger kilometres) increased by an average 4.4% a year. This has reflected both a propensity for people to spend a higher proportion of their household budget on air travel as

incomes have risen (on average) over time, coupled with a fall in the relative costs of air travel due both to technical progress and the impact of airline liberalisation in improving efficiency. Whilst the economic recession has clearly acted to dampen demand growth at present, over the medium term future we can expect that demand will re-establish growth as the world economy recovers. In relatively mature markets – such as North America and Western Europe – demand growth can be expected to be considerably slower than historically (although still material). And in the developing aviation markets in Asia – and the long haul routes connecting to Europe and North America – high growth can be expected to continue. Key uncertainties on the speed of future growth relate to the medium term recovery of growth in the world economy and to the impact of climate change policies. But it seems likely that some significant level of growth in air traffic can be expected over the medium term.

This growth will put obvious pressure on airport capacity- which in some cities is already stretched. To give one illustration, from London, politically controversial proposals to add a third runway at Heathrow and a second runway at Stansted will, taken together, barely match the forecast increase in demand over the next twenty years (Department for Transport, 2009a). But pushing capacity limits harder – with associated increases in costs, congestion and delay – will start to inhibit aviation's contribution to productivity and growth. To illustrate – again using the case of London – the two additional proposed runways (at Stansted and Heathrow) are together estimated to generate economic benefits worth around GBP 30 billion (measured as a present value over the projects' lives with negative environmental impacts netted off; Department for Transport, 2009a). Furthermore, congested capacity is likely to inhibit the development – or the sustainability – of airline competition, putting at risk at least some of the considerable benefits of liberalisation to airline passengers and, indirectly, aviation's contribution to productivity and growth.

All of this puts a premium on delivering the right kinds of additional capacity to meet this increased demand. But this will be significantly shaped by the regulatory and institutional frameworks, a subject to which we now turn.

Regulatory arrangements have not always kept pace with the rapid developments in the aviation sector over the last three decades or with developments in regulatory best practice

Recent decades have seen profound changes in aviation markets – on both the demand and supply side – together with profound changes in the regulation, ownership and the organisation of both airports and airlines: changes which have both prompted and responded to the changes in market conditions.

On the demand side, the rapid growth in passenger numbers is the most obvious indicator of change and this has been associated with various changes in market characteristics – in terms of both the purposes and distances of travel as well as changes in the social composition and the service quality preferences of travellers. On the supply side, the liberalisation of air services in many parts of the world has changed competitive conditions and prompted profound changes in the airline industry – from markets where competition was heavily restricted and the main suppliers were flag carriers or established regulatory incumbents to a world of alliances, low cost carriers and often intense competition. Over the same period, airports have in many cases shifted to a more commercial framework of organisation and method of operation, in some cases accompanied by full or partial privatisation.

Taken together, the evidence shows that the changes in regulation and organisation over the last three decades have resulted in significant overall benefits to air travellers and have helped the aviation industry to respond in a highly effective way to the market and technological drivers which have re-shaped aviation across the world.

Professor Oum's paper for the Workshop reviewed this evidence. The seminal analysis by Morrison and Winston (1986) estimated that de-regulation of air services in the US resulted in benefits to passengers worth USD 6 billion and gains to carriers' stakeholders (profits and labour) worth USD 2.5 billion. Studies in a range of markets across the world show that liberalisation has generally been associated with lower (overall) relative prices and/or improvements in service quality (see Professor Oum's paper). These benefits have been possible because de-regulation has both facilitated improvements in airlines' efficiency – in particular by enabling the more efficient design of route networks and the more efficient design of passenger-responsive pricing schedules – and because de-regulation has also incentivised improvements in efficiency, by providing business opportunities for the more innovative and efficient to capture market share from those less able to compete.

As already noted, these significant improvements to the efficiency of the aviation sector will also act to raise productivity in sectors of the economy which are significant users of air transport – by lowering the costs of doing business and by improving connectivity – and so providing additional indirect benefit to the world economy.

In sum this adds up to a very significant achievement and one from which the aviation industry, and its policy makers, can rightly claim great satisfaction. Turning to the future, the central question discussed at the Workshop – and hotly debated – was whether the organisational and regulatory reforms which have delivered such successful outcomes over the last three decades also provide the best framework for moving the aviation sector forwards over the coming decades.

The discussion suggested that, at least in part, the answer to this question should be yes. There remain many markets where de-regulation policies remain incomplete or where there remain institutional barriers to fully effective competition. In these circumstances, the evidence from the last three decades of regulatory reform suggests strongly that widening and deepening the working of competition has the potential to yield significant benefits.

But there are also two questions of concern:

- The first is whether the institutional arrangements and regulatory methods which are in place reflect current thinking on regulatory best practice, or whether there is scope for improvement.
- The second is whether current institutional and regulatory arrangements provide the best approach for the forward looking challenges of demand growth and constrained capacity.

On the first question, the paper provided to the Workshop by Professor Niemeier compared key aspects of the existing regulatory arrangements for airports in different European countries, with a benchmark of best practice suggested by the emerging research evidence on the relative effectiveness of different approaches. Professor Niemeier's conclusion is that, in most parts of Europe, current arrangements could be improved to match the best practice

suggested by the research evidence. It is likely that a similar conclusion would be reached in many other parts of the world. Interestingly, Professor Niemeier's conclusion is echoed in the initial findings of a review of airport regulation which is taking place in the UK (see Department for Transport 2009b; this is a particularly interesting observation given that the UK scored relatively favourably in Professor Niemeier's analysis). It is perhaps worth emphasising that what these findings suggest is not so much that the regulatory and institutional arrangements that have been adopted in many parts of Europe were mistaken in conception, but rather that as our understanding of what constitutes best practice has developed then so this provides the opportunity to make improvements. Perhaps not surprisingly, these conclusions prompted a lively debate at the Workshop and some participants put forward arguments in favour of the present arrangements in Europe. What perhaps can reasonably be concluded is that the emerging research evidence on the effectiveness of different forms of regulation provides the opportunity to consider potentially beneficial reforms. This is the approach that will be reflected in the more detailed discussion of specific regulatory issues in the next part of this paper.

On the second question, the key issue – and one which is central to the Workshop's purpose – relates to demand growth and capacity utilisation. This is a generic issue which extends to several other sectors which have undergone similar types of regulatory reform over the last three decades; for example, gas and electricity supply. A recent paper by Professor Dieter Helm (Oxford Review of Economic Policy, 2009) provides a detailed overview of this issue. In a nutshell, the question of concern is whether existing regulatory arrangements are adequate to ensure the efficient utilisation of constrained capacity and to incentivise timely additions in the right parts of the market. The basic problem is that the existing arrangements were often established (or owe their provenance) to market conditions during the 1980s when capacity was often in generous supply – reflecting both the well established tendency for public provision (or intervention) to goldplate capacity provision, coupled with the unanticipated depression in demand growth flowing from the oil price shocks of the 1970s. Given this generous capacity endowment, the most important issue during the 1980s was typically (although obviously not in every location) to move toward less over-provision of capacity – in other words, to sweat the assets. Measured against this task, the regulatory arrangements have proved very successful.

However, demand growth over the last three decades has typically shifted the balance between supply and demand. The forward looking issue – in a world in which demand is expected to establish significant growth over the medium term – is whether present regulatory arrangements are adequate to:

- First, incentivise the most efficient use of capacity in places, and times, when it is in short supply.
- Second, to incentivise the provision of additional capacity in the right places on the right timescale (and vice versa); and
- Thirdly, to do so at an efficient level of costs.

In his report for the Workshop Professor Niemeier reviewed evidence from various research studies on these issues. He concluded that there is significant scope for obtaining greater value. Perhaps unsurprisingly, this conclusion prompted a lively debate.

On the first question – making the best use of existing capacity when it is scarce – it is noticeable that the present methods used in aviation are dis-similar to those used in many other sectors of the market economy where, in many cases, differential pricing and product packages (of varying degrees of sophistication) are used to match supply to the highest value uses. For airport infrastructure, in contrast, the most usual approaches involve either rationing by queuing or a limit on the numbers of slots, which are then often allocated between airlines using administrative (rather than market based) procedures, which put a high weight on historic utilisation. The studies reviewed by Professor Niemeier have attempted to estimate the economic costs of using these arrangements in preference to a market based approach. For the US, Morrison and Winston estimated, in 2007, that the existing arrangements – a mix of rationing by queuing and slot trading in selected markets – resulted in economic costs of USD 6 billion annually. In Europe, a study by Mott Macdonald in 2006 (for the European Commission) concluded that the introduction of secondary slot trading (to the existing IATA slot allocation system) could similarly realise large economic benefits.

Of course it needs to be acknowledged that these estimates – though reflecting very thorough research – are inevitably uncertain. In particular, it is difficult to be confident about the ways in which a market in slots would work in practice and difficult to be certain how far practical frictions might erode at least some of the estimated benefits. However, it is also worth noting that:

- The costs of present arrangements can be expected to rise as increasing passenger numbers tighten the balance between demand and capacity at key pinch points.
- Capacity constraints more usually arise at airports serving large metropolitan areas, where aviation's contribution to productivity and growth is at its most significant.
- Capacity constraints are likely to raise entry costs and thereby weaken competition in air service markets, putting at risk some of the gains from liberalisation.

On the second question – providing additional capacity in the right locations on the right timescale – Professor Niemeier concludes that investment has often been sub-optimal, with excess capacity in some locations and, elsewhere, underinvestment at locations with capacity constraints. There was an interesting discussion on this at the Workshop. It certainly seems that the institutional and regulatory reforms of the last three decades have had some success in sweating the assets and reducing excess capacity. For example, Professor David Starkie (2008) has carried out an interesting and persuasive case study of the UK market which supports this view. It is less clear that investment is being carried forward effectively to reduce capacity constraints. For example, a major study by the UK's Competition Authorities (see Competition Commission 2009) concluded that investment at London's airports has been too slow – a conclusion which is widely, but not universally, supported.

On the third question – whether cost levels are efficient – the research evidence is less clear cut reflecting, at least in part, the intrinsic difficulties of measurement in circumstances where regulatory reforms are sometimes relatively recent. Perhaps unsurprisingly, the discussion at the Workshop on this issue showed little consensus. However, the research evidence does show clear support for the comparative effectiveness of some particular types of organisational arrangements (see the study by the Air Transport Research Society (2008)). For example, by out-sourcing services such as ground handling or the operation of terminals, airports often achieve higher efficiency scores in comparison with airports where these

activities are vertically integrated. As such, the research evidence suggests opportunities for organisations looking to improve their performance.

Drawing together this discussion of present regulatory and institutional arrangements suggests the following key conclusions:

- First, that the changes of the last three decades – liberalisation of competition and collateral changes to regulation and/or ownership – have been very successful in creating enormous benefits to air passengers and to facilitating the sector’s response to rapidly changing market conditions. In turn, these changes in aviation have provided a material and worthwhile contribution to productivity and growth in both developed and developing countries.
- Second, that there are opportunities to widen and deepen this approach in markets where there remain institutional or regulatory barriers to fully effective competition – and this has the potential to yield significant additional economic benefits.
- Third, that looking forwards there are material risks to aviation’s contribution to productivity and growth. These risks relate both to keeping aviation’s institutional and regulatory arrangements up to date with best practice and also – in particular – adapting these arrangements to reflect a rapidly changing market and the shifting balance between demand and supply for infrastructure, which is making congestion an increasingly important issue.
- Fourth, that whilst the value of these risks cannot be precisely quantified – and some were contended in the Workshop – the evidence suggests the potential for significant benefits from improving the present ways in which we make use of congested capacity and from improving the present ways in which we incentivise the delivery of additional capacity where it is needed.

These themes will be used to frame the discussion of more specific regulatory and institutional reforms – which is the subject of the next section of this paper.

3. Opportunities for reform

Enhancing competition has the potential to realise benefit and to reduce the costs of market power and regulation

The previous discussion documented the considerable economic benefits which have already been achieved through liberalisation of air service markets. It was also noted that there remains considerable scope to realise further benefit through widening and deepening in markets where institutional or regulatory barriers are impeding effective competition. In his paper for the Workshop, Professor Oum discussed, in particular, the scope for further liberalisation of the intra North East Asia market (possibly moving towards an Open Skies bloc) and the scope for further liberalisation of inter-continental markets along the lines of the EU-US Open Aviation Area.

Of particular importance to the Workshop’s aims, is the possibility of improving the overall effectiveness of the airports sector through enhanced competition. There is a 2-way interaction here: greater liberalisation of air service markets will sometimes be critical to the development

of greater competition between airports. At the same time, greater effectiveness in the airports sector will sometimes help prevent emerging capacity constraints from weakening competition in air service markets.

The case study of the UK by David Starkie (discussed earlier) provides evidence that workable competition can be developed in at least some airport markets (as, unintentionally, did the Dutch aviation tax) with beneficial results in the case of the UK (and dis-beneficial results in Holland).

The evidence suggests that not all airports (or even many) have market power: we have a good analytical understanding of the key factors which will determine the scope for competition in a particular market:

- First, are the characteristics of demand – in particular, is demand locationally specific (which will reduce the scope for competition) or is it more footloose (for example, with a significant role for interline traffic) increasing competitive opportunities.
- Second, are the characteristics of supply – whether there is competing capacity and, if not, what are the nature of entry costs.
- Third, the supply/demand balance is important – a tight fit will inhibit competition, because it is more difficult to serve new markets or expand existing ones (whereas a loose fit will facilitate competition as airports seek new business at low marginal cost).
- Fourth, is the question of market organisation – in particular, whether there are horizontal (airport-airport) or vertical (airport- airline) ties which (may) foreclose competition.
- Fifth, there may be an issue of airlines market power – this may foreclose competition in air services through biases to the structure of airport charges, or may depress the overall level of charges.

This discussion suggests that the scope for competition in airport markets will be shaped both by factors which are intrinsic to the market – and hence less susceptible to public policy – but also by factors which can be shaped by policy choices. This both suggests a role for public policy in enhancing competition in airport markets, but also cautions that this role may be limited in some cases by the intrinsic characteristics of demand and supply outlined above. The key question is then how public policy can be used to beneficially enhance competition and reduce the costs of regulation in airport markets. The discussion of the presentations and papers at the Workshop suggested a range of promising approaches – some more relevant to individual circumstances than others:

- First, greater air service liberalisation will sometimes be needed; the role of LCCs in developing the market position of some of the second tier European airports provides a good illustration of the potential.
- Second, it is important to remove horizontal ties (airport-to-airport) which reduce competition; the recent moves by the UK's competition authorities to separate ownership of the three largest London airports provides a particularly powerful illustration.

- Third, it will be important to consider whether there are vertical ties (airport-airline) which reduce competition. Given that there will often be public policy benefits, as well as costs, from horizontal or vertical ties then interventions will often best be based on case specific evidence rather than *ex ante* rules (as in some other areas of competition policy); a requirement for the transparency of any agreements is a key pre-requisite for this to be effective.
- Fourth, providing access to slots (e.g. through a secondary market) will be important where capacity is constrained.
- Fifth, it may be feasible to consider competition promoting policies (e.g. separate terminal ownership).
- And finally, the design of other public policies (e.g. on surface access) may have implications for competition.

Although there are opportunities to enhance competition in airport markets – and probably most have the potential to be competitive – there will be some circumstances where the underlying market characteristics will nevertheless leave some airports with residual market power. These conditions are most likely, although not exclusively, to arise in large, densely populated urban areas – where much traffic has strong locational preferences and where environmental considerations often mean that capacity expansion is constrained. The significance of this is that, as discussed earlier – it is in these locations where aviation’s contribution to productivity and growth is often at its greatest. Thus, although regulation of market power may only be relevant to a relatively small number of airports – given appropriately designed policies to enhance airport competition, these nevertheless are the locations which are fundamentally important to aviation’s contribution to productivity and growth. It is to issues concerning the regulation of market power which we now turn.

Modernising regulation can materially improve efficiency in airport markets where market power is embedded

The key question, then, is how can public policy best reduce the adverse consequences of market power (whilst minimising the collateral costs of regulation)? The discussion of the presentations and papers at the Workshop provided a number of suggestions:

- First, policy should recognise the potential for regulation to detriment efficiency (whilst seeking to reduce the costs of market power) and should seek to balance the costs of intervention against the prospective benefits, through a proportionate approach – using an evidence-based approach to setting the balance.
- Second, there should be a differentiated approach – applying regulation where necessary to reflect variations in market power across markets and over time. As discussed above, most probably most airports don’t hold sufficient market power to justify regulation (over and above the provisions of general competition policy) but those that do will often, by their nature, be particularly important to aviation’s contribution to productivity and growth. So “quality rather than quantity” is probably a key attribute of an effective regulatory policy.
- Third, regulatory policy should build upon the principles of good governance suggested by the research evidence on the practice of regulation. In summary,

regulatory authorities should be independent and democratically accountable and the regulatory process should be open and transparent (Professor Niemeier's paper for the Workshop discusses this research evidence).

- Fourth, regulation should focus on protecting consumers against the risk of abuse of market power. This principle raises two particular questions. The first relates to the scope of airport services which should be covered by regulation, where application of this principle would provide opportunities to improve effectiveness at some airports by excluding activities which are inappropriately included within scope at present, and adding others which should properly be included. (Professor Niemeier's paper provides some examples; particularly important is the exclusion from price regulation at some European airports of central infrastructure charges, such as baggage handling. This provides opportunities to shift price increases on to these unregulated charges.) The second question relates to the wider public policy issues to which airports are particularly relevant – especially their environmental impacts and their contribution to productivity and growth. Here, the Workshop's discussion suggested that these are best dealt with through separate and specific policy interventions (e.g. emissions trading for carbon emissions).
- Fifth, regulation should reflect emerging evidence on effective instruments – price caps, quality floors and appropriate investment incentives. Practice on the first of these is well established and practice on the second is developing; Professor Niemeier's paper discusses the research evidence. The third issue – getting the right investment incentives – remains challenging and is discussed further below.

Making the best use of constrained airport capacity can significantly improve aviation's contribution to productivity and growth

As discussed previously the present methods which are used to ration airport capacity where it is scarce – typically either rationing by queuing or the administrative allocation of a fixed set of slots – have very significant economic costs to travelers and, in some cases, to airlines. This is particularly detrimental to aviation's contribution to productivity and growth, because capacity constraints are most usually found in the major metropolitan areas where – as discussed earlier - aviation's importance to economic growth is often at its greatest. And this is a serious problem which is likely to get worse in future, as the growth in passengers risks out-running the additions to capacity which can be made at what will often be environmentally and socially sensitive locations, in a post-recession world in which finance (particularly public finance) will often be less readily available.

Given these costs and barriers to investment in new capacity it is important, and economically efficient, to make the best use of existing assets. This theme also emerged as an important conclusion from the Eddington Transport Study (Eddington 2006), which looked at the contribution of transport investment to productivity and growth in the UK. The Eddington Study found very considerable scope for making better use (in terms of getting higher economic value) from many types of transport infrastructure in the UK (and particularly roads). The Eddington Study saw better use as an important step toward getting the best balance in the growing tension between, on the one hand, the costs to productivity of congestion and delays on crowded infrastructure and, on the other, the financial, environmental, and social costs of investment in new capacity.

In terms of airports, the papers and presentations discussed at the Workshop provided several proposals for making best use of capacity:

- First, that slot limits will often be more efficient at rationing scarce capacity than queuing (particularly as the capacity constraint tightens)
- Second, that a market based allocation of slots – where a market can be either primary or secondary – will usually enable capacity to be directed toward higher value uses better than an inflexible allocation
- Third, that congestion charging – whether as part of a charges structure or through a secondary slot trading market – will both help make the highest value use of existing capacity and also provides a direct signal of the investment value of scarce capacity

As discussed above, the research evidence suggests the scope for very substantial economic benefit from making better use (meaning higher value use) of constrained capacity than we do at present. It needs to be recognised, however, that there are practical barriers which have thus far prevented these benefits being realised. The key issue, then, is to develop these principles into a workable proposition which will command support. The barriers are both technical, but are also shaped by the gains and losses which might result from reform. The technical problems include co-ordination and price stability as well as avoiding the risk that congestion charges (are perceived to) turn into abuse of market power. The patterns of gains and losses reflect the significant commercial value that de-facto slot rights at congested airports hold, and the risks and opportunities that might result from reforms. Developing a workable solution to these problems offers a major prize – to passengers, to the aviation industry and to the wider economy – and the issue is set to become more pressing with rising demand.

Getting investment signals better aligned can improve efficiency

As already discussed, the research evidence shows considerable scope to improve the effectiveness of decisions on additional capacity – at present, there are examples both of over-provision at some locations and under-provision at others. In looking at how to improve investment signals, it is useful to distinguish between airport markets which are (potentially) competitive and those where there is residual market power.

In the former case, then market signals (prospective demand and associated revenues) provide the central investment incentive. The case study of the UK by Professor David Starkie shows how this can work effectively in practice. There are two key public policy issues that need to be resolved:

- First, there needs to be appropriate (evidence based) policies to assure alignment of private and public interests – in particular in relation to aviation’s environmental impacts and impacts on productivity and growth – so that, where material, these impacts are reflected in prices
- Second, there needs to be effective sharing of the risks associated with stranded sunk assets (where an airport faces competition there is an evident risk to losing business before a long-lived infrastructure investment is fully remunerated). Professor Starkie’s case study shows how long-term contracts between (key) airlines and individual airports can play this role effectively.

In cases where an airport has material residual market power, then the regulatory controls provide the central investment incentive. As before, collateral policies to reflect environmental and productivity impacts are needed. The remaining key issues – in an evolving subject – relate to how to best structure price and quality controls so as to align commercial and social returns to investment (in relation to both the scale and timing of investment). The research evidence suggests that price caps are preferable to cost based (or rate-of-return) regulation at incentivising cost efficiency, and that cost based regulation also carries risks of over-investment in capacity (Professor Oum’s paper discusses some of the evidence on this in aviation). The key risk with price caps is the exact opposite – that they will provide insufficient incentives for investment (Professor Oum’s paper finds some evidence for this in the case of airports). The essential problem here is to do with time inconsistency; that is, whilst regulators can offer a price cap which would reward investment, once costs are sunk there is a risk that periodic reviews of the price cap will drive prices down toward marginal costs and under-remunerate the investment.

Professor Dieter Helm has proposed a potentially fruitful solution to this problem (Oxford Review of Economic Policy, 2009). His solution is essentially in two parts:

- The first builds on the regulated asset base (RAB) approach, in which price caps are set so as to provide an appropriate return on historic assets and recently completed investment. Together with a (legal) duty to ensure that functions could be financed, this offers a solution to the time inconsistency problem by providing a credible and robust long-term contract between investors and customers (reducing the perceived risk of opportunistic changes to price caps once costs are sunk).
- The second part of the proposed solution is to use a split cost of capital to reflect the lower risks of the RAB (where costs have already been sunk) and the higher risks, susceptible to managerial control, associated with future capital and operating costs. Professor Helm argues that using a single (weighted) cost of capital risks under-incentivising investment but also encourages financial engineering to appropriate the high returns on the RAB.

4. Key themes and evolving conclusions

Key themes emerging from the discussion

Four emerging themes from the discussion of the presentations and papers at the Workshop are particularly important to shaping conclusions:

- The first relates to the crucial economic contribution which aviation makes to the functioning of the global economy and to economic welfare in both developed and developing countries; rapidly rising demand both signals this crucial role but also underpins the challenge of providing adequate gateway infrastructure.
- The second relates to the importance of recognising heterogeneity – in both market conditions and in regulatory and institutional arrangements. Heterogeneity in market conditions means that different approaches will be right for different circumstances. For many airports, workable competition is either a reality or at least a feasible possibility which it is worthwhile to prompt; but in some cases market power is embedded by market and geographic circumstances. Similarly, there are some

airports where wider public policy issues – particularly environmental impacts and impacts on economic growth and productivity – are critically important whilst for many others these are less significant. It is important to recognise that these two dimensions often overlap – airports in large, densely populated metropolitan areas are typically those where competition is most problematic, but also those where impacts upon environmental outcomes and upon productivity are often most significant

- The third theme relates to benefitting from experience. The heterogeneity of institutions and regulatory approaches provides a body of research evidence on the merits of different approaches. This evidence suggests that there are some areas of policy making where there are fairly clear opportunities for public benefit by more consistently drawing upon emerging best practice (for example, in the widening and deepening of competition in air service markets and in making the best of competition in airport markets).
- The fourth theme relates to the emerging challenge of rising demand pushing against capacity at an increasing number of key airports. The response to this challenge should be two-fold. The first part of this challenge is about making the best use of existing capacity (in the sense of getting the best economic value); the research evidence suggests the scope for very substantial economic benefits by improving on present approaches. The second part of this challenge is about incentivising new capacity in the right places at the right time; here the research evidence suggests significant risks to aviation's contribution to productivity and growth without reform of present arrangements.

Evolving Conclusions

Transport infrastructure is essential for economic growth. Adequate airport capacity, where it is needed, is crucial to allowing the global economy to grow.

Present regulatory arrangements are not efficient because the airline and airport markets have changed enormously over recent years. There is scope to do much better.

The challenge is to create conditions for efficient infrastructure development where in some circumstances some airports have market power and might abuse this position.

Though market power may exist in some circumstances, it is not inherent to any particular category of airport and probably not present in most airports.

Diagnosing where there is the potential for market power abuse requires an evidence-based, case-by-case examination of the scope of, and the scope for, competition in the current circumstances, airport-by-airport.

It is important that regulatory intervention only occurs where it is actually needed, as it is costly in terms of administrative effort and altering the market.

Aviation requires economic regulation, and to be fully effective this requires a regulator that is independent and accountable, operating under a transparent set of rules and objectives. There should be flexibility to apply regulation where necessary, and only where necessary, reflecting variations in market power across markets and over time.

The purpose of economic regulation is to protect consumers from abuse of market power, where dominance cannot be dealt with through general competition law. This should be its only objective. Of course there are other public policy objectives which are relevant (and in some cases very important) for aviation – particularly environmental impacts and impacts upon productivity and growth. In general these issues will be most effectively handled through separate and specifically focused policy interventions (for example of the type discussed in the parallel Workshop on “Environmental Impacts of International Transport”).

The number of airports that require regulation could be reduced by increasing competition through more open skies agreements and a gradual extension of the use of market based landing rights. In some cases the removal of horizontal (airport to airport) or vertical ties (airline to airport) may also be needed, although given that these agreements often have significant public benefit there needs to be a case by case balancing of risks.

Purely administrative allocation of slots is unlikely to make the best use of existing capacity, and rationing by queuing is likely to be worse; in terms of getting the best economic value, there is likely to be a substantial shortfall from using these approaches. An administrative allocation of slots also carries the risk of creating disincentives for investment in airport capacity and robs the market of information on the value of capacity at busy airports where slots are scarce.

All regulatory controls on the pricing of aviation services carry the risk of getting the investment incentives wrong. This is particularly true of cost plus regulation, which also provides only weak incentives to pursue cost efficiencies. Price caps have the advantage of leaving price structures to the airport and providing stronger incentives to pursue cost efficiencies. However, price caps are less transparent and they carry greater risk of providing insufficient incentive for investment. In either case, regulation should be based on forward costs, not historical costs, in order to provide for incentives for investment. A number of regulators are beginning to experiment with this key reform. If price caps are to provide the right incentives to invest then there may also need to be consideration of the more systematic development of the RAB (regulated asset base) approach, together with a duty to finance functions, and a differentiated cost of capital – between the RAB and operating and investment costs.

It follows that prices for aviation services should be able to rise above current costs in periods of scarcity of capacity when capital needs to be raised for investment. They can also be expected to fall below costs when there is excess capacity, although for long term agreements with airlines average costs remain relevant.

Close co-operation between airlines and airports is essential to meeting demand and providing good quality services. Agreements between airlines and airports on pricing, investment and levels of service are frequently employed to manage business risks. Such agreements can carry risks of discrimination in the access to airport facilities given to other airlines, although instances of this are unusual. The agreements need to be transparent and subject to monitoring by regulators.

Alliances between airlines, with some of the members holding such agreements with airports, account for an increasing share of the world passenger market and merit increased monitoring by regulators. National competition authorities hold sufficient powers to address

international alliances but regulators need to pay close attention to the impact of alliances in international as well as national markets, on a case-by-case basis.

Liberalisation of aviation markets has contributed to accelerating globalisation. This, combined with privatisation of most airlines, and now many airports, has changed aviation markets rapidly and profoundly. Regulatory models have tended to evolve more slowly and need reform if they are not to become a drag on global growth.

Much remains to be learned for improved regulation and there is much to be gained from exchanging experience between regulators, airports and airlines around the world.

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