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The Evolution of U.S. Airline Competition

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Studies by academic economists were a significant force in the movement towards deregulation of the domestic airline industry in the early 1970s (Levine, 1965; Jordan, 1970; Keeler, 1972; Douglas and Miller, 1974). During the critical 1977–78 period in which deregulation was imposed first *de facto* by the Civil Aeronautics Board (CAB) and then *de jure* by Congress, the chairman and vice-chairman of the CAB were economists. For the 14 years since deregulation, economists have continued intensive study of the industry, in part because of the unusual availability of reliable firm- and transaction-level data and in part because of the rare opportunity to observe an industry as it evolves from strict economic regulation to fairly unimpeded competition and strategic behavior.

The simplest prediction of economists about airline deregulation, and one of the few on which nearly all economists agreed, was that deregulation would improve consumer welfare in comparison to continued price and entry regulation. Fourteen years later, nearly all economists still agree on this, though the degree of enthusiasm for the deregulation outcome varies considerably. There was substantial disagreement among economists about the market structure that would result. Because studies of scale economies in the airline industry had concluded that none existed beyond the scale of the smaller major airlines of the 1970s (Caves, 1962; Eads et al., 1969), many economists argued that deregulation would result in more than the 11 major airlines that existed at the time of deregulation. Others predicted that only a few, or possibly only one, airline would survive at a large scale. Two noted University of Chicago economists, Sam Peltzman and Lester Telser, made a bet in 1979 on whether

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the 4-firm concentration ratio would be above or below 90 percent by 1985. Peltzman bet that it would be below 90 percent and, as he put it, "won the bet, but lost the war." Nationwide, concentration decreased during the first few years following deregulation, but has turned upward since then.

Though comparisons of the airline industry under regulation and deregulation continue, this is not my primary focus here.[1] As the time since deregulation grows, such comparisons to the "straw man" of regulation are increasingly speculative and decreasingly relevant to the issues at hand. Regulation under the CAB was far from ideal; if it were reimposed today, it would probably be more efficient than the pre-1978 regulation. Deregulation has also entailed missteps that would not be repeated were the process to be replayed. Therefore, an estimate of the net welfare gain (or loss) resulting from deregulation gives little guidance about the relevant choices that will face policy-makers in the future.

For the most part, the lessons that have been learned from the deregulated domestic airline industry are not about government regulation or the process of deregulation, but about the tactics, strategies, and results of competition in a dynamic, complex, and innovative service industry. These lessons are more likely to inform economists about the market process in, for instance, the hotel or fast-food industries than in electric power distribution or other traditional areas of regulation.

The next section reviews the evolution of the domestic airline industry since the late 1970s, when it was abruptly freed from most regulatory constraints on pricing, entry and exit. (International air travel is considered here only as it relates to competition in the domestic industry. This is due both to space limitations and because international air travel remains heavily and idiosyncratically regulated.[2]) The following sections will examine the competitive issues that have arisen since deregulation; the conclusions, and in some cases consensus, that economists have reached on these issues; and the public policy options in dealing with the airline industry in light of these issues.

A Brief History of the Deregulated Airline Industry

In the early 1970s, just a few years prior to deregulation, government intervention in the airline industry reached its apex. The CAB had prevented

[1]See Bailey, Graham, and Kaplan (1985), and Morrison and Winston (1986) for the most complete analyses of the effects of deregulation during the first half decade. Dempsey (1990) compares the trend in average prices since 1978 to the pre-deregulation trend, adjusting only for fuel price changes, and finds that prices are higher than they would have been under deregulation. The significant weakness in this comparison is that real fuel prices fell during the period Dempsey analyzes, while most other airline input prices, for which Dempsey does not control, were constant or increased in real terms. The Morrison and Winston study does a much more complete comparison and finds substantial price decrease relative to regulation.

[2]Those interested in whether the single European market scheduled to go into effect at the end of 1992 might offer some hope for increased international airline competition should consult the cautious view of McGowan and Seabright (1989) and Borenstein (1992).

Table 1
Measures of Domestic Airline Industry Concentration Since Deregulation

	1977	*1982*	*1987*	*1990*
4-firm Concentration Ratio	56.2%	54.2%	64.8%	61.5%
8-firm Concentration Ratio	81.1%	80.4%	86.5%	90.5%
Herfindahl Index	0.106	0.093	0.123	0.121

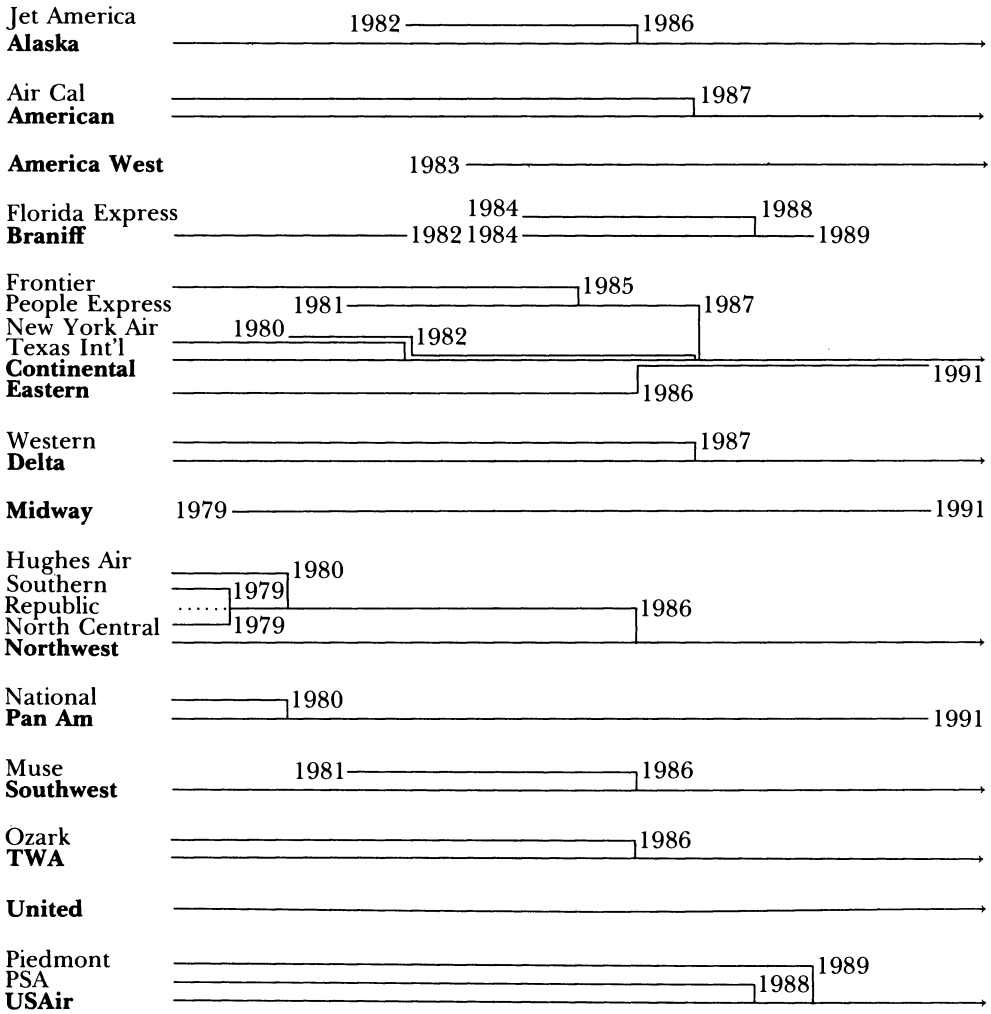
Source: U.S.D.O.T. Air Carrier Traffic Statistics, Revenue Passenger-Miles.
Note: The 4- and 8-firm concentration ratios are the sums of the market shares of the 4 and 8 largest firms, respectively. The Herfindahl index, the sum of the squared market shares of all firms, ranges between 0 and 1.

entry of new start-up airlines for many years, but in the early '70s it also imposed a "route moratorium," ceasing to assign new authority for existing airlines to serve new city-pairs and preventing many airlines from abandoning routes that they no longer wished to serve. At the same time, the CAB decided that the discounts with which it had experimented in the '60s—such as student fares and discounts for a spouse accompanying a full-fare passenger—conflicted with its mandate for fair and equitable prices, so it greatly reduced the scope for such fares.

By 1976, however, the CAB began to move towards deregulation by again permitting discriminatory fare discounts. In the following two years, the Board permitted free entry of any certified carrier on a few selected routes, breaking with its history of choosing which airlines would compete in each market. It also relaxed the restrictions on chartered service to the extent that charters became close substitutes for regular scheduled flights. Just as some of the major airlines had begun to sue the CAB for violating its congressional mandate by allowing too much competition, Congress passed the Airline Deregulation Act of 1978. The Act set out a time schedule for relaxation of price and entry regulation and permitted the CAB to accelerate that schedule as it deemed appropriate.

New entry boomed and prices fell substantially on most routes, especially long distance routes. On the shorter routes, which had been cross-subsidized under regulation, real prices did not fall as much and even increased in some cases. Airline profits were at record levels in 1978, but the 1979 oil price shock dampened these gains. As the deep recession of the early 1980s set in, the profits turned to large losses. Entry of new airlines slowed markedly and came to a nearly complete halt by 1983. In the next few years, many of the new entrants and the pre-deregulation smaller carriers either merged with a major carrier or declared bankruptcy and ceased operations. Table 1 presents the evolution of three different measures of nationwide concentration in the industry. By all three measures, concentration increased between 1982 and 1990, and is now higher than it was in 1977. Figure 1 tracks the lineage of the major carriers that operated in 1991.

Figure 1
Chronology of Large U.S. Airlines Since Deregulation



Source: Kaplan (1986) and *Wall Street Journal*, various issues

Measures of national concentration are convenient reference points, but the increase in concentration is less apparent at the city-pair route level, where competitors' products are effective substitutes for one another. Table 2 shows that looking at all traffic, route level concentration decreased substantially between 1984 and 1987, and showed a slight drop between 1987 and 1990. If we examine direct trips, however—those in which the passenger does not change planes—concentration has steadily increased from 1984 to 1990.

This outcome reflects the growth of hub-and-spoke operations. All major airlines now have one or more hubs at which many of their long-distance

Table 2
Average City-Pair Herfindahl Indexes

	Market Distance in Miles					
	0–200	*201–500*	*501–1000*	*1001–1500*	*1500+*	*ALL*
Year			**All Trips**			
1984	0.600	0.588	0.537	0.479	0.415	0.531
1987	0.689	0.616	0.498	0.444	0.363	0.512
1990	0.618	0.614	0.518	0.424	0.357	0.506
			Direct Trips Only			
1984	0.601	0.598	0.601	0.581	0.536	0.590
1987	0.691	0.648	0.612	0.587	0.532	0.620
1990	0.612	0.641	0.672	0.625	0.536	0.632

Source: U.S.D.O.T. Databank 1A.
Note: Excludes interline tickets and markets with less than 10 passengers per day. The numbers shown are unweighted averages across routes. The sign and approximate magnitudes of these changes are the same if routes are weighted by either passengers or passenger-miles. All data are for the second quarter of the given year.

passengers change planes. This approach has allowed carriers to fill a higher proportion of the seats on their planes and to increase flight frequency of nonstop routes between their hubs and other airports. Since most hub airports can accommodate large-scale operations of only one airline, both logistically and economically, competition has tended to decrease on direct routes to and from the hubs. Yet, because a hub allows an airline to serve a large number of routes with a change of plane at the hub, longer routes and ones on which most passengers change planes are now served by many airlines, each channeling passengers through its particular hub airport. This explains the decline in concentration on longer routes and increase on shorter routes—usually served without a change of plane—when all trips are examined.

One drawback to hub-and-spoke operations is that a larger proportion of passengers change planes, especially on longer trips, instead of flying nonstop from their origin to their destination. The share of trips over 1500 miles that involve a flight change rose from 42 percent in 1978 to 52 percent in 1990. On trips between 500 and 1500 miles, it increased from 33 percent in 1978 to 38 percent in 1990. Gordon (1992) finds that nonstop service has increased on most of the top 500 routes since deregulation, but even on these higher density routes, the increase in nonstop flights has not kept pace with the increase in traffic. Furthermore, the loss of nonstop service is more likely to be evident on smaller routes.

Still, by allowing each airline to serve more city-pairs with change-of-plane service, hub systems have decreased the proportion of passengers who need to change airlines as well as planes during their trip. Carlton, Landes, and Posner

(1980) and many passenger surveys have concluded that changing airlines imposes substantial additional costs on passengers, due to increased probability of missed connections and lost baggage. The proportion of trips that included a change of airline fell from 11.2 percent in 1978 to 6.9 percent in 1981, 4.0 percent in 1984, and 1.2 percent in 1987 and 1990. While the more recent changes are due in substantial part to mergers among major carriers, the earlier and more significant declines are explained largely by formation of hub-and-spoke systems.

Furthermore, for most travel between non-hub airports, the choice of departure times has been enhanced substantially by hub-and-spoke operations. A thinly traveled route that had one or two nonstops a day under regulation is likely now to have 10 or more possible change-of-plane routings through different hubs spread throughout the day. Finally, hub-and-spoke operations have contributed to the increased use of satellite airports such as Oakland, Burbank, or Orange County in California. Many people would rather fly to these airports with a change of plane than to San Francisco or Los Angeles airports nonstop.

Concerns about the possible anticompetitive effects of hub-and-spoke systems have been fueled by mergers and bankruptcies among some of the larger airlines in the last few years. Eight mergers among major airlines were approved in 1986 and 1987. Two of these mergers, Northwest-Republic and TWA-Ozark, involved airlines that shared the same primary hub. The Department of Transportation (DOT) approved these two combinations over the objections of participants from the Department of Justice.

The industry shakeout intensified following the August 1990 Iraqi invasion of Kuwait that increased jet fuel prices, for a brief period by more than 100 percent. Since then, America West, TWA and Continental have filed for Chapter 11 bankruptcy protection, but continued to operate. Midway, Pan Am, and Eastern have been liquidated, but only after hundreds of millions of shareholders' and creditors' dollars had been spent trying to revive these companies.

Despite the spate of airline mergers and failures, or some have argued because of them, domestic airline prices have not increased relative to costs since most new entry ended in the early 1980s. From the second quarter of 1984 to the second quarter of 1990, before the events in the Persian Gulf, prices increased 4 percent less than DOT's index of airline costs. Many managers in the industry have claimed that cash flow requirements of airlines near bankruptcy or operating under bankruptcy court protection have led to cutthroat pricing. The industry average comparison, however, hides an important dichotomy: prices on short-haul routes, under 500 miles, increased 5 percent more than the cost index between 1984 and 1990, while prices on longer routes increased 10 percent less than cost. Nearly all of these changes occurred between 1984 and 1987; from 1987 to 1990 prices moved closely in line with the DOT cost index.

Many analysts have pointed to airport capacity shortages as the most critical factor affecting competition and efficiency in the domestic airline industry. Though a few airports suffered significant congestion before deregulation, the problem has worsened dramatically since 1978. In part, the increase in airport congestion is a cost of the success of airline deregulation. From 1977 to 1990, domestic air travel increased by 120 percent.[3] During this time, no new airports were built, while expansion of existing airports was greatly hampered by environmental concerns and local zoning and noise restrictions. The formation of hubs also increased the strain on many airports. A hub operates by scheduling many incoming flights at virtually the same time and then many departures 30 to 60 minutes later, thereby increasing airport capacity demands for a given number of flights.

One approach to allocating scarce airport capacity would be to impose congestion-based landing fees, which would increase at times of peak demand. Historically, landing fees have been kept quite low; for example, from $25 for a small private plane (known as general aviation) to $800 for a jumbo jet at Boston's Logan airport. To date, political resistance to peak-load pricing of runway use, particularly from general aviation operators, has successfully prevented its implementation, but recent moves by the FAA indicate that this may soon change. Congestion-based landing fees would also imply that fees would cease to be a linear function of weight, as is common now, raising the cost to smaller commercial planes and general aviation and lowering the cost to large planes. This would reduce use of congested airports by aircraft carrying few passengers. An attempt to implement such a plan in Massachusetts in 1987, however, was successfully challenged in the courts for being "discriminatory."

At a few U.S. airports, permission to have a plane takeoff or land at a given time of the day has been converted into a transferable property right. Such landing slots at Washington National airport and O'Hare in Chicago have recently sold for $.5 to $1.2 million, with the higher prices going for peak time slots. Unfortunately, congestion delays appear to be just as high at "slot-controlled" airports as at similar-size airports without slots, though changing the number of slots permitted would surely affect this result. The issue of airport congestion is likely to become more important in the future.

Innovation has also occurred in the technology and strategy of selling air travel. Computer reservation systems (CRSs) used by travel agents have become a central and critical part of airline ticketing. Travel agents now write more than 80 percent of all tickets, up from about 50 percent before deregulation. There are four CRS systems currently in use, but Sabre (owned by American) and Apollo (owned principally by United, but also by USAir and some foreign airlines) have more than 75 percent of the business. Worldspan (Delta, TWA,

[3]Growth in travel was even greater in the 13 years prior to 1977, but this was probably due to improvements in speed and comfort of travel with the introduction of jet aircraft. Since deregulation, there have been very few technological improvements in air transport quality.

and Northwest) is still a distant third in volume. SystemOne (Continental) is considered the poorest sister of the industry and may cease operations soon. Most tickets written by travel agents are booked through one of these systems.

The airlines, led principally by American, have also successfully explored marketing strategies to increase customer loyalty. Frequent flyer programs (FFPs) and travel agent commission override programs (TACOs) were introduced shortly after deregulation. Most travelers are aware of frequent flyer programs, which give free travel or other bonuses to passengers who have flown some preset amount with a firm. TACOs have been called "frequent booker" programs for travel agents. In a typical TACO agreement, airline *X* promises a travel agency a 15 percent commission rate, instead of the usual 10 percent, if that agency books more than 80 percent of its tickets on airline *X*. In a 1990 study by the General Accounting Office, more than half of all agents reported receiving commission overrides.

The biggest surprise from the first 13 years of deregulation has been the pervasive importance of hub-and-spoke operations in the logistic and competitive development of the domestic airline industry. Hubbing has enhanced the efficiency of airline operations, increased the effectiveness of marketing devices such as frequent flyer programs, changed the scale at which an airline must operate to be competitive, and exacerbated problems of congestion at major airports. For this reason, much of the economic research on the industry since deregulation has investigated issues related to the hubs and airline networks in a deregulated industry. The result has been a few well-established facts, and a growing number of questions that remain to be answered.

Nearly all of the research on airline competition addresses one or both of the two critical questions that underlie most work in applied industrial organization: "What equilibrium will evolve in the industry and what will be the speed and path of transition to that equilibrium?" and "What type or degree of government intervention will maximize social welfare?" The next two sections focus on the first question, though the observations have immediate consequences for the second. The topics divide roughly into what might be called "structure" and "strategic" issues; the former covers questions of the effect of market structure on market power—the influence of potential competition, airline networks, and mergers—while the latter includes the complexities in airline competition that result from the sophisticated marketing strategies that have developed—frequent flyer plans, TACOs, price discrimination, and computer reservation systems.

Structure Issues in Airline Competition

Many of the pre-deregulation predictions about competition in the airline industry relied on simple textbooks models. The application of contestability theory to the airline industry generally assumed an industry of independent

city-pair markets, failing to take account of the importance of airline networks and hub operations. Likewise, the strategic advantages to an airline of dominating service at an airport were not foreseen by many. The textbook theories generally concluded that actual or potential competition would drive all prices to the marginal costs of the most efficient firms, with less efficient airlines reorganizing or exiting the industry. The actual outcome has been quite a bit different.

The Disappointing Evidence on Contestability and Potential Competition

For many economists and policy-makers, advocacy of airline deregulation was simply a rejection of the incredibly inefficient regulation of the previous 50 years. For others, however, a cornerstone of support for airline deregulation was contestability theory, reliance on the disciplining effect of potential competition. It was argued that an airline can enter a new market quickly and with low sunk costs, particularly if the entrant already serves one or both of the endpoints of the route (Bailey and Panzar, 1981). The importance of a potential entrant serving both ends of a route before entering has been demonstrated by Berry (1990a) and Morrison and Winston (1990). Berry, for example, finds that in a sample of 281 new markets entries that occurred between the first and third quarters of 1980, the new competitor already served both endpoints in 245 cases and at least one endpoint in 277 cases.

Unfortunately, potential competition appears to be no substitute for actual competition. While contestability theory in its pure form suggests that the number of actual competitors should have no effect on prices, many studies have found that the number of airlines actually competing on a route has a significant effect on the price level (Bailey, Graham, and Kaplan, 1985; Call and Keeler, 1985; Morrison and Winston, 1987; Borenstein, 1989; Hurdle et al., 1989). In 1990, prices on routes with two active competitors averaged about 8 percent lower than on monopoly routes. A third active competitor was associated with another 8 percent price drop. Nor can these effects be attributed to cost savings from higher traffic volume on more competitive routes; volume per airline is smaller on average on routes with more competitors.

Studies that attempt to explain cross-sectional variation in average prices find that a potential competitor in a market has from one-tenth to one-third the competitive impact of an actual competitor (Morrison and Winston, 1987; Borenstein, 1989; Brueckner, Dyer, and Spiller, 1990). In retrospect, the result is not very surprising. If sunk costs are non-trivial, albeit small, and an incumbent can respond in price and quantity as quickly as a new competitor can enter, then the incumbent has little incentive to respond in advance of actual entry (Stiglitz, 1987). Advertising and the short-run losses associated with inauguration of service on a new route seem to be sufficient sunk costs to inhibit contestability in the airline industry.

Even the small estimates of potential competition effects that have been made may be too high. The measure of potential competition—the number of

airlines serving one or both endpoints, but not the route itself—is almost certainly endogenous. A low price in a market will encourage well-positioned potential competitors to stay out of the market, thus increasing the number of potential competitors observed. This effect is likely to bias the analysis towards a larger estimated impact of potential competition. Reiss and Spiller (1989) make an ambitious attempt to model this problem explicitly.

A related approach to comparing the effects of actual and potential competition is to observe when entry and exit occur; that is, the result of a potential competitor becoming an actual competitor and *vice versa*. Joskow, Werden, and Johnson (1990) find that after controlling for cost factors, routes with unusually low prices are subject to more exit than others, and that exit of a competitor leads to a 10 percent average price increase for the incumbents that remain. Routes with abnormally high prices, however, are no more likely to experience new entry than are other routes. Still, they estimate that new entry on average drives down prices by about 9 percent. Morrison and Winston (1990) find that routes with lower-than-average prices, controlling for distance, are actually more likely to be entered than other routes and that routes with higher-than-average prices are more likely to experience exit of a competitor. These studies lend little support to a belief that potential competition disciplines airline markets. They do, however, strongly indicate that prices and entry are jointly determined by some process that is not well understood.

Whinston and Collins (1990) use a stock market event study to analyze the effect of entry. They look at a series of announcements by People Express during 1984–85 about specific routes that it planned to enter in the ensuing weeks. They find that the average combined equity value loss to the incumbents in these markets reflect a pretax loss in future profits of 25 percent to 43 percent of the annual revenues earned on these routes. Such a finding indicates that substantial rents were being earned prior to new entry, again reinforcing the conclusion that potential competition cannot substitute for actual competition in airline markets.

Airport Concentration and Market Power

The value of hub-and-spoke networks for the cost savings they offered was recognized before deregulation, but few saw that hubs would also be valued for the market power that they permit. For people whose origin or destination is the hub city, there is often very little competition. The hub-and-spoke networks have evolved to the point that one airline will generally fly to another airline's hub only from its own hub. United, for instance, offers nonstop service to Atlanta—Delta's major hub—only from Denver, Chicago-O'Hare, and Washington-Dulles, three of United's four largest hubs.

Table 3 lists the 30 largest U.S. airports in declining order of what might be called "hubness"—the percentage of passengers using the airport who are traveling through, rather than to or from, the city. Not surprisingly, the hubs tend to be located towards the center of the country. Table 3 also demonstrates

Table 3
Hubbing and Airport Concentration at the 30 Largest U.S. Airports

Airport	*Percent Changing Planes*	*Airport Herfindahl*	*Airport Fare Premium*	*Rank by Size*
Charlotte	75.7%	0.579	18.8%	20
Atlanta	69.0%	0.347	17.2%	3
Memphis	67.7%	0.355	27.4%	29
Dallas/Ft. Worth	65.8%	0.386	20.5%	2
Pittsburgh	62.1%	0.529	15.9%	16
Salt Lake City	61.3%	0.430	19.1%	28
St. Louis	56.2%	0.354	−4.0%	13
Chicago—O'Hare	55.7%	0.270	14.8%	1
Denver	54.1%	0.272	15.3%	7
Minneapolis	51.0%	0.418	31.5%	15
Houston—Intercontinental	49.5%	0.423	15.6%	19
New York—Kennedy	47.3%	0.202	2.9%	6
Detroit	43.6%	0.296	−0.7%	11
Baltimore	40.5%	0.299	9.1%	26
Phoenix	33.1%	0.205	−28.4%	9
Miami	31.0%	0.171	−14.3%	14
Seattle	27.3%	0.145	8.7%	24
San Francisco	25.3%	0.145	−1.5%	5
Los Angeles	25.2%	0.110	−5.3%	4
Philadelphia	24.9%	0.217	11.2%	22
Honolulu	22.4%	0.199	−20.8%	17
Newark	19.6%	0.292	11.5%	12
Las Vegas	18.9%	0.177	−27.8%	23
Houston—Hobby	17.5%	0.481	−23.4%	30
Orlando	16.8%	0.180	−15.6%	21
Boston	13.8%	0.120	9.0%	10
Washington D.C.—National	11.1%	0.125	10.7%	18
Tampa	11.0%	0.181	−12.4%	27
San Diego	6.6%	0.138	−18.1%	25
New York—La Guardia	6.2%	0.118	9.5%	8

Source: U.S.D.O.T. Databank 1A, second quarter, 1990.

that the markets for travel to and from hub airports tend to be more concentrated than at nonhub airports. The third column shows the Herfindahl index of to/from traffic, known as local traffic, at the airport. The correlation between the percentage of passengers changing planes at the airport and the local traffic Herfindahl is 0.74 in this list.

It has been clearly and frequently demonstrated that average prices for local traffic at concentrated airports are significantly higher than prices on other routes (Borenstein, 1989; GAO, 1990a; DOT, 1990; Berry, 1990b; Abramowitz and Brown, 1990; Evans and Kessides, forthcoming). This is

illustrated by the fourth column of Table 3, which presents the average ratio of fares on local routes at these airports compared to national average fares on routes of the same distance. The correlation between this "airport fare premium" and airport concentration is 0.44 in this table. Econometric studies have found this effect while controlling for traffic volume, business/tourist mix, the number of plane changes a passenger must make, heterogeneous costs of airlines, concentration and market share on specific routes, airport-specific congestion, and many other factors. The effect, however, does not carry over to itineraries in which the passenger just changes planes at concentrated airports; "through" passengers using these airports pay prices about equal to the national average.

One of the leading explanations for this result is the market power and customer loyalty advantage that a locally dominant airline can achieve through use of frequent flyer plans and travel agent commission override programs (TACOs). One piece of evidence for this theory is that the dominant carrier at a concentrated airport charges higher average prices on routes to and from the airport than other airlines serving the same routes (Borenstein, 1989; Evans and Kessides, forthcoming). Borenstein (1991) also demonstrates that, controlling for price and service quality, the dominant airline at an airport attracts a disproportionate share of passengers who originate their trips at the airport, with the advantage being especially great on business-oriented routes. As explained below, one would expect that frequent flyer programs give a dominant airline a greater advantage in attracting business travelers than others. Other studies have included airport-level entry barriers as an explanation for the higher prices at dominated hubs. Abramowitz and Brown (1990) control explicitly for the effect of majority-in-interest (MII) clauses in gate lease contracts, which allow a dominant airline to block construction of new airport facilities. The effect of MII's is statistically significant, but small, increasing prices by less than 2 percent.

Thus, hub-and-spoke networks are not just a source of increased production efficiency; they are also associated with airport concentration and dominance of a hub airport by one or, occasionally, two airlines. This airport dominance ensures a degree of protection from competition and control over price that was not foreseen prior to deregulation and has significantly altered airlines' strategies in the deregulated industry.

Horizontal Mergers

For better or worse, the Reagan administration's *laissez-faire* views of mergers provided an experiment in industry restructuring, especially in the airline industry. In particular, two mergers between hub-sharing carriers in October 1986 were an excellent opportunity to observe the effect of increased airport dominance.

The merger between Northwest and Republic caused prices at Minneapolis, the primary hub they shared, to increase substantially faster than the

national average immediately before and after the merger. The largest price increase occurred on routes where the two merging airlines had been the only competitors, increasing 23 percent faster than the national average. Overall, the average Minneapolis/St. Paul passenger's ticket price went up 11 percent faster than the national average between the year before the merger and the year after (Borenstein, 1990; see also Werden, Joskow, and Johnson, 1991).

The effect of the TWA-Ozark merger on prices at St. Louis is more mixed. When all tickets to and from St. Louis are considered, price went up 8 percent faster than the national average (GAO, 1988; Borenstein, 1990). The increase, however, is driven by a few high-volume routes on which prices increased dramatically following the merger. These were routes on which TWA and Ozark competed prior to the merger along with at least one other airline. Increases on routes with just TWA and Ozark were not faster than the national average. Finally, as Table 3 indicates, St. Louis remains a remarkably low cost city to fly to or from given that it is a concentrated hub airport dominated by TWA.

Such hub mergers appear to decrease service on routes where the merging airlines had competed. This may reflect the elimination of "redundant" service or it could be indicative of reduced competition. The interpretations are not mutually exclusive. Overall, the number of flights offered by the dominant airlines fell 7 percent at Minneapolis following the merger and 11 percent at St. Louis (Borenstein, 1990). Both mergers led to an increase in the total number of cities served from the hubs and to a large increase in the number of connections passengers could make without changing airlines (Huston and Butler, 1988).

The overall welfare effects of these and other mergers require a balancing of the increased market power that may result with the possibility of improved service and efficiency. Brueckner, Dyer, and Spiller (1990) estimate that increased traffic for a dominant airline at a hub will significantly lower the prices it charges to consumers changing planes at the hub on their way to another location. Thus, the merger of two airlines' operating hubs at the same airport would be expected to increase the volume of the traffic carried by the surviving carrier on the spokes of the network and thus decrease costs and prices to through passengers. In fact, prices for passengers traveling through Minneapolis on Northwest-Republic fell by 1.5 percent relative to industry average prices between the second quarters of 1986 and 1987, while passengers traveling through St. Louis on TWA-Ozark saw their prices increase by 0.5 percent relative to industry average during this period.

Morrison and Winston (1989) attempt to compare the costs of market power and the benefits of improved efficiency for six mergers among jet carriers that took place between 1985 and 1988. Besides the two mentioned above, these included Delta-Western, American-Air California, USAir-Piedmont, and USAir-Pacific Southwest Airlines. They find that the six mergers in total had a small positive effect on consumers. This result, however, depends

on a large positive estimate of the change in the value of frequent flyer bonuses, an estimate that is probably too optimistic.

Morrison and Winston estimated that frequent flyer miles were valued by consumers at an average of 2.7¢ per mile earned in 1983, about 20 percent of the average fair paid per mile at that time, implying that the minimum 20,000 miles necessary for a free domestic ticket would produce a bonus worth $540. The estimate seems high, considering that supersaver fares for the longest transcontinental trips were under $400 at the time. More importantly, most frequent flyer mileage is never cashed in for free travel, because the consumer either never earns enough mileage for a bonus, never uses the bonus once it is earned, or uses it only for a first-class upgrade, which is likely to be a less valued use. In fact, only 5 to 8 percent of passenger miles are "non-revenue," which includes both frequent-flyer bonus tickets and employee travel. If frequent flyer program bonus trips are valued as much as paid-for trips, then the value enhancement of FFPs would be in the 3 to 7 percent range, after deducting the 1 to 2 percent of passenger miles comprised by employee travel. The actual value enhancement is probably much lower than 3 to 7 percent, since many FFP trips would not have been taken had the traveler had to pay actual fares. On the other hand, to the extent that FFP mileage is used for upgrades and other perks, the actual figure could be somewhat higher. If one assumes that FFPs enhance average ticket value by 6 percent instead of 20 percent, or about 0.8 cents per mile, the overall impact of the mergers they analyze falls from a $67 million annual increase in consumer welfare to about a $200 million loss (Morrison and Winston, 1989, Table 7).[4]

In reality, the short-run welfare effect of the mergers between direct competitors was probably significantly negative. Whatever production efficiency that the mergers may have permitted does not seem to have been reflected in prices, but the increased market power was often evident. The long-run effect is much more difficult to estimate, because many of the firms—Ozark being the most notable—would probably have failed within a few years absent these mergers. Morrison and Winston (1989) point out that since mergers are extremely unlikely to be "unscrambled" once they have occurred, the appropriate long-run comparison is not to that market structure before the merger, but to the alternative possible market structures and mergers—with the potential for greater efficiency and competition increases—that are foreclosed by the merger.

[4]Furthermore, Morrison and Winston assume that the value of a FFP bonus ticket increase linearly with an increase in the number of cities that the airline serves, implying that a merger in which the surviving carrier serves 50 percent more cities than either merging carrier did would increase the value of all FFP on the carrier tickets by 50 percent. Given that one always has the option of paying for a ticket to fly where one wants, the size and unbounded nature of the value increase doesn't seem credible.

Vertical Mergers with Commuter Airlines

As the much-publicized horizontal airline mergers were taking place in the mid-1980s, less-publicized vertical network mergers and joint marketing agreements were forming between major airlines and commuter carriers who serve short routes that transport passengers to larger airports. In the early part of deregulation, many commuters agreed to operate in coordination with, and under the name of, a major jet airline. These "codesharing" agreements meant that the commuter airline's flights would be timed to connect with the major airline and would be listed on computer reservation systems under the airline code of the major. In the later 1980s, these agreements were often replaced by vertical integration.

Such agreements and mergers permit greater coordination of flight schedules, baggage handling, marketing, and frequent flyer programs, which may increase the consumer's value of the joint product and may lower actual production costs. In addition, however, they can raise the costs of entry for a new airline at airports where the major and the commuter airline connect. These agreements and mergers do not lead to strict exclusivity—it is possible to connect from a United-affiliated or -owned commuter airline to an American flight—but realistically, a commuter airline cannot coordinate its schedule, airport location, and marketing with many different major airlines. If a new major carrier can compete with the commuter-affiliated major at an airport only by having its own coordinated commuter carrier, there is an associated increase in the sunk cost of starting service at the airport. The theoretical debate over whether efficiency-enhancing vertical coordination might also be used anticompetitively is far from settled.

Consumers occasionally complain that codesharing agreements are an attempt to mislead consumers about who is operating their flights. Most of these complaints are about flying on a propeller plane, however, not about the ownership or operation of the flight. Since both ownership and equipment information are available when the ticket is purchased, and since an airline will have incentive to make sure that an affiliated commuter doesn't harm the airline's good name, government intervention here does not seem wise.

Cost Heterogeneity Among Airlines

The absence of substantial economies of scale was one of the leading arguments for deregulation of the airline industry. The inference drawn by many economists was that all airlines would attain approximately the same costs of production. Yet the studies on which this conclusion was based were not very sophisticated. Essentially, they regressed the total costs of an airline on a measure of output and the costs of inputs, with little focus on the actual production process. Caves, Christensen, and Tretheway (1984) improved upon the earlier studies by distinguishing economies of density—additional passengers on a given set of routes—from economies of scope—a proportional

expansion of the size of the network as output expands. Using data from 1970 to 1981, they found substantial density economies, but did not find that increases in the scope of operations lowers an airline's unit costs.

One of the most remarkable results of the various cost studies has received little attention: the significant variation in unit production costs across firms. After controlling for input prices and output characteristics, the carrier-fixed effects in the study by Caves, Christensen, and Tretheway (1984) exhibit a substantial spread, with the least efficient major airline estimated to have 40 percent higher unit costs than the most efficient ones. Since none of these studies corrects for the endogeneity of wages—wages tend to decline when an exogenous cost increase causes the firm's profits to decline—these spreads might well be understated.[5]

Table 4 presents the cost per passenger-mile and per seat-mile for the 12 largest U.S. carriers during 1990. The cost heterogeneity appears to be as significant as ever, with the highest cost airline, USAir, exhibiting unit costs about 64 percent above Southwest's. Caves, Christensen, and Tretheway identify average flight length as the most significant cause of costs heterogeneity, but Southwest actually has a shorter average flight length than USAir, implying that Southwest should exhibit higher costs. America West, which operates a more traditional hub-and-spoke system than Southwest and makes greater use of travel agents and computer reservation system ticketing also has much lower costs than the other major airlines while flying shorter average trips than most of the others.

What is the source of these cost differences? One answer seems to be managerial ability. The managers of Southwest and American, which has the lowest costs among the large major airlines, are recognized in the industry for being smart and sophisticated. USAir has a reputation for poor management that dates back to the days of regulation.

Still, that just leads to the question of how the inefficient managers hold on to their jobs. Levine (1987) and others have argued that the separation between ownership and control explains the persistence of bad management at some U.S. airlines. The canonical case in the industry is Pan Am, which lost money in all but one year between 1980 and its 1991 demise—a net loss of more than $2 billion—but survived by selling off assets on which huge capital gains were realized, such as land that the company owned in Tokyo. To survive, inefficient firms must retain substantial market power. USAir is a good example. It has two significant dominated hubs, Pittsburgh and Charlotte, where it has over 80 percent of the enplanements. Eastern, which had high costs prior to its bankruptcy declaration and associated wage concessions, exemplifies the alternate outcome. Before its demise, Eastern's most significant airport position was

[5]Greenwald, Salinger, and Stiglitz (1991) argue that the cost disparities may be self-enforcing. In a theoretical model and empirical application to the airline industry, they find that firms in financial distress may be less able to invest in productivity-enhancing improvements, thus increasing their cost disadvantage.

Table 4
Costs of Major U.S. Airlines, 1990

Airline	*Average Cost Per Passenger-Mile*	*Average Cost Per Seat-Mile*	*Average Flight Distance*
Southwest	0.111	0.067	376
America West	0.122	0.075	544
Eastern	0.128	0.078	606
Midway	0.144	0.084	636
American	0.144	0.088	776
United	0.145	0.093	809
Continental	0.150	0.087	743
Northwest	0.150	0.094	665
TWA	0.151	0.089	719
Delta	0.155	0.090	626
Pan Am	0.168	0.101	693
USAir	0.189	0.112	463

Source: U.S.D.O.T. Air Carrier Traffic and Financial Statistics.

at Atlanta, where it had to coexist with Delta, a much more efficient and sophisticated airline.

These answers, however, are *ad hoc* and the evidence is largely anecdotal. The heterogeneity of management ability and entrenchment in the airline industry, along with the detailed public data on company operations and finances, may offer an unusual opportunity to look more systematically at the internal dynamics of large corporations. These heterogeneities appear to play as large a role in the competitive evolution of the industry as the differences in market shares and concentration across firms and markets.

Strategic Developments in Airline Competition

Under government regulation, airline managers had few marketing decisions to make beyond reviewing the latest brand-image advertisements. Not only did the CAB tell each airline which products it could sell, it also dictated the ways in which they could be sold and the prices that could be charged. When these constraints were lifted, the marketing of air travel quickly became a dynamic and central part of the airline business. The airlines that innovated most quickly gained in market share and profitability.

Loyalty-Inducing Marketing Devices

The first frequent flyer program was introduced in 1981 by American Airlines, but it took until 1986 for all of the major airlines to start one. In some ways, frequent flyer programs (FFPs) are just quantity discounts: "Buy four

trips, get the fifth one free." Supporters of this view have pointed out that quantity discounts are present in many industries and that they are particularly appropriate if marginal cost is below average cost, because they allow total costs to be covered while decreasing the inefficiency that results when the marginal price is above marginal cost.[6] However, FFPs also create strategic advantages for an airline with a large market share and reduce the threat of potential competition.

Strategic advantages may result both from the way frequent flyer mileage is accumulated and the way that bonuses are paid out. Because the marginal value of the reward increases as the customer builds up miles or points on a single airline, FFPs encourage travelers to choose the airline that they are most likely to fly on in the future. Thus, the airline with the most service from the traveler's home airport is particularly attractive, because it serves many markets that the consumer may need to travel in the future. Furthermore, the most common bonus—a free flight anywhere in the U.S.—will be more valuable on an airline that offers substantial service from the consumer's home airport than on an airline with little service there.

Frequent flyer programs are targeted primarily at business travelers, taking advantage of the principal-agent problem resulting when the traveler, monitored imperfectly by his employer, does not make the efficient tradeoff between lower prices, or reduced travel time, and extra FFP bonuses (Levine, 1987). In essence, the frequent flyer bonus is a kickback to the purchasing agent, in this case the employee. In a survey of travel agents conducted by the General Accounting Office (1990b), more than half said that their business customers select flights to match their frequent flyer program "always or almost always."

Bonuses earned on business travel are also untaxed fringe benefits which may jointly benefit the employer and employee while harming the government and other taxpayers. Defenders of frequent flyer programs argue that even if the employer finds it costly to monitor frequent flyer miles and bonuses directly, it can still calculate an expected value of the bonuses earned by certain types of employees, and count that toward the employees' compensation. Though this will transfer some of the agent's gains to the principal, it does nothing on the margin to lessen inefficient (and cost-increasing) schedule choices of the employee. Nor does it address the advantage that the dominant airline in an area gains through such bonuses.

What frequent flyer programs are to business travelers, travel agent commission overrides (TACOs) are to travel agents. Most travel agents earn increased commission rates from at least one airline in return for steering passengers to those airlines. No work has explicitly modeled the effect of TACOs on competition among airlines, but there is widespread belief within

[6]This argument is frequently made in support of declining block pricing schedules for public utilities.

the industry that TACOs are most effectively used by the dominant airline in an area (Levine, 1987; Borenstein, 1991). Just as with FFPs, the rewards for increased bookings on an airline are designed to encourage the agent to concentrate bookings on a single carrier. The anecdotal evidence that exist supports the notion that travel agents will be most affected by the TACO program of the dominant airline in the area (DOT, 1988). This is due in part to the correlation between use of a carrier's computer reservation system and receipt of commission overrides from that airline, as discussed below.

Of course, salespeople of many goods and services receive different commissions on various brands and are thus biased toward the high-commission sale. Are commission overrides for travel agents any different? Probably. Most travelers are not aware of TACOs and do not realize that the agent has a reason to prefer one airline over another, so are less likely to be wary of the agent's advice. Agents hold themselves out as unbiased conveyors of travel information. Moreover, even if customers were aware, it is extremely difficult for any customer to monitor travel agent performance, due to the complexity and constant flux of prices and seat availability in a market.

Increases in brand loyalty or switching costs, such as from FFPs or TACOs, may also facilitate market division and tacit collusion (Banerjee and Summers, 1987). These programs lower the cross-elasticity of demand between products, reducing the incentive for competitive price cutting. This effect may be less important than the dominant firm advantage that the devices permit, because airlines use these strategies most aggressively in areas where they have large market shares, but the two uses are not mutually exclusive. In either case, it is clear that the airlines view these aspects of retailing their product as much more than simple price cuts or commission payments.

Information and Distribution Channels

At the time of deregulation, many industry analysts forecast a streamlined distribution system, possibly with most ticketing done through machines similar to automatic teller machines, so that the travel agent industry would shrink or even disappear. Instead, travel agents are now more central to the distribution of air travel services than ever before, thanks to the complexity of airline fare structures and the frequency of price changes. With the current computer reservation systems, the agent can look up the schedules, fares, and seat availability on all airlines simultaneously, then reserve a ticket and seat assignment, enter the traveler's frequent flyer number, and even print out boarding passes.

The earliest entrants in the computer reservation service industry, American's Sabre and United's Apollo systems, signed up many travel agents before competing CRSs became widely available. Later entrants have never attained significant penetration in more than a few locations, areas in which the airline owning the CRS has a large share of the flights and traffic. In recent years, Sabre and Apollo have been accused of attempting to lock travel agents into

exclusive use of their systems through various contract requirements: damages charged to agents who choose to switch systems may have been out of proportion to actual costs; access to an airline's TACO program may have been illegally tied to use of its CRS; and minimum use clauses may be the reason that nearly all travel agents use only one airline's CRS for all bookings. These complaints continue, but so far have not been confirmed in court.

The earliest complaints registered against the CRSs were by airlines that didn't own a system of their own, in reaction to the biased presentation of flight information. Prior to a 1984 CAB rule outlawing the practice, airlines would systematically list their own flights more prominently than those of their competitors, a practice known as "screen bias." A recurrent and naive view of computer reservation systems is that they are equivalent to advertising for an airline, and that every airline could start a reservation system and engage in such promotion. In reality, the sunk costs for starting a computer reservation system are substantial, because complex industry-specific software must be developed, tested, and marketed. The learning effects also appear to be significant; Sabre and Apollo systems continue to exhibit more sophistication and capabilities, as well as much larger market shares, than the other CRSs. Economies of scale are quite substantial, because the software production and updating expenses are unrelated to the number of users on the system. The 1984 CAB rule forbidding "screen bias" was implicitly based on the decision that CRSs are essential facilities for selling air transport, and so should be available on a comparable basis to all airlines. Because the software that runs a computer reservation system is so complex, some screen bias almost surely remains, though it is certainly less obvious or important than before 1984.

Computer reservation systems have also become a critical tool in the administration of travel agent commission overrides. Although the 1984 rule explicitly forbids tying of TACOs to use of a carrier's CRS, such practices almost certainly continue (DOT, 1988). Ownership of the CRS used by an agent makes it easier for an airline to implement a TACO program, because most programs are based on the *share* of the agent's bookings that go to an airline, requiring reliable information on all of the agents' sales.

The bias in travel agent booking associated with the CRS it uses, called the "halo effect," was studied in 1988 by the DOT. They found that the airline owning a travel agent's CRS receives a disproportionate share of the bookings from the agent, even after a rough control for commission overrides. The strong results they get, however, could reflect factors other than CRS influence and are certainly subject to endogeneity bias. In a city with a dominant airline that owns a reservation system most of the agents in that city are likely to adopt that CRS for its superior information on the airline's flights and a greater share of agents are likely to be on the dominant airline's TACO program. Furthermore, the dominance will likely inspire greater customer loyalty through frequent flyer programs, which is not controlled for at all.

The ownership of a computer reservation system may also be a deterrent to new entry and price competition, both because of the halo effect, and also because airline *B* must pay a booking fee to airline *A* for every airline *B* ticket booked through airline *A*'s CRS. Under the 1984 CAB rules, a CRS must charge the same booking fees to all airlines, but such a non-discrimination rule cannot affect the internal price or cost paid by the airline-owner for booking its own tickets. In Dallas, for instance, where more than 90 percent of the travel agent bookings go through American's Sabre system, high booking fees on Sabre could discourage entry into all Dallas routes. The DOT study found that booking fees are well above marginal or average cost.

The high-speed transmission of complex information through computer reservation systems has also raised concerns about collusion among the airlines. It appears to be common practice for an airline to announce, through the CRSs, that its price on a certain route will increase by some amount beginning on a certain date in the future. The carrier then waits to see if others will match. If they do, the price increase is implemented. If they don't, the airline suggesting the increase will either withdraw it or push back the implementation date. Other airlines might counteroffer with a smaller increase, effective a day after the first increase. Then the first airline many proceed with a smaller increase, or counteroffer again. All of this occurs without the airlines changing any prices on actual sales, because the negotiation goes on with effective dates two or three weeks hence.

Each airline's fare on the computer reservation system for each route has a descriptive code, usually a string of 5 or more letters and numbers, that may contain further information about what the airline is suggesting or at which competitor a price change might be targeted (Nomani, 1990). In one incident reported in the *Wall Street Journal*, Continental introduced a new fare on a certain route with a fare code that included "HP," the two-letter designation for America West, which Continental appeared to be attacking with the discount. The code may have included "HP" to inform other airlines that Continental was targeting the fare cut at America West and was not interested in starting a widespread fare war.

If such signalling and possible attempts at collusive price fixing exist, they give a basis for concern over the increased national concentration figures, even if route concentration has been fairly stable. The language of signalling is easier to develop and communicate if there are many opportunities for a small number of firms to interact, than if there are many firms. The impact of multimarket contact on tacit or explicit collusion and thus prices has been examined in many industries, but only Evans and Kessides (1991) has focused on domestic airlines. They find that multimarket contact has a significant effect on prices, increasing average round-trip ticket prices by more than $20. The Department of Justice has announced an investigation of airline price signalling. There is sure to be more work done in this area.

Price Discrimination and Dispersion

In the early days of deregulation, some economists called the prevalence of discount fares a sign that the new competitive equilibrium had not yet been reached. As time went by, however, and more airlines adopted complex fare structures, explanations shifted. Unlike the pre-deregulation discounts, availability of today's low fares is limited to a given number on a flight, with that number differing across flights in response to differences in demand. In this way, discounts may reflect peak-load pricing (Salop, 1978; Gale and Holmes, 1990). The restrictions on discounts have also been refined, however, so as to approach the discriminating firm's ideal: imposing prohibitive discount-qualification costs on members of the less-elastic demand group (for example, business travelers are almost never willing to stay over a Saturday night), while retaining relatively easy availability to the group with more elastic demand.

Frank (1983) suggested that the fare differentials were cost-based, because the travelers paying higher prices were those who demanded more frequent service and were thus responsible for higher fixed costs. In models of price discrimination under imperfect competition, Borenstein (1985) and Holmes (1989) have made this argument more rigorous, while clarifying that such pricing is still discriminatory in the traditional sense of differential mark-ups above marginal cost. Even though airline prices are discriminatory, there is no clear reason to believe they are less efficient than a single price set by firms with the same market power. While price discrimination necessarily results in exchange inefficiency—any given quantity produced is not allocated to the users who value it most highly—it also may increase total output compared with firms that face the same demand functions and each charge a single price.

The pattern of price discrimination in the airline industry is in itself interesting and surprising. After controlling for peak-load pricing effects, Borenstein and Rose (1991) find that discrimination is greater on more competitive routes. The theoretical works by Borenstein and Holmes predict this pattern if discrimination is based more on variations in customer willingness to switch flights—scheduling flexibility and brand loyalty—than on variations in customer reservation prices for the trip. Borenstein and Rose also find that airlines owning CRSs have significantly more price dispersion on a route, supporting the industry wisdom that effective market segmentation requires the sort of management and computer sophistication that varies widely among the airlines.

Bankruptcies, Bailouts, and Public Policy

The crisis in the airline industry that began in the last half of 1990 raised numerous public policy issues. Unsecured debt markets were closed to the weaker airlines, many of which requested financial assistance from the federal government. Did this represent a failure of capital markets, or simply a market

signal that these companies should not be extended loans because they are unlikely to be able to repay them? In late 1990, the government considered several short-run fixes, including short-term loans, tapping the Strategic Petroleum Reserve specifically to lower jet fuel prices, and permitting airlines to delay remitting some of the 10 percent ticket tax to the government, thereby making interest-free loans to the airlines.

None of these steps was taken. The main reasons seemed to be that the industry was not yet so close to anticompetitive levels of concentration that the impending bankruptcies would be pivotal and, in addition, that a bailout appeared likely to spend taxpayer's money without a real hope of benefits. Bankruptcy courts handling the Eastern and Pan Am cases took a very different view, willingly spending the remaining funds of these firms to give the companies every possible chance to survive. Effectively, these courts were taxing the holders of the firms' debt. Their motivation seemed to be the preservation of competitors in the marketplace, not protection of creditors' wealth.

The bankruptcy proceedings have highlighted the fact that large corporate failures in the U.S. always involve some government intervention. The default regulator of the industry is the bankruptcy court judge. The fact that government will be involved does not mean, of course, that earlier intervention by some other government body will necessarily lead to better outcomes, but it does imply that a simple hands-off approach to the disruption and increasing concentration in the airline industry is not realistic.

The policies that have been suggested to respond to declining competition in the domestic airline industry range from more deregulation to complete reregulation. Here is a brief summary and critique of the most probable actions, ordered from least to most interventionist.

Foreign Ownership and Foreign Competition

Currently, foreign interests can hold no more than a 49 percent voting share in a U.S. airline (increased from 25 percent in 1991) and cannot otherwise control the company. Advocates of permitting greater foreign ownership argue that it would provide a quick infusion of capital to the distressed airlines.

Opposition to this proposal has rested on national defense arguments, such as the questionable view that the aircraft of foreign-controlled airlines might be unavailable for government use in times of war or other disaster. The obvious response is to require that all aircraft serving U.S. routes are subject to confiscation during national emergencies. The real weakness of this plan is that no queue of foreign investors is waiting to sink money into the crippled U.S. airlines; they are more interested in buying part of American or United than Continental or TWA. Again, the capital markets might be telling us something about these airlines.

The corollary to foreign investment is competition from foreign airlines on domestic U.S. routes. Among economists and policy-makers, this idea is seen as

one whose time has come, but it will still be a long time in the implementation. The main sticking point is that the European Community and most Asian countries are not yet ready to allow U.S. airlines to fly domestic and international routes within and between their countries. U.S. negotiators are understandably hesitant to drop barriers to foreign airlines in the U.S. without gaining access to foreign markets. In fact, most foreign carriers are much less efficient than U.S. airlines, due to years of government ownership and protection, and they have comparatively little sophistication in modern airline marketing strategies. Without subsidies from their home governments, they would not be likely to offer much competition to U.S. airlines. As with foreign ownership, foreign competition is probably a good idea, but not one likely to have a dramatic effect on the domestic airline industry.

Airport Expansion, Peak-Load Pricing, and Privatization

Some critics believe that the only remaining problem in the U.S. domestic airline industry is that the government is still in the airport business. They argue that if airports were privatized, the operators would charge efficient peak/off-peak prices and would respond to market incentives for expansion. This argument ignores the fact that airports are natural monopolies, which would lead to restricted output in the absence of regulation, and that airports create large externalities, which would lead to *de facto* regulation even without an explicit regulatory body. Furthermore, without competition from other airports, an operator's profits would probably be maximized by permitting dominance of the airport by a single carrier and then extracting the carrier's rents with high facility fees.

Still, there is no doubt that current airport management fails to implement many of the market-based incentives, most notably peak-load pricing of runway and facility use, that would lessen the inefficiencies that permeate the system (Morrison, 1987). A switch to peak-load pricing—including a recognition that a general aviation plane landing or taking off creates about as much congestion as a commercial jet—would significantly improve allocation of limited airport capacity.

Rational funding of airport expansion would also greatly improve airport congestion. In a program that seems to be based more on politics than economics, the DOT currently distributes most funds for airport improvements through a program that is strongly biased towards thousands of small general aviation and commercial "reliever" airports. These airports are not operating at capacity and are not used by jet aircraft. Shifting funds towards improvements that have the highest shadow value would substantially lessen airport congestion without increased funding.

Funding is not the only constraint on airport expansion, however. Neighborhood opposition to increased air traffic is often quite strong and the incumbent dominant airlines at many airports are powerful opponents to

facility expansion. Improved airport management and expansion planning would increase competition, but the impact may be disappointingly small. Even with higher capacity and peak-load pricing, airport access problems may remain. While additional capacity at an airport could facilitate new entry, the monopoly rents earned by a dominant incumbent would probably give it the incentive to outbid potential new entrants for rights to the additional capacity. Anecdotes about control of gates for the purpose of excluding competitors are commonplace. At the four slot-controlled airports, minimum-use rules have been imposed to keep the owner of a slot from holding it for exclusionary purposes.

Limiting Loyalty–Inducing Devices for Flyers and Travel Agents

Since frequent flyer programs and travel agent commission overrides are widely thought to give a competitive advantage to the dominant airline in an area, their elimination or curtailment has been suggested. Discussion continues at DOT and in Congress about the possibility of banning frequent flyer programs or taxing them as fringe benefits. The latter approach poses practical difficulties, since the IRS would have to distinguish between awards earned from personal travel and those earned from business travel. An alternative approach would be to require that airlines allow sale and transfer of frequent flyer miles, and thus lessen the lock-in effect of these programs. The airlines have made it clear that they would respond to such a rule by cancelling their frequent flyer programs. FFPs do seem to present a barrier to entry in areas where one airline is dominant. There are clear inefficiencies from the principal-agent problem that they create, without which they would probably be abandoned by the airlines. No good data have been found on FFPs, however, so reliable estimates of the magnitudes of these effects are still lacking.

The principle argument against eliminating frequent flyer programs seems to be the generic concern that limits on the forms in which companies can do business should be enacted only in extreme situations, because the results of such rules can be unpredictable. For example, some have argued that sustainable prices may not exist for hub operations, and that the loyalty induced by frequent flyer programs could allow an airline to maintain efficient economies of density at their hubs. However, such an effect would be empirically indistinguishable from barriers to entry that enhance market power and lead to supracompetitive prices.

A minimalist proposal to address the principal-agent problem induced by travel agent commission overrides would require that agents disclose the average commission rates that they receive from each airline. If this information were posted at the travel agency and enclosed with each ticket sold, customers would be made aware that the agent receives different commission rates from different airlines and would know the direction in which the agent is likely to be biased. A more significant step would be to require that airlines pay

equal commission rates to all agents. This, however, intervenes in the retailing process to a much greater extent than in other industries and possibly to a greater extent than is justified by the principal-agent problem.

Opponents of policy actions on TACOs make the arguments that the travel agent industry is very competitive and that differential commission rates are common in many industries. However, given that airlines think TACOs have an effect on the agents' airline choice and travel agents report in surveys that they do (*Travel Weekly*, 1988), the commission disclosure proposal seems a minimally invasive way to alert consumers to the bias.

Divestiture or New Restrictions on Computer Reservation Systems

The most frequent suggestion to correct biased treatment of carriers in listing flights and updating information on computer reservation systems is to require that airlines sell off their systems. The proposal would also eliminate differential booking fees that effectively result when one carrier owns the CRS that is charging above-cost fees. To the extent that owner-airlines use their CRSs to coordinate or enforce TACOs, divestiture will weaken the impact of commission overrides. Levine (1987) and others who are very familiar with CRSs argue that no realistic amount of rule making and enforcement will remove these advantages without divestiture.

The problem with divestiture is that it would be a very costly form of intervention. Separated from one another, the computer reservation systems and the airlines would each be worth quite a bit less, because both the "bias" advantages for the airlines and any economies of jointly operating and making innovations in these two related businesses would disappear. The litigation that would precede and follow such a move would be lengthy. The net benefits of divestiture could well be positive, but the variance of most guesses about the benefits is large both relative to the expected benefit and in actual dollar terms. CRS divestiture would not reduce concerns about tacit collusion through CRS pre-announcement of price changes.

Conclusion

The airline industry was deregulated not because economists or politicians knew what the deregulated equilibrium would look like, but because they believed that the deregulated outcome would be better than regulation. Airline executives also did not know what the new equilibrium would be. The managements of Delta and American vigorously opposed deregulation, but they have reaped the greatest benefits from it. The industry has gone through a wave of new entry and mass exit, while the survivors have reorganized to focus on hub and spoke operations. Movement towards equilibrium has been slow in part because the structure of the new equilibrium has not been clear; the players

were guessing about the outcome as much as the observers, and were probably not much better informed.

The long-run equilibrium in the airline industry is still not clear. Eventually, the number of major airlines might be reduced to just a few, reinforcing calls for renewed price regulation. If so, that may be the inevitable result of network economies that may make competition unworkable. More likely, however, it would result from marketing devices that give strategic advantages to larger firms and incumbents operating hub and spoke systems.

The current task for policy-makers is to make sure that efficient production and competition, not anticompetitive marketing devices, determine the winners and losers in the airline industry as it moves towards a new equilibrium. At the least, this requires opening markets to foreign competition, improving access to and pricing of airport ground facilities, requiring that travel agents disclose their commission rates, and monitoring CRSs closely for biased and strategic uses. Of course, any future mergers among major airlines must also be examined with great skepticism. As the number of competitors has continued to decline in the last year, the arguments have been bolstered for more aggressive actions: banning frequent flyer programs, requiring airlines to pay flat and equal commission rates to all agents, and forcing divestiture of the CRSs. These moves would imply a heavier hand of government intervention, but still much less than the price and entry regulation that may otherwise result.

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References

Abramowitz, Amy D. and Stephen M. Brown, "The Effects of Hub Dominance and Barriers to Entry on Airline Competition and Fares," mimeo, U.S. General Accounting Office, Washington D.C., October 1990.

Bailey, Elizabeth E. and John C. Panzar, "The Contestability of Airline Markets During the Transition to Deregulation," *Law and Contemporary Problems*, Winter 1981, *44*:1, 125–45.

Bailey, Elizabeth E., David R. Graham, and Daniel P. Kaplan, *Deregulating the Airlines*, Cambridge: MIT Press, 1985.

Banerjee, Abhijit and Lawrence Summers, "On Frequent-Flyer Programs and Other Loyalty-Inducing Economics Arrangements," Harvard Institute of Economic Research Discussion Paper #1337, September 1987.

Berry, Steven T., "Estimating a Model of Entry in the Airline Industry," Yale University Working Paper, 1990a.

Berry, Steven T., "Airport Presence as Product Differentiation," *American Economic Review*, May 1990b, *80*, 394–99.

Borenstein, Severin, "Price Discrimination

in Free-Entry Markets," *Rand Journal of Economics*, Autumn 1985, *16*, 380–97.

Borenstein, Severin, "Hubs and High Fares: Airport Dominance and Market Power in the U.S. Airline Industry," *Rand Journal of Economics*, Autumn 1989, *20*, 344–65.

Borenstein, Severin, "Airline Mergers, Airport Dominance, and Market Power," *American Economic Review*, May 1990, *80*, 400–04.

Borenstein, Severin, "The Dominant-Firm Advantage in Multi-Product Industries: Evidence from the U.S. Airlines," *Quarterly Journal of Economics*, November 1991, *106*, 1237–66.

Borenstein, Severin, "Prospects for Competitive European Air Travel." In Adams, W. J., ed., *Europe After 1992*. Ann Arbor: The University of Michigan Press, forthcoming 1992.

Borenstein, Severin and Nancy L. Rose, "Competition and Price Dispersion in the U.S. Airline Industry," National Bureau of Economic Research Working Paper #3785, July 1991.

Brueckner, Jan K., Nichola J. Dyer, and Pablo T. Spiller, "Fare Determination in Airline Hub-and-Spoke Networks," University of Illinois Working Paper, June 1990.

Call, Gregory D. and Theodore E. Keeler, "Airline Deregulation, Fares, and Market Behavior: Some Empirical Evidence." In Daugherty, Andrew H., ed., *Analytic Studies in Transport Economics*. Cambridge: Cambridge University Press, 1985, 221–47.

Carlton, Dennis W., William M. Landes, and Richard A. Posner, "Benefits and Costs of Airline Mergers: A Case Study," *Bell Journal of Economics and Management Science*, Spring 1980, *11*, 65–83.

Caves, Douglas W., *Air Transport and Its Regulators: An Industry Study*, Cambridge: Harvard University Press, 1962.

Caves, Douglas W., Lauritis R. Christensen, and Michael W. Tretheway, "Economies of Density Versus Economies of Scale: Why Trunk and Local Service Airline Costs Differ," *Rand Journal of Economics*, Winter 1984, *15*, 471–89.

Dempsey, Paul S., *Flying Blind: The Failure of Airline Deregulation*. Washington, DC: Economic Policy Institute, 1990.

Douglas, George W. and James C. Miller III, *Economic Regulation of Domestic Air Transport: Theory and Policy*, Washington D.C.: Brookings Institution, 1974.

Eads, George, Mark Nerlove, and W. Raduchel, "A Long-Run Cost Function for the Local Service Airline Industry," *Review of Economics and Statistics*, August 1969, *51*:3, 258–70.

Evans, William N. and Ioannis N. Kessides, "Living by the 'Golden Rule': Multimarket Contact in the U.S. Airline Industry," University of Maryland Working Paper, January 1991.

Evans, William N. and Ioannis N. Kessides, "Localized Market Power in the U.S. Airline Industry," *Review of Economics and Statistics*, forthcoming 1992.

Frank, Robert, "When Are Price Differentials Discriminatory?," *Journal of Policy Analysis and Management*, Winter 1983, *2*:2, 238–55.

Gale, Ian and Thomas J. Holmes, "Advance-Purchase Discounts and Monopoly Allocation of Capacity," SSRI Working Paper #9005, 1990.

Gordon, Robert J., "Productivity in the Transportation Sector." In Griliches, Zvi, et al., eds., *The Measurement of Output in the Services Sector*, University of Chicago Press for NBER, forthcoming 1992.

Greenwald, Bruce C., Michael A. Salinger, and Joseph E. Stiglitz, "Imperfect Capital Markets and Productivity Growth," mimeo, Stanford University, March 1991. Paper presented at NBER Conference in Vail, Colorado, April 1991.

Holmes, Thomas J., "The Effects of Third-Degree Price Discrimination in Oligopoly," *American Economic Review*, March 1989, *79*, 244–50.

Hurdle, Gloria J., Richard L. Johnson, Andrew S. Joskow, Gregory J. Werden, and Michael A. Williams, "Concentration, Potential Entry, and Performance in the Airline Industry," *Journal of Industrial Economics*, December 1989, *38*, 119–39.

Huston, John H. and Richard V. Butler, "The Effects of Fortress Hubs on Airline Fares and Service: The Early Returns," *Logistics and Transportation Review*, September 1988, *24*, 203–15.

Jordan, William A., *Airline Regulation in America: Effects and Imperfections*, Baltimore: The Johns Hopkins University Press, 1970.

Joskow, Andrew S., Gregory J. Werden, and Richard L. Johnson, "Entry, Exit and Performance in Airline Markets," Department of Justice Discussion Paper EAG90-10, December 1990.

Kaplan, Daniel P., "The Changing Airline Industry." In Weiss and Klass, eds., *Regulatory Reform: What Actually Happened*. Boston: Little, Brown and Company, 1986, 40–77.

Keeler, Theodore E., "Airline Regulation and Market Performance," *Bell Journal of Economics and Management Science*, Autumn 1972, *3*, 399–424.

Levine, Michael E., "Is Regulation Necessary? California Air Transportation and National Regulatory Policy," *Yale Law Journal*, July 1965, *74*, 1416–47.

Levine, Michael E., "Airline Competition in Deregulated Markets: Theory, Firm Strategy, and Public Policy," *Yale Journal on Regulation*, Spring 1987, *4*, 393–494.

McGowan, Francis and Paul Seabright, "Deregulating European Airlines," *Economic Policy*, October 1989, *4*, 283–344.

Morrison, Steven A., "The Efficiency and Equity of Runway Pricing," *Journal of Public Economics*, October 1987, *34*, 45–60.

Morrison, Steven A. and Clifford Winston, *The Economic Effects of Airline Deregulation*. Washington D.C.: Brookings Institution, 1986.

Morrison, Steven A. and Clifford Winston, "Empirical Implications and Tests of the Contestability Hypothesis," *Journal of Law and Economics*, April 1987, *30*, 53–66.

Morrison, Steven A. and Clifford Winston, "Enhancing the Performance of the Deregulated Air Transportation System," *Brookings Papers on Economic Activity: Microeconomics*, 1989, 61–112.

Morrison, Steven A. and Clifford Winston, "The Dynamics of Airline Pricing and Competition," *American Economic Review*, May 1990, *80*, 389–93.

Nomani, Asra Q., "Airlines May Be Using a Price-Data Network to Lessen Competition," *Wall Street Journal*, June 28, 1990, *122*, A1, A6.

Reiss, Peter C. and Pablo T. Spiller, "Competition and Entry in Small Airline Markets," *Journal of Law and Economics*, October 1989, *32*, S179–S202.

Salop, Steven C., "Alternative Reservation Contracts," Civil Aeronautics Board memo, 1978.

Stiglitz, Joseph E., "Technological Change, Sunk Costs, and Competition," *Brookings Papers on Economic Activity: Microeconomics*, 1987, *3*, 883–937.

U.S. General Accounting Office, "Airline Competition: Fare and Service Changes at St. Louis Since the TWA-Ozark Merger," September 1988.

U.S. General Accounting Office, "Airline Competition: Higher Fares and Reduced Competition at Concentrated Airports," July 1990a.

U.S. General Accounting Office, "Airline Competition: Industry Operating and Marketing Practices Limit Market Entry, August 1990b.

U.S. Department of Transportation, *Study of Airline Computer Reservation Systems*, Washington, D.C.: U.S. Government Printing Office, 1988.

U.S. Department of Transportation, *Secretary's Task Force on Competition in the U.S. Domestic Airline Industry*, Washington, D.C.: U.S. Government Printing Office, 1990.

Werden, Gregory J., Andrew S. Joskow, and Richard L. Johnson, "The Effects of Mergers on Price and Output: Two Case Studies from the Airline Industry," *Managerial and Decision Economics*, October 1991, *12*, 341–52.

Whinston, Michael D. and Scott C. Collins, "Entry and Competitive Structure in Deregulated Airline Markets: An Event Study Analysis of People Express," Harvard University Working Paper, August 1990.

"The 1988 Louis Harris Survey," *Travel Weekly*, XLVII (June 29, 1988), 9–142.