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1

Institutions, Regulation, and the Evolution of European Air Transport

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1 INTRODUCTION

An economy's institutional and regulatory structure can have profound impacts on economic activity. This impact has been significant in the aviation sector, and the impact is starkly revealed when institutions and regulations change abruptly as a result of deliberate public policy decisions. Such a change occurred in the United States in the late 1970s when the previous regulatory structure governing airline operations was abruptly eliminated. Over the next decade, airline route structures were reorganized, flight frequencies increased, many new airlines began operations (with many ultimately failing), and real airfares began a long secular decline that has continued to the present.

Europe is now reaping some of the benefits of its own process of airline deregulation, a process that has been more gradual than in the United States. The most noteworthy change is the explosive growth of low-cost carriers, whose share of European traffic, though still relatively small, has shown a remarkable upward trend. These carriers are not burdened by the high labor costs of the major European carriers, and they are exploiting the new opportunities for route entry in the most aggressive fashion, serving many routes that lie entirely outside their home countries.

While the major airlines have been slow to exploit the freedoms granted by deregulation, strong forces are at work behind the scenes that will ultimately reshape these carriers' operations. The new possibility of cross-border mergers within the EU will lead to consolidation of the industry, with some former flag carriers disappearing and

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others growing while reorganizing their route systems to achieve greater efficiency. Many observers argue that such consolidation is sorely needed to reduce the number of European airlines, which is viewed as needlessly inflated under the flag-carrier regime.[1] The first major step toward industry consolidation has been achieved with the recent completion of the Air France–KLM merger, and this event is bound to be followed by other combinations of existing carriers.

Deregulation faced a more difficult challenge in Europe than in the United States. because the process had to dismantle an international institutional structure, as opposed to the purely domestic one in the United States. In particular, while freeing the domestic operations of its carriers, Europe had to sweep away the web of bilateral agreements between its countries, which governed international traffic. Such an achievement was only possible, of course, because of existence of a supra-national authority like the EU.

The legacy of this old institutional structure is still very much in evidence, with European airline service still reflecting the patterns established under the old flag-carrier regime. Restructuring of Europe's aviation sector will undoubtedly take time, although this process will be accelerated by the formidable competitive pressure emanating from the low-cost carriers.

The purpose of the present paper is to provide an overview of the recent evolution of air transport in Europe, with special attention to the impact of public policies. The goal is to show how institutions and regulatory history affected the initial conditions for the process of European deregulation, while exploring how changes in these institutions and regulations have begun to transform the aviation sector. While it attempts to predict the course of the aviation sector's future evolution, the paper also discusses further regulatory changes that are needed to fully realize the benefits of European deregulation.

The discussion starts in section 2 by showing how the old flag-carrier regime affected the structure of European airline networks. It is argued that this regime precluded the emergence of efficient hub-and-spoke networks, which concentrate traffic on relatively few routes. Instead, the old regime led to a profusion of point-to-point airline routes, with too many carriers providing service. By leading to relatively low traffic densities, this point-to-point system prevented European carriers from fully exploiting economies of traffic density, partly contributing to their high operating cost per passenger.

Sections 3 and 4 argue that the traffic deficiency of European airlines was partly remedied in the 1990s by regulatory changes that occurred in parallel with the main course of EU deregulation. These changes allowed the emergence of immunized airline alliances along with the linked phenomenon of US open skies agreements, which were signed by a number of EU countries. Alliances and open skies agreements provided a notable stimulus to international traffic between the United States and EU countries, raising passenger flows within the networks of European carriers in a beneficial fashion.

[1] As of 1998, the EU had 13 major carriers serving a population of 374 million, while the United States had seven major carriers serving a population of 269 million. Thus, the number of carriers per million people was almost 50 per cent higher in the EU relative to the United States (0.035 vs. 0.026). In this count, the EU carriers are Austrian, Sabena, SAS, Finnair, Air France, Lufthansa, Olympic, Aer Lingus, Alitalia, KLM, TAP, Iberia, British Airways. Major US carriers are American, United, Delta, Northwest, Continental, US Airways, and TWA.

Section 5 explores the initial effects of EU deregulation itself, discussing the growth of low-cost carriers and the competitive threat that they constitute. The discussion argues that, to compete against these new entrants, major carriers need to restructure their route networks to achieve greater efficiency, while renegotiating costly labor contracts in the current US fashion. It is argued that the new freedom to pursue cross-border mergers provides one path to more rational route systems, with the new potentially larger carriers able to concentrate traffic in pan-European hub-and-spoke networks. Section 6 points out that negotiation of a Common Atlantic Aviation area may be prerequisite to such mergers. Such an agreement would eliminate the threat of losing US traffic rights following a merger, which may impede some otherwise attractive combinations of carriers.

Section 7 argues that a reform of airport institutions may be needed to realize the full benefits of deregulation. The current rigid system for allocating airport slots must be replaced by a system capable of delivering slots to the carriers best able to use them, with a slot auction system being an attractive possibility. Airport congestion must also be attacked, either by appropriate use of the slot system or by congestion pricing. Finally, airport privatization may be required to ensure that airports operate efficiently, although the exercise of market power by privatized airports may be a concern.

2 EUROPEAN NETWORK STRUCTURE BEFORE DEREGULATION

The structure of European airline networks in the period prior to deregulation was governed largely by geography and by the institutional and regulatory features of the old regime. Since the current network structure under deregulation partly reflects the heritage of the past, it is important to understand the sources of that heritage.

2.1 Hub-and-Spoke Versus Point-to-Point Networks

To begin, it is helpful to discuss the nature of a common airline network structure that has emerged over the last several decades, especially in the United States. This structure is known as a hub-and-spoke (HS) network, and it is illustrated in Figure 1.

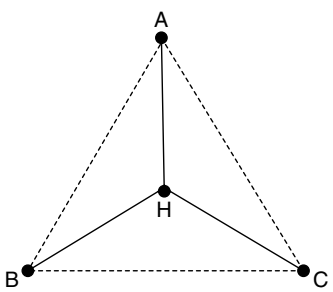

Figure 1 HS and PP Networks.

For simplicity, suppose that an airline serves four cities, denoted H, A, B, and C, as in the Figure. To serve these cities, the airline could operate a point-to-point (PP) network, under which each pair of cities is connected by an airline route, allowing nonstop service in each city-pair market. Under a PP network, airline routes in Figure 1 would consist of both the solid lines and the dotted lines, with a total of six routes being operated by the carrier.

Under an HS network, by contrast, the airline uses city H, which is centrally located, as a hub, and it operates just three routes, indicated by the solid lines in the Figure. While passengers in city-pair markets AH, BH, and CH still benefit from nonstop service, passengers in city-pair markets AB, BC, and AC must now make a connecting trip, changing planes at the hub H on the way to their eventual destinations.

In the United States, prior to deregulation, the structure of airline networks was largely determined by regulators, who controlled entry and exit on individual routes. In the interest of providing convenient service to the public, regulators encouraged extensive provision of nonstop service, leading to a structure that resembled the PP network. With deregulation, however, airlines were free to choose the routes they served, and as a result, the pursuit of profit maximization dictated that routes be reorganized an economically efficient manner.

Economic efficiency, along with desire to serve the full range of city sizes, dictated the formation of HS networks. While such a network obviously allows a carrier to operate fewer routes, as seen in Figure 1, the true source of the efficiency gain is a phenomenon known as "economies of traffic density." With economies of density, cost per passenger falls on an airline route as the traffic volume on the route rises. This effect arises in part because high traffic volumes allow the use of larger aircraft, which have a lower cost per seat mile.[2] In addition, the fixed cost of airline operations at the endpoints of the route (operation of ticket counters and other ground facilities) can be spread over more passengers as traffic density rises.

By concentrating traffic on the spoke routes in and out of the hub, the HS network reduces cost per passenger on these routes.[3] Because of this cost reduction, the cost of transporting passengers in city-pair markets AH, BH, and CH, who make nonstop trips, clearly falls relative to the PP case. However, passengers in the remaining city-pair markets, who must connect at the hub, have longer flight distances than under the PP network. But, because the cost of carrying these passengers along the spoke routes is relatively low due to high traffic densities, the overall cost of transporting them is likely to be lower than under the PP network. The upshot is that the total cost of carrying passengers among the six cities in Figure 1 will be lower under the HS network than in the PP case.

An additional benefit of the HS structure is that the high traffic volumes on the spoke routes allow in an increase in flight frequency relative to the PP case. Offsetting this gain, however, is the reduced convenience of travel for connecting passengers, who

[2] Without adjustment of aircraft sizes or flight frequencies, larger traffic volumes translate into higher load factors, which also reduce cost per passenger. Average load factors indeed rose following deregulation.

[3] A downside to hub operations that has gained prominence recently is the potential for reduced aircraft utilization, a result of the need to expand aircraft ground time at the hub in order to facilitate passenger connections. However, this effect does not offset the many advantages of HS networks.

could make a nonstop trip under the PP network but undergo a time-consuming transfer at the hub under the HS network.[4]

2.2 European Network Structure Under the Regulated Regime

With this background, consider the structure of European airline networks under the regulated regime. Initially, it is useful to focus just on intra-European traffic, considering intercontinental traffic later.

First, observe that, as European carriers were public enterprises, their incentives for profit maximization were relatively weak. Losses could be covered by government subsidies, and any profits accrued to the government and not to private owners. As a result, European carriers had little incentive to hold down labor costs, allowing their workers to enjoy the benefits of an uncompetitive environment and unlimited government support. In addition, the carriers had little incentive to achieve operational efficiencies.

Against this backdrop, airline operations within Europe were governed by an extensive regulatory structure. Airline service between any two European countries was regulated by a bilateral agreement between the two countries. These agreements typically specified the routes that could be flown and the allowable capacities on these routes. The identities of the carriers providing service were also specified, with the chosen carriers usually being the two flag carriers of the countries involved.

With this structure ruling out competition between the carriers on routes between European countries, and with little concern for the magnitude of profit, air fares were set in a mechanistic fashion. Generally, fares corresponded to those set under fare "conferences" organized by the International Air Transport Association (IATA). At these conferences, carriers determined mutually agreeable fares for tens of thousands of international city pair markets. The pricing of intra-European trips under the old regime relied mechanically on these IATA fares.[5]

As a result of the web of bilateral agreements between European countries, each flag carrier operated a radial route network connecting its home city to the major cities of the other countries, as seen in Figure 2. In the Figure, each square represents a different European country, with the major cities indicated by A, B, C, D, and E. For convenience, let the countries be identified by a lower case letter matching the given city, so that city B is contained in country b, and so on. As can be seen, country a's flag carrier operates routes from its home city A to the major cities B, C, D, and E of the other countries, with country b's flag carrier serving A, C, D, and E from its home city B (these latter routes are indicated by the dotted lines in the Figure). As a result, city-pair market AB is served by the flag carriers of countries a and b, and similarly for other markets. In this market, each carrier's flight capacity is governed by the bilateral agreement between countries a and b, and fares are set at the IATA level.

[4] For a discussion of the effects of US deregulation on airline networks, see Morrison and Winston (1985, 1995). For a discussion of economies of traffic density as well as empirical evidence, see Brueckner and Spiller (1994) and Caves et al. (1984).

[5] For a discussion of IATA fares, see O'Connor (1989).

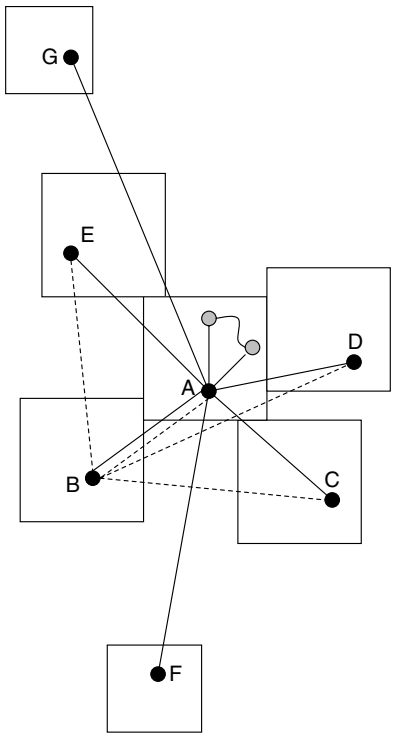

Figure 2 European Airline Networks.

Country a's flag carrier also serves domestic endpoints within that country, as seen in Figure 2 (these cities are unlabeled and shaded in grey). Routes to Africa (country f) and the United States (country g) are also shown in the Figure, but these are considered after the discussion of intra-European traffic patterns.

2.3 HS Networks in Europe?

The route network operated by country a's flag carrier is clearly radial in nature, with routes emanating from the home city A to many destinations, both outside the country and within it. While the network thus seems to resemble the HS network of Figure 1, a question is whether the network indeed functions in the HS manner, with the carrier transporting significant volumes of connecting passengers who change planes at city A.

The answer to this question is negative: despite their radial structure, European route networks prior to deregulation did not function as true HS networks, carrying large volumes of connecting traffic. Instead, these networks functioned mostly as point-to-point networks, with connecting traffic apparently modest in volume.

Several observations help to explain this pattern. First, the pattern of flag carrier service between countries meant that a given country's carrier could not attract connecting

passengers flying between a second and a third country. To understand this point, observe that while country a's airline could provide connecting service between B and D via city A, passengers in the BD city-pair market already enjoyed nonstop service between these cities, which was provided by the flag carriers of countries b and d. As a result, a connecting trip on country a's airline would hold little attraction. While this conclusion might been have been overturned in a competitive environment, where country a's carrier could have attempted to attract BD connecting passengers by substantially undercutting the nonstop BD fare, the weak profit motive felt by flag carriers would have made such an action unlikely.

Another potential group of connecting passengers, those traveling between domestic cities within country a, would also find such a trip unattractive. Two key features of the European setting account for this conclusion. First, compared to the United States, the spatial size of European countries is relatively small. As a result, domestic travel between different cities within country a may involve a relatively short distance, making airline travel unappealing, a conclusion that applies even more strongly to a circuitous, inconvenient connecting trip through city A. The effect of relatively short domestic distances is compounded by the availability of widespread and convenient rail service within Europe. Rather than flying between two domestic endpoints, a preferred choice would be to simply take the train, using a route indicated by the curved line in Figure 2.

These obstacles to connecting airline travel by domestic passengers were compounded by the nature of the pricing environment. Because of the weak profit motive felt by flag carriers, they had little incentive to make connecting trips more attractive by offering relatively cheap fares.

By contrast, a third group of passengers represented more plausible candidates for connecting intra-European air travel. This group consists of passengers traveling between a small city in one country and a city in a second country, either large or small. For example, a passenger traveling between one of the small domestic endpoints in country a, shown in Figure 2, and city C in country c would find a connecting trip via city A on country a's flag carrier to be an appropriate choice. Similarly, a passenger traveling between two small endpoints, one in country a and one in country c, would need to make a connecting trip using both flag carriers. The passenger originating in country a would change planes at city A and would change both planes and airlines (switching to country c's carrier) at city C.

Because both types of connecting passengers make international trips within Europe that involve at least one small endpoint, their total number was likely to be relatively small compared to the total volume of intra-European traffic. As a result, connecting traffic within Europe under the old regime was undoubtedly of limited importance. With connecting traffic limited, European airline networks thus functioned mainly as point-to-point networks, with HS operations of little importance despite the radial form of the networks.

The US air travel market, by contrast, offers much greater scope for HS networks, mainly as a result of a different geography. First, while the relatively compact size of Europe means that many major cities are so close together that a circuitous connecting trip would be unacceptable, the spatial expanse of the United States leads to a greater average distance between cities. Greater distances tend to reduce the circuity of connecting trips, with layover time also being less significant compared to total travel time. Second, the

US population, which is comparable in size to that of Europe, lies within a single national boundary. There is thus no analog to flag carrier system, which automatically generates nonstop service between most pairs of major European cities. As a result, even in the US city-pair markets involving relatively large endpoints, nonstop service may not be available, with passengers forced to rely instead on connecting travel.[6] Third, the large physical size of the United States, as well as the limited nature of rail service, means that air travel is usually necessary for trips between one small domestic endpoint and another, unlike in the European case. Such travel by necessity requires a connecting trip. Moreover, since these small-endpoint trips occur between cities in the same country, they presumably involve larger passenger volumes than for analogous trips in Europe, which are often international in nature.

Thus, connecting passengers in the United States come from two groups of travelers who, in Europe, would enjoy nonstop service or shun air travel altogether: passengers traveling in some city-pair markets involving medium and large size cities, and travelers making trips between small endpoints. The presence of these groups of passengers allows HS networks to play a more important current role in the United States than they did under the old regime in Europe.

The point-to-point nature of European airline networks under the old regime was undesirable from an efficiency perspective. In effect, these networks involved the operation of too many airline routes. With traffic dispersed over this large number of routes instead of concentrated on fewer segments, European carriers were unable to fully exploit economies of traffic density. One result was a higher cost per passenger than could have been achieved under a more efficient HS-style route structure. This cost escalation compounded the underlying problem of high labor costs, which resulted from union power coupled with public ownership of the carriers. The upshot was notoriously high airline operating costs throughout Europe.[7]

A second deleterious effect of the inadequate traffic densities caused by the point-to-point network structure lay in the area of service quality. As mentioned above, one byproduct of large traffic densities is high flight frequency, which raises the convenience of air travel. By depressing densities, reliance on a PP route system imposed a cost in this dimension of passenger convenience.

It is important to note that the source of these inefficiencies lies both in geography and in the fundamental institutional aspects of the old regime, neither of which was easily changed. The fact that Europe is divided into separate nations, with each naturally operating its own flag carrier under the old regime, helped to predetermine the nature of airline networks, leading to an excessive number of airlines and airline routes. This outcome, combined with the relative unattractiveness of domestic air travel within

[6] An example might be the Boston-Portland, OR city-pair market.

[7] Oum and Yu (1998) offer evidence on cost differences between EU and US carriers. They compute a composite output measure, which represents passenger, freight, and mail volumes carried by the airlines, and divide total input cost by this measure. For 1995, the resulting average unit cost was 0.95 for US carriers and 1.28 for EU carriers, for an EU cost premium of more than 30 per cent (these numbers are scaled so that the value for American Airlines is 1.00). Higher EU costs are due to the combined effects of higher input costs and lower productivity. Marin (1998) computes productivity measures for EU and US carriers, and under one measure, technical efficiency for the period 1985–1989 averaged 0.83 for US carriers and 0.69 for EU carriers.

individual countries (a consequence of a compact geography and good rail service), helped to depress traffic densities, leading to high cost per passenger and relatively low flight frequencies.[8]

Mirroring the flag-carrier system of the old regime, the European air traffic control (ATC) system was similarly balkanized. Each country operated its own ATC authority, and control over each international flight within Europe was handed from one ATC authority to another as the flight progressed through European air space. Relative to a system like that in the United States, which is uniform across a broad geographical area, the presence of many separate national ATC systems introduced various inefficiencies. Coordination problems between the different systems contributed to the problem of flight delays within Europe. Moreover, the sovereignty of each country over its own air space and existence of many restricted military areas undoubtedly tended to generate inefficient flight paths, with greater circuity than necessary. Both effects contributed to high airline operating costs as well as reducing the convenience of air travel within Europe.

2.4 Intercontinental Aspects of Network Structure for European Carriers

Under the old regime, Europe's flag carriers operated many international routes to other continents, with the intercontinental routes to North America being the most important. Service on these routes was governed by bilateral agreements similar to those existing between European countries, with the routes and carrier identities specified along with flight capacities.

While the observations on network structure based on Figure 2 sometimes remain relevant in the intercontinental case, important exceptions arise. The most important observation is that, because of the distances involved and weak condition of many non-European flag carriers, these carriers provided spotty or nonexistent service to many important destinations outside their home countries. This fact provided service opportunities for European carriers that did not exist in the case of intra-European traffic.

To understand this point, return to Figure 2, and consider the intercontinental routes from country a to the African country f and the United States (country g). While a bilateral agreement may have existed between the African country and the United States, no carrier from either country may have provided the service that the agreement allowed. However, country a's flag carrier may have served the African country under its own bilateral, while also serving the United States, as shown in the Figure. In this situation, that carrier could provide connecting service from the African city F to the US city G via its home airport in A.[9]

Such connecting service by European carriers to countries with weak flag carriers appears to have been commonplace, and it may have involved Western endpoints in

[8] For further discussion of European industry under the old regime, see Doganis (1985, 2001), Good et al. (1993), McGowan and Seabright (1989), and Neven and Roller (1996).

[9] An example of this phenomenon is air service to and from India, which appears to be disproportionately provided by non-Indian carriers, despite the enormous size of the country.

Europe rather than in the United States In this case, the endpoint G would instead be a city in another European country, whose relatively small flag carrier did not serve the African country. Country a's large flag carrier could then have provided connecting service linking the African country to the European neighbor.

Such connecting service is beneficial from a network perspective, helping to raise traffic densities for a's flag carrier on important routes like that to city G. However, the volume of traffic involved is likely to be low given that the other endpoint is in Africa, or some similar location, that does not generate or attract much traffic compared to the United States. As a result, the salutary network effects of this connecting traffic were likely to have been small. Thus, the previous conclusion that European airline networks functioned largely as point-to-point networks is largely unaltered when intercontinental routes are considered.

3 THE IMPACT OF AIRLINE ALLIANCES

3.1 The Emergence of Alliances

In the 1990s, the old regime of European air transport was altered by several new developments. The first of these changes, which coincided with the initial major steps in European airline deregulation, was the emergence of international airline alliances. The ultimate effect of these alliances was to raise the number of intercontinental passengers carried by European airlines, with beneficial effects on their traffic densities and hence costs per passenger (and ultimately profit). The growth of alliances, however, has generated regulatory concerns both in Europe and North America. As discussed further below, these concerns have been resolved mostly in favor of the alliances, allowing their growth to proceed.

The fundamental force driving the emergence of international alliances is globalization of the world economy, which has spurred intercontinental business travel while also stimulating leisure trips. In competing for this new breed of international passengers, airlines have sought to enhance the convenience and attractiveness of intercontinental trips. An obstacle to achieving this goal, however, is the fact that many international trips cannot be carried out using just one airline. Travelers are thus forced to make an "interline" trip, typically flying on two airlines (and occasionally more than two).

This need for interline travel arises because no existing airline is large enough to serve most of the world's endpoints. While the desire to better serve international passengers creates an incentive to build such an airline through cross-border mergers, airline regulation has historically ruled out such combinations, even though the last round of European deregulation makes intra-EU mergers feasible, as discussed further below. Short of a merger, airlines can try to serve more international destinations by extending their own route networks, but such efforts are hampered by unwillingness to acquire the necessary equipment and labor force and by existing bilateral agreements, which limit the number of carriers that can provide service on any given international route.

With these avenues to improving international service blocked, airlines instead attempted to improve the quality of interline trips by forming alliances. Under a typical arrangement, the alliance partners attempt to coordinate their schedules in order to

ease interline connections at gateway airports. While this coordination reduces passenger layover times, the airlines have also strived to rearrange gate facilities to shorten walking distances. Alliance partners have also worked to improve baggage transfers for their passengers, reducing the problem of mishandled luggage that plagues traditional interline travel. Finally, the frequent flier programs of the partner airlines are typically merged, allowing passengers to earn more miles than under a usual interline trip and giving elite members reciprocal access to the alliance partners' airport lounges. All of these changes serve to make interline travel more like a trip on a single airline, and the resulting improvement in travel convenience has allowed alliances to capture a growing share of international traffic.

The major alliances are built around pairings of large US and European carriers. The key partners are United and Lufthansa for the Star Alliance, American and British Airways for the Oneworld alliance, Delta and Air France for the Skyteam alliance, and Northwest and KLM for the "Wings" alliance.[10]

3.2 The Effect of Alliances on Fares

Alliances also generate economic benefits for interline passengers by lowering the fares they pay. The fact that airline cooperation reduces, rather than increases, interline fares may appear counterintuitive. However, the reason for this outcome in the case of interline trips is that such travel is a "joint product" resulting from the combined efforts of two carriers. Economic theory shows that cooperation between the providers of a joint product leads to a price lower than the one emerging under noncooperative behavior.

To understand this point more fully, note that the airlines relied on IATA fares in pricing traditional interline trips. Such fares can be viewed as the result of noncooperative behavior, where each airline specifies (in the context of an IATA fare conference) the amount it requires to carry a passenger over its portion of an interline journey, with the total interline fare equal to the sum of these amounts for both airlines.

The problem with this fare-setting process is that, in determining its own required revenue from an interline passenger, an airline does not consider that a high revenue requirement hurts the other airline by raising the overall fare for the trip, which in turn depresses traffic and reduces the other airline's profit. If the airlines were instead able to cooperate in setting the interline fare, with a goal of maximizing their joint profit, each would recognize the harm done to the other when it attempts to extract extra revenue from the interline passenger. Each airline would then restrain its own pursuit of higher revenue, and the overall interline fare would fall. Moreover, the combined profits of the carriers would rise relative to that earned under the IATA fare.[11]

In order to engage in this kind of cooperative pricing of interline trips, the carriers must enjoy "antitrust immunity," which legalizes interfirm cooperation that would otherwise be disallowed. Such immunity is granted formally by the US regulatory authorities

[10] It is expected that the latter alliance will be blended into the SkyTeam alliance as a result of the Air France–KLM merger.

[11] For empirical evidence on this fare effect as well as a general discussion of the economics of alliances, see Brueckner and Whalen (2000).

and through a less-formal process by the European Commission. Antitrust immunity is granted to carrier pairs and not to alliances more generally, and most of the pairings in the key alliances are immunized.

With antitrust immunity leading, via airline cooperation, to lower interline fares, the benefits of alliance travel are enhanced. With lower fares and greater convenience reducing the full economic "cost" of interline travel for the passenger, the volume of such trips has grown in step with the expansion of alliances.[12] As a result, traffic flows within the networks of the European alliance partners have expanded, and the resulting gains in traffic density have reduced cost per passenger and enhanced airline profits.

To better understand the pattern of alliance traffic, consider Figure 3, which also highlights the regulatory concern that alliances have generated. Suppose that a US passenger wants to travel from city I, a small or medium-size endpoint, to city J overseas, which is not served by a US carrier. To do so, the passenger would fly on a US alliance member from I to city G, the airline's hub, connecting to one of the carrier's transatlantic flights to city A, the home airport of the carrier's European alliance partner (the US airline's routes are shown as dotted lines). At city A, the passenger would then connect to one of the partner's flights to J. Note that while Figure 3 shows city J as being located in a third country, it could alternatively be located in country a itself. Note also that

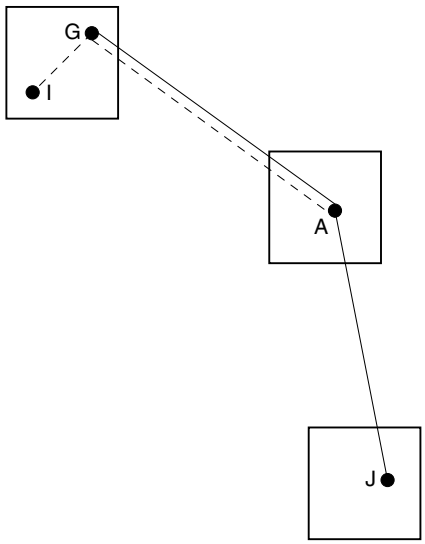

Figure 3 Travel on an Airline Alliance.

[12] For evidence on interline traffic growth, see US US Department of Transportation (1999, 2000) (both studies can on the DOT website). As an example of the kind of data presented, the 1999 study shows that traffic between Northwest's US gateways and Amsterdam, the hub of its partner KLM, increased nine-fold between the pre-alliance year 1992 and 1998. However, origin–destination traffic on these hub-to-hub routes showed only a modest increase, testifying to the huge surge in interline traffic resulting from the alliance.

the trip pattern would be similar if the origin for the US passenger were the hub city G rather than the smaller endpoint I (in both cases, travel on the two airlines would be required). Finally, observe that a key feature of alliances is implicit in Figure 3. In particular, alliances effectively link the networks of two different carriers, making a trip within the combined network equivalent to a trip on a single airline.

3.3 Regulatory Concerns Engendered by Alliances

While clarifying the nature of a typical interline alliance trip, Figure 3 also shows a feature of alliances not considered up to this point. In particular, the Figure shows that, because the European alliance partner also serves the route between G and A, the two airlines provide overlapping service on this route. While this fact means that the US interline passenger could just as well have used the European alliance partner for both the transatlantic portion of his journey and the onward flight to J, this overlap has broader implications.

In particular, the overlap may have consequences for a different group of passengers, namely, those making nonstop trips between the major cities G and A. These passengers obviously can make their journey on one airline or the other, having no need for interline travel. Normally, this choice would enhance a passenger's prospects, with competition between the two carriers guaranteeing an affordable fare. However, antitrust immunity gives the carriers full scope for cooperation in the fare-setting process, and on a route where overlapping service is provided, this cooperation may be anticompetitive. In other words, the carriers' license to cooperate may be used in a collusive manner in the AG city-pair market, with the carriers raising the fare in an anticompetitive manner, knowing that passengers may have no alternative choice of service.

This concern has motivated regulatory action on alliances. The European Commission recently gave its approval to the Star and Wings alliances after a multi-year inquiry, recognizing that the AG-type markets were relatively small in each case, and that mild measures could address anticompetitive concerns. By contrast, antitrust immunity for American and British Airways has been denied by US regulators. The regulators argued that the large size of the AG-type overlap markets, which consist of the heavily traveled routes between US gateways and London's Heathrow airport, meant that losses from potential anticompetitive behavior by the alliance partners could be substantial. Rather than being mild, the proposed remedy was so draconian (involving a substantial slot divestiture at Heathrow) that the carriers rejected it, settling instead for an unimmunized alliance.

International alliances will prosper as long as the regulatory environment prevents cross-border mergers between the US and European carriers. In the absence of such mergers, alliances provide the only means by which airlines can compete for a larger share of international traffic. While alliances have not generated a fundamental change in the nature of European airline networks, they have led to a beneficial growth in traffic densities within the existing networks of the alliance partners. This growth has reduced, but not eliminated, the problem of inadequate traffic flows, which is caused, as explained above, by route proliferation under the flag-carrier regime as well as the compact geography and good rail service of European countries.

4 THE EFFECT OF OPEN SKIES AGREEMENTS

The 1990s witnessed the signing of a host of "open skies" agreements between the US and European countries. In a typical case, an open skies agreement completely eliminates the capacity and route restrictions of the prior bilateral agreement. The US carrier is then allowed to provide unlimited service to any endpoint in the other country, and that country's carrier(s) are allowed to fly anywhere in the United States, with capacities and frequencies of their choosing. In addition, the most-liberal open skies agreements provide unlimited "beyond" rights (or fifth freedom rights), allowing one country's carrier(s) to provide continuing service beyond the other country to additional destinations, service that may be used both by the US passengers and local passengers originating in the other country.

The proliferation of open skies agreements is intimately tied to the growth of airline alliances. In particular, as a condition for signing such an agreement, the European country typically demands that the US regulators grant antitrust immunity to the country's flag carrier and its US alliance partner. This requirement grows out of a fear that the much larger size of the US carriers will confer an unfair advantage under open skies unless a mechanism exists to provide the smaller European carrier, which may lack the resources to massively expand service, with equivalent effective access to US endpoints. Antitrust immunity, which effectively allows the two carriers to act as a single airline in providing interline service, achieves this goal.

Traffic between the United States and the open skies signatories grew more rapidly in the 1990s than on other international routes, partly reflecting the elimination of service restrictions.[13] But this traffic growth partly reflects the favorable effects of immunized alliances themselves, effects that arise only because open skies and antitrust immunity are linked.

As mentioned above, the traffic growth associated with open skies and alliances has been beneficial for European carriers, helping to raise traffic densities and generally strengthen their operations. Moreover, even though the beyond rights associated with open skies agreements raised potentially negative consequences for European carriers, who stood to lose traffic that they previously carried, this outcome has not materialized to any significant degree. Rather than exercising their beyond rights, US carriers typically relied instead on their alliance partners to provide such service, deploying their resources elsewhere.

5 THE IMPACT OF EUROPEAN DEREGULATION

Following the lead of the United States, Europe in the late 1980s launched its own process of airline deregulation. The process proceeded in stages, with a sequence of three deregulation "packages" introduced by the EU over the succeeding decade. Deregulation culminated with the "third package," introduced in 1993, which by 1997 removed the last restrictions limiting the activities of European carriers. Currently, European airlines

[13] See US Department of Transportation (1999, 2000).

enjoy complete pricing freedom and the freedom to enter and exit routes anywhere in the EU, including domestic routes in another country. In addition, previous prohibitions on cross-border mergers within the EU were removed, so that the old flag-carrier regime, where airlines are associated with particular countries, can in principle be replaced by a system of broader ownership. In effect, European carriers now enjoy exactly the same freedoms within the boundaries of the EU as do carriers within the United States, despite the presence of the European national borders.

The response to deregulation proceeded slowly. The initial liberalization in the first half of the 1990s apparently produced little effect, with route structures and fares showing little change relative to the old regime.[14] By the end of the 1990s, however, dramatic impacts of the new regime were becoming evident. The most striking change was the launching and subsequent explosive growth of low-cost carriers, especially EasyJet and Ryanair, both based in the British Isles. The growth of these carriers was partly fueled by acquisition of other, less-successful low-cost operators, although a number of these lesser carriers still compete for business.

The low-cost carriers have followed the model of Southwest Airlines in the United States by relying on flexible work rules to generate high labor productivity, by flying just one or two aircraft types to economize on maintenance and crew training, by emphasizing fast aircraft turnarounds to maximize daily usage hours, and by serving large city-pair markets but doing so from secondary airports. This airport strategy avoids the congestion that plagues major European airports, facilitating the carriers' quick-turnaround standard, and it also economizes on airport charges, which are lower at secondary airports.

In the United States, low-cost carriers mostly operate point-to-point networks. For example, although some Southwest passengers make connecting trips, the airline appears not to explicitly schedule its operations to facilitate connections.[15] Because of this point-to-point strategy, Southwest is unable to serve small endpoints, which would not generate enough traffic to justify point-to-point operations. Such service is instead left to the network carriers, which link small endpoints to their hub airports. Because all traffic to and from the small endpoint, regardless of its origin or destination, travels along the spoke route to the hub, the volume is large enough to justify service by the network carrier.

By shunning such endpoints, low-cost carriers in the United States thus follow a "cherry-picking" strategy, serving only the most attractive markets. Their European counterparts, which also favor a point-to-point style of operation, have in effect adopted the same strategy. The likely impact of this type of competition on the major EU carriers provides a key to predicting the subsequent course of European deregulation.

Some clues as to the effect of low-cost competition come from observing the US case. Evidence for the United States shows that, in attempting to preserve market shares, network carriers dramatically reduce their fares in city-pair markets also served by low-cost carriers, despite their cost disadvantage. Because low-cost competition has spread

[14] See Commission of the European Communities (1996) for details.

[15] Although JetBlue's network also offers mainly point-to-point service, AirTran and ATA appear to rely more on connecting passengers. For a discussion of Southwest's service patterns and market-entry decisions, see Boguslaski, Ito and Lee (2004).

to an ever greater number of the network carriers' markets, the result has been severe downward pressure on their profits. This pressure, combined with the effects of the recent overall slump in air travel, has helped push several major US airlines into bankruptcy, while threatening other network carriers with the same fate.[16]

With the US example providing guidance, it is possible to speculate about the likely effect of the low-cost revolution in Europe. Recall from above that, under the old regime, the flag-carrier system, geography, and intermodal competition led to the operation of too many airlines routes, most with inadequate traffic densities. Low densities, compounded by high labor costs and various operating inefficiencies, in turn led to exorbitant operating costs for European airlines. With such costs, EU carriers had to rely on high IATA fares to avoid substantial losses. This negative picture was improved somewhat in the 1990s by the traffic stimulus provided by international airline alliances. Moreover, the trend toward full or partial privatization of EU carriers, which has proceeded apace with deregulation in the 1990s, has strengthened the profit motive, and helped to hold down labor costs at a number of airlines. But the growth of low-cost competition is likely to produce the same dramatic impact on the fortunes of EU carriers as has occurred in the United States.[17]

First, by draining traffic in the large city-pair markets out of the major carriers' networks, low-cost competition will exacerbate the problem of inadequate traffic densities, putting upward pressure on cost per passenger. Second, as the major carriers attempt to cut their fares to stem the traffic loss, the resulting downward pressure on revenue will interact with higher costs to cut profits. The picture is thus similar to the US case, but the EU carriers' plight is compounded by their lower operating efficiency relative to US airlines.

One effect of these developments is likely to parallel the US experience. In particular, EU carriers are likely to attack the problem of high labor costs by asking for wage concessions from their workers. Such concessions have been extracted mostly through the bankruptcy process in the United States, although American carriers gained a broad reduction in the wages of its workforce through a credible threat of bankruptcy. However, greater labor militancy in Europe relative to the United States may make this process more difficult, and its result less effective, than in the US case.

A second likely response to low-cost competition is a push for greater operating efficiency through cross-border mergers between EU carriers. By allowing replacement of the flag-carrier system, such mergers would allow a rationalization of European route networks. The current proliferation of airlines and routes would be reduced, with the merger partners reorganizing their point-to-point operations in favor of US-style HS networks. Traffic densities would rise, reducing cost per passenger and improving profits. Greater densities would in turn lead to higher flight frequencies on key routes, although some passengers would be forced to make more circuitous connecting trips.

[16] For evidence on the competitive effects of low-cost carriers in the US, see Morrison (2001).

[17] The more favorable profit positions of EU relative to US carriers in recent years poses a puzzle given their higher operating costs. Possible explanations include the lower EU penetration of low-cost carriers relative to the US case, which results in less competitive pressure, and the greater reliance of EU carriers on transcontinental traffic, which tends to generate a higher profit than domestic traffic.

The Air France–KLM merger is likely to generate some of these beneficial effects, at least in the long run. But these gains may come at the expense of a reduction in competition on routes that were jointly served by the two carriers prior to the merger. However, the widely perceived need for consolidation of the industry led EU regulators to discount these possible negative effects in approving the merger.[18]

Through efficiency improvements, industry consolidation may lead to some reduction in the current disadvantage EU carriers face relative to the low-cost competition, putting the airlines more or less in the situation of the US network carriers prior to the latest upheaval. But ultimate survival in the midst of the European low-cost revolution requires more draconian cost reductions of the kind currently being secured by US airlines. Whether EU carriers will be able to gain such reductions is an open question.

It should be noted that European deregulation is likely to have an impact on a segment of the aviation sector that lies mostly outside the purview of government regulators: charter operations. Partly in response to high European airfares under the old regime, a substantial share of leisure passengers used charter flights rather than scheduled service to reach their vacation destinations. With deregulation putting downward pressure on fares, it is likely that leisure travelers will increasingly opt for scheduled air service rather than using charter flights. However, this change will unfold gradually as the effects of deregulation take hold.

Finally, EU deregulation has been accompanied by planned changes in Europe's air traffic control system. The changes are designed to foster greater coordination between ATC personnel in different countries under a proposal known as Single European Sky, thus reducing delays and eliminating excessive flight distances. It is expected that the proposal will be implemented in 2004, although its effectiveness in reducing ATC fragmentation in Europe remains to be seen.

6 THE ROLE OF A COMMON ATLANTIC AVIATION AREA

While internal deregulation of transport in the EU is now complete, intercontinental service outside of the EU is still governed by the various bilateral agreements, some of which have been liberalized through open skies agreements. This intercontinental traffic is exceedingly important for EU carriers, accounting for a much greater share of their total traffic than in the case of US carriers.[19] Thus, internal airline deregulation within the EU affects a smaller share of the airline sector than did US deregulation.

Accordingly, most observers argue that the last step in the deregulation process must be elimination of the remaining restrictions on the important North American routes through creation of what is known as a Common Atlantic Aviation Area. Under this proposal, individual bilateral agreements would be replaced by a single agreement governing traffic between the United States and the EU as a whole. Anticipating such

[18] See Brueckner and Pels (2005) for an analysis of these anticompetitive effects, which include those resulting from consolidation of the Northwest–KLM and SkyTeam alliances.

[19] See Good et al. (1993).

an agreement, the European Court of Justice ruled in a widely noted 2002 decision that existing bilateral agreements are illegal under EU law because they award US service rights only to the given country's flag carrier, effectively discriminating against other EU airlines (in other words, the agreements contain a "nationality clause"). Under a common aviation area, this restriction would disappear, with any EU carrier able to provide US service from any European endpoint.

At first glance, such new freedom would appear to hold little value for European carriers. For example, a carrier like Lufthansa would appear to have little incentive to provide US service from Paris, a city where Air France operates most of the flights. With limited Lufthansa operations in Paris, few connecting opportunities would be available for the airline's passengers, making US service unattractive. Since other EU carriers similarly lack the incentive to initiate service from the home airports of other airlines, the gain from eliminating the nationality clause in existing bilaterals would not appear to be substantial.

This argument, however, overlooks the effect of the nationality clause on the incentives for cross-border mergers within the EU. The problem is that, because bilateral agreements give traffic rights to a country's national airline, another carrier acquiring control of that airline through a merger may lose these traffic rights, thus being unable to replicate existing service to the United States. Although some remedy might ultimately be available in such a case, uncertainty about the disposition of international traffic rights greatly reduces the incentive for airline mergers within the EU.[20] However, if existing bilaterals were replaced by a common aviation area, with any EU carrier able to operate any route to the United States, then this merger disincentive would be eliminated. An acquiring carrier would be free to operate all of its merger partner's previous US routes, removing the potential merger penalty inherent in the current system.[21]

Cross-border mergers hold the key to survival of many major European carriers in the face of the ongoing low-cost revolution, and a key ingredient to facilitating such mergers is the kind of route-authority liberalization inherent in a common aviation area. Until such an agreement is in place, the mergers that are needed to achieve consolidation of the European industry may be delayed.[22]

7 THE INTERACTION BETWEEN AIRPORT OPERATIONS AND AIRLINE DEREGULATION

The deregulation of European air transport has the potential for leading to dramatic improvements in the functioning of the aviation sector within the EU. However, full

[20] This uncertainty appears to partly explain the structure of the Air France–KLM merger, where the two carriers will initially operate as separate entities but under common ownership. This arrangement does not jeopardize KLM's traffic rights to the US

[21] For a discussion of the effect of a common aviation area on potential European mergers, see Brattle Group (2002).

[22] As of mid-2004, an agreement had not been reached, reached, despite intensive negotiations by EU and US officials.

exploitation of the benefits of deregulation may be blocked if the operating procedures and pricing policies of EU airports are not reformed. The airport slot allocation system, airport congestion, and the determination of airport charges are key issues that may help determine the course of deregulation in the EU.

7.1 The Slot Allocation Mechanism

As argued above, Europe currently has too many carriers and too many routes. In a fully deregulated market, these problems would vanish over time as redundant routes are dropped and inefficient carriers disappear, either through bankruptcy or mergers. These developments would mean that some airports now serving as the hubs of smaller flag carriers would lose traffic, while the secondary airports served by low-cost carriers would gain passengers. In addition, as these carriers gain an ever-larger share of European traffic, pressure will build to extend their services to the major airports. Pressure to increase traffic at the major endpoints will also come from the flag carriers (or their descendants created via mergers) as these carriers attempt to concentrate traffic in more efficient, HS-style route structures.

While the demand for capacity thus can be expected to grow at the larger airports, this outcome may be blocked by the current slot allocation system. This system controls landing rights at the great majority of European airports, with a carrier needing a landing slot for a particular time of day in order to operate a flight at that time. The problem is that slots are allocated using "grandfather rights." In other words, carriers that used their slots last year have the right to continue using the slots this year. As a result, current slot allocations reflect a heritage from the past, with slot holdings largely reflecting past allocations to the pre-deregulation flag carriers. This slot allocation system implies that inefficient, high-cost airlines can have access to an airport even though a new low-cost carrier or an efficient, former flag carrier could use the slot much more productively.

To fully realize the benefits of deregulation, the slot allocation system must avoid this outcome by allocating slots to the carriers best able to use them. Under a market system, such a carrier would be one willing to pay the highest amount to acquire the slot. Given this fact, an efficient allocation system could rely on the price mechanism, auctioning scarce airport slots to the highest bidder. Since airlines are currently granted the rights to use specific slots but do not actually own them, such an auction system is institutionally feasible. By contrast, if the airlines themselves had actual ownership of the slots, such a system would not be workable.

A slot auction system will generate substantial revenues, and a key question is who will receive these revenues or, equivalently, who will organize the auction. Individual airport authorities could acquire control over the slots and thus the right to organize an auction, but as discussed below, this arrangement may give the airports considerable market power. Moreover, at a number of airports in Europe, the national government currently limits the number of available slots, in which case it would be natural for the government to organize the auction. The revenues from slot auctions could be used to finance capacity, or to invest in other airport facilities that improve passenger benefits (for instance, airport accessibility).

Alternatively, it could be argued that since airlines need matched pairs of slots, one at the origin airport and one at the destination airport for a given flight, the auctions should

be implemented at a European level. While such "network auctions" are theoretically very complex, they are in essence no different from the spectrum-rights auctions held in the United States, which were generally considered to be a success.[23]

The alternative of uncoordinated slot auctions by individual national governments would be an improvement over the current slot allocation system. But since such auctions would not take into account the carriers' need for matched pairs of slots at airports in different countries, the resulting slot allocation may not be fully efficient, preventing the full benefits of deregulation from being realized.

7.2 Airport Congestion

Airport congestion may also reduce the benefits of airline deregulation. When a lack of airport capacity causes delays, airlines and passengers incur congestion costs in the form of higher operating expenses and wasted personal time. At slot-constrained airports, congestion is determined partly by the slot allocation system, which assigns slots by time of day and thus determines the daily time pattern of airport usage. Given this fact, it could be argued that excessive congestion at European airports is a result of a failure of the slot allocation system, with too many slots allocated at peak periods at a number of airports. However, other factors may contribute to existing congestion levels, absolving the slot system from some of the blame. For example, congestion at a smaller airport that is not slot-constrained may cause a flight from that airport to arrive late at a large airport, disrupting the pattern of arrivals and causing excess congestion. Delays due to in-flight congestion of the airspace, whose management is the responsibility of the air-traffic control system, may similarly cause late arrivals, disrupting traffic and generating airport congestion.

Regardless of the apportionment of blame for congestion at EU airports, it must be recognized that, because of the high demand for air travel at the most convenient times during the day, some level of congestion during these peak periods should be tolerated. In other words, a conservative allocation of slots that totally eliminates airport congestion throughout the day is not in society's interest. It is difficult, however, for authorities running a traditional slot allocation system, or managing a slot auction, to tell exactly how much peak-hour congestion should be tolerated. In other words, it is hard to know how many peak-hour slots to allocate relative to the airport's design capacity, or how many peak slots to sell under an auction system.

This indeterminacy could be solved by the alternate system of airport congestion pricing. Under such a system, the first step is to calculate the external congestion costs that are generated when an airline operates another flight at the airport. These external costs equal the increased operating cost for *other airlines* plus the value of the extra time lost by their passengers when the given airline schedules another flight, adding to congestion at the airport. Since each airline fails to take these external costs into account, it over-schedules peak-hour flights. A congestion-pricing system corrects this problem by charging the airline a fee per flight equal to the external congestion costs it generates. Faced with this fee, the airline reduces peak flights, partly alleviating airport congestion.

[23] Rassenti et al. (1982) developed a numerical model for airport slot auctions in a network setting.

The congestion fee could also include other external costs beyond those directly related to congestion, such as the costs of environmental damage from airline flights (noise and pollution).[24]

Under a congestion-pricing system, slots are no longer used. As long as a carrier can pay the appropriate congestion fee at a given time of day, it gains airport access at that time. It is important to recognize that, because the congestion fee captures all the external costs generated by a flight, the number of peak flights, and the corresponding level of congestion, end up being the correct ones from society's point of view.[25]

Even though slots are absent, there is an important equivalence between the congestion-pricing and slot allocation systems. In particular, a slot allocation system replicates the outcome under congestion pricing if the total slots allocated over the day match the flight totals chosen by the airlines when faced with congestion fees. The problem, however, is that there is no guarantee that this correspondence will actually be realized, given that choosing the number of slots to allocate is mostly a matter of guesswork. For example, a well-meaning slot allocation manager may mistakenly allocate or sell too few peak-hour slots on the belief that peak congestion needs to be dramatically restricted. By contrast, the congestion-pricing system automatically generates the correct flight totals over the course of the day. It does so by basing congestion fees on hard evidence regarding congestion costs, which is derived from engineering data on the airport's congestion properties along with data on airline operating costs and information on the value of passenger time.

Note that the potential for misallocation inherent in a slot allocation system exists even when the manager relies on the price system, running a slot auction, to distribute slots among the airlines. While an auction guarantees that the slots the manager chooses to sell are allocated efficiently, going to the carriers who value them most, the problem of selecting the *number of slots to sell* still involves guesswork. Use of the auction mechanism provides no guidance in making this quantity choice.

It has been argued that appropriate congestion fees cannot be computed reliably, creating an equally serious drawback for a system of congestion pricing. Some experts would dispute this point, however, arguing that reliable operating-cost and value-of-time information can be gathered to compute appropriate fees. Such concerns, along with a common preference for quantity restrictions over the price mechanism on the part government regulators, mean that use of a slot allocation system is likely to continue. However, reliance on such a system should include a recognition of its potential pitfalls.

7.3 Airport Prices

While slot auctions or congestion fees could provide substantial new revenue sources for airports, the large institutional changes needed to implement such systems may not

[24] See Daniel (1995) and Brueckner (2002) for analyses of airport congestion pricing.

[25] Congestion fees need not impose a larger financial burden on the airlines than existing landing fees. The latter fees, which are constant over the day at a typical airport, can be reduced at off-peak hours while being increased during peak periods. Despite this fact, airlines usually oppose any kind of new fee system. In addition, the general aviation lobby in the US strongly opposes congestion pricing, which would effectively exclude many small aircraft from busy airports at peak hours by imposing prohibitive costs.

occur soon. Therefore, it is useful to consider the current system of airport pricing, recognizing that piecemeal, temporary changes may be beneficial on the path to broader reform.

Given that the provision of airport capacity exhibits constant returns to scale for large airports and increasing returns for smaller facilities, economic theory says that airport charges should roughly cover the cost of operations for major airports.[26] However, existing charges, which include landing fees based on aircraft weight, occasional noise surcharges, and facility rents paid by airlines and airport retailers, often bear little relation to airport costs. As a result, airports in some cases incur losses that must be subsidized by general tax revenues, while profits are earned in other cases, indicating an excessive level of charges.

In a deregulated environment, airport charges that are too high put inappropriate upward pressure on the fares charged by the carriers, leading to an unwarranted economic transfer from passengers to the airport authorities. Charges that are too low, on the other hand, force the general public to subsidize users of the air transport system, while also prolonging the lifespan of inefficient carriers, whose operations may be fostered by cheap airport fees. Both problems are exacerbated when airports are operated inefficiently, with labor and capital costs higher than the levels that could be incurred under best-practice methods.

A potential solution to the joint problems of inappropriate airport charges and operational inefficiencies is airport privatization. Private airports have an incentive to keep operational costs as low as possible and to set their prices to at least recover costs. But while airport privatization eliminates inefficiency and the need for taxpayer subsidies, it may confer market power on the airport operator, raising concerns about excessive airport charges. These concerns may be especially strong for airports that enjoy high passenger demand, because they are important destinations (or origins) for business and leisure traffic. Abuse of the resulting market power will be reflected in the level of airport charges, which the airport authority may set too high, or in airport capacity, which the authority may set too low (by limiting expansion, for example).

A natural remedy for potential airport market power is government regulation of airport charges. Various characteristics of the aviation sector, however, make the result of such regulation uncertain and its use potentially counterproductive. First, price regulation may lead to under-investment in airport capacity, potentially exacerbating the problem of airport congestion. Second, it is not completely clear that airports will actually abuse their market power, in which case regulation of charges would be inappropriate. Airports may restrain their charges because the profitability of complementary activities (shopping, catering etc.) is negatively affected when they are set too high, a consequence of the resulting loss in passenger volumes. More generally, an airport may recognize that if charges are set too high, it may lose the totality of an airline's operations, either because the carrier relocates to another more affordable facility or because it is forced into bankruptcy. This threat of a dramatic revenue loss may help to restrain the level of charges levied by the airport.[27]

[26] See Doganis (1992) for evidence.

[27] See also Starkie (2001) for a discussion of the consequences of airport price regulation.

The potential exercise of airport market power remains a problem under both an auction-based slot allocation system and a congestion-pricing system. If a private airport authority controls the slot auction, it has an incentive to limit the number of slots sold in an attempt to extract more auction revenue. Similarly, the authority could charge congestion-sensitive landing fees but set these fees at an excessive level in an attempt to extract additional revenue.

These problems could be overcome if the government ran the slot auction or the congestion-pricing system, with the privatized airport operator reaping the resulting revenue. In pursuit of profit, the operator would then minimize airport operating costs as well as making appropriate capacity investments.

8 CONCLUSION

This paper has provided an overview of the institutional and regulatory developments underlying European airline deregulation. It is hoped that by clarifying the nature of the air transport system as it existed at the outset of deregulation, particularly the structure of airline networks, the paper allows a better understanding of the evolutionary process initiated by this important policy action. The paper has argued that the old flag-carrier regime led to a proliferation of airlines and airlines routes, with one effect being inefficiently low traffic densities in European networks. By raising cost per passenger, these low densities amplified the problem of high labor expenses, contributing to the high operating costs of European carriers. While international alliances and open skies agreements helped to boost traffic densities, the low-cost carriers that have been unleashed by deregulation, though generating substantial passenger benefits through lower fares, threaten to drain traffic out of the major carriers' networks. A defensive response is needed, and part of this response must involve concentration of the major carriers' traffic on fewer routes through network reorganization and cross-border mergers. While the paper has also highlighted the need for additional policy steps, especially formation of a Common Atlantic Aviation Area and new rules for airport operations, one further recommendation is in order. This recommendation relates to the task of *measuring* the effects of deregulation.

The problem is that, currently, the EU lacks a systematic means for tracking changes in airfares paid by European passengers. Since the ultimate goal of deregulation is to reduce the cost of air travel for passengers by generating a more efficient transportation sector, this measurement deficiency is a critical problem. To better grasp this point, consider the case of the United States, where the Department of Transportation collects extensive data on airfares that allows researchers to investigate a host of questions regarding the performance of the air transport sector. This data source, known as the Passenger Origin and Destination Survey, is generated from a 10 per cent quarterly sample of all airline tickets. The survey indicates the origin and destination cities for a passenger, the route traveled and the carriers used, and the overall fare paid for the trip. Given the nature of the data, average fares in individual city-pair markets can be measured and tracked over time, and the effect of competition in the market and other factors can be evaluated.

An alternative to using such data is to rely on the published airfares available in various sources. These data, however, do not reflect the actual fares paid by traveling passengers.

For example, some published fares may hardly ever be used, making them irrelevant in any attempt to measure the performance of air transport sector. Alternatively, some researchers have collected private survey data on fares, but the volume of such data is necessarily limited.

With air transport deregulation now achieved in the Europe, a high priority is for the EU to institute a system that allows its effects on fares to be measured. The relevant EU authorities should create a data collection system like the ticket-sampling system used in the United States. Such a system imposes a slight cost on the airlines, who must carry out the actual ticket sampling and report the detailed results, while also generating some cost for the government authority. However, without the resulting ability to track fares, the EU can never fully evaluate the success of its historic deregulation effort.[28]

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[28] The EU should also collect data analogous to the "service segment" data compiled by the US DOT (known as database T100). These data provide detailed information about airline operations on individual non-stop route segments (flight frequency, total seat capacity, etc.). Such data are useful in tracking route entry and exit by the airlines.

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