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Efficiency and competition in the airline industry

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After reviewing some recent developments in the airline industry, this article tests two hypotheses that were central to the argument for deregulation: (1) that CAB regulation caused airlines to employ excess capacity relative to the capacity that would be provided under unregulated competition; and (2) that potential competition would keep fares at cost even in highly concentrated markets. An econometric analysis of these hypotheses based on postderegulation data suggests that the excess capacity hypothesis is essentially confirmed. In contrast, the pattern of fares in late 1980 and early 1981 does not support the potential competition hypothesis that fares are independent of market concentration.

1. Introduction

■ The deregulation of the airline industry provides an invaluable opportunity to compare the performance of an industry with and without economic regulation, as well as an important test of economists' predictions of the consequences of deregulation.[1] After reviewing some of the recent developments in the airline industry, this article tests two hypotheses that were central to the arguments for deregulation. First, Civil Aeronautics Board (CAB) fare regulation was thought to promote service competition and thus cause the airlines to employ excess capacity, so that market-determined fares were predicted to yield more efficient capacity utilization. Second, because capital is highly mobile in the airline industry, potential competition was predicted to keep fares at competitive levels, even in highly concentrated markets. The article also describes the added efficiencies afforded by the realignment of airline routes, and the role of the new "low cost" airlines in the long-term development of the industry.

The industry has not yet adapted fully to the new competitive environment. Nevertheless, some basic developments signal the direction in which the industry is evolving. The analysis presented here suggests several provisional conclusions:

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[1] See, for example, Jordan (1970), Keeler (1972), Levine (1965), MacAvoy and Snow (1977), Pulsifer *et al.* (1975), and the Report of the Kennedy Hearings on airline regulation (U.S. Senate, Committee on the Judiciary (1975)).

(1) Rising load factors as well as changes in the patterns of load factors across markets since the late 1960s suggest that more efficient levels of capacity are provided today. Together with the adoption of peak-load pricing and improvements in the system of airline routes, this indicates that the industry is operating more efficiently now than under regulation.
(2) Fares appear to be closely related to the cost of service. Market characteristics, such as distance and the time sensitivity of passengers, explain most of the variation in fares across markets.
(3) There appears to be some price-setting power exercised by airlines in relatively concentrated markets. But if the Herfindahl index is .5 or higher, further increases in concentration have little effect on fares.
(4) New, low cost airlines have a substantial negative effect on fares in the markets they serve. Their increasing role is contributing to the evolution of a more efficient industry.

2. Events since deregulation

■ The transition from regulation has been gradual and has involved both legislative and regulatory initiatives. Hence, it is impossible to pinpoint an exact end of regulation. The CAB took a major step in liberalizing fare regulation when it approved the first "Super Saver" fares in the spring of 1977. In the fall of 1978, carriers were allowed to set fares as much as 10% above or 50% below a CAB standard fare. In May 1980 this "zone of reasonableness" was expanded to give carriers unlimited downward flexibility and expanded upward flexibility.[2]

The Board was able to take pricing initiatives under longstanding authority; however, it was not until the Airline Deregulation Act was passed in October, 1978, that the Board got clear authority to liberalize route awards. Three months after the Act was passed, the Board essentially gave carriers the ability to serve any routes they wished. The airlines have taken advantage of these new freedoms to dramatically change their route networks and pricing strategies.

□ **Routes.** The CAB's authority over routes gave it control over entry into the industry as well as into markets. The Board not only restricted entry by new firms, but also restricted the number of existing carriers competing in a given market. (Usually only 2 or 3 airlines were authorized to serve any given route.) Moreover, only the trunks, the largest airlines, were permitted to serve major long-haul markets, while other airlines were restricted to serving regional markets. These route policies caused a degree of regional and market specialization to develop. Consequently, many travelers had to change airlines enroute, even though passengers prefer online connections.[3] Online connections afford greater assurance that bags will not be lost or connections missed, and they allow passengers to avoid long walks between terminals at large airports. An analysis of travel patterns in a sample of more than 4,000 markets shows that the fraction of trips that require passengers to change planes has remained about the same since 1978, but the proportion of passengers that must change airlines in route has decreased by 38%.[4]

Along with this shift towards single carrier service have come changes in traffic patterns. Table 1 depicts the changes in the number of flights between cities of four size

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[2] Initially, ceilings were lifted altogether for markets of less than 200 miles. They were set at 50% above the standard fare in markets of 201 to 400 miles and at 30% above the standard fare in longer haul markets. In September 1980, the ceilings were changed to equal the standard fare plus 30% plus $15 in all markets.

[3] Carlton, Landes, and Posner (1980) estimated that an online connection is worth more to the traveler than an interline connection.

[4] For a discussion of connecting patterns and more detailed empirical support, see Graham and Kaplan (1982).

TABLE 1 Changes in Weekly Departures between Airport Categories: Week of June 1, 1978 vs. June 1, 1981

		Percentage Changes in Weekly Flights			
		City Category			
City Category	Number of Cities	Large Hubs	Medium Hubs	Small Hubs	Nonhubs
Large Hubs	23	9.3			
Medium Hubs	36	10.5	0.0		
Small Hubs	66	18.3	−7.1	−23.2	
Nonhubs	517	12.3	10.5	−21.1	−12.6

Source: *Official Airline Guide*, Oak Brook, Ill.: Official Airline Guides, Inc.

categories.[5] Large and medium hubs had more flights in 1981 than in 1978. Total flights declined at smaller communities (small hubs and nonhubs), but these communities had more flights to big cities (large and medium hubs). The decrease in total service at nonhubs is entirely explained by reduced service to other small communities, and the increase in direct service to larger airports has improved the convenience of service to many of these communities.[6]

These changes in the route networks have been accompanied by corresponding changes in the competitive structure of the industry. The share of domestic traffic served by the trunks fell from 87% to 80% between the second quarters of 1978 and 1981. On the other hand, local service airlines grew markedly as they entered longer haul markets, thereby offering an increasing amount of online service to their passengers. Also, newly certificated airlines have begun service in many heavily traveled markets. As Table 2 shows, between May 1978 and May 1981 the Herfindahl index of concentration did not increase in any category of market and fell in most categories. (To be sure, there is enough variation across markets so that the differences in the average Herfindahls for May 1978 and May 1981 are not statistically significant.) To an important degree, declining concentration is due to entry by additional airlines into markets. Specifically, 69% of the 100 most heavily traveled markets were entered by one or more airlines.[7]

□ **Fares.** Under regulation the Board generally set fares based on distance. But even among markets of a given distance, the cost of air service differed widely. For example, the volume of travel in a market affects costs. Moreover, the Board deliberately set fares below cost in the short-haul markets and above cost in the long-haul markets.

With increased fare flexibility, the fare structure has changed dramatically. For a sample of markets, Table 3 compares the average fares paid in 1980 with the Board's fare

[5] The Federal Aviation Administration classifies communities on the basis of their relative sizes. Large hubs have at least 1% of domestic passenger enplanements; medium hubs, .25 to .99%; small hubs, .05 to .24%; and nonhubs have less than .05%.

[6] Small communities in which commuter carriers have replaced larger airlines have, on average, experienced increases in the number of flights. Since the Deregulation Act was passed in October, 1978, trunk and local airlines have dropped service at 72 cities; those cities have experienced a 30% increase in flights. Though these communities no longer have the opportunity for online service for long-haul trips, commuters and larger airlines are developing interline agreements that offer commuter passengers some of the advantages of online service. For a further discussion of the Board's regulation of service to small communities as well as changes since deregulation, see Graham and Kaplan (1982).

[7] There was entry into 54% of the second 100 markets, and 35% of the smaller markets. These markets are ranked by origin-destination traffic volume.

TABLE 2 Herfindahl Indexes of Market Concentration* (May 1978 vs. May 1981)

Market Distance (in miles)	Top 100 Markets			Second 100 Markets			Sample of Smaller Markets		
	Number of Markets	1978 Herfindahl	1981 Herfindahl	Number of Markets	1978 Herfindahl	1981 Herfindahl	Number of Markets	1978 Herfindahl	1981 Herfindahl
Less Than 500	36	.40	.36	40	.54	.44	79	.75	.66
		(.13)	(.13)		(.17)	(.17)		(.29)	(.27)
501 to 1000	26	.50	.41	31	.55	.46	25	.66	.59
		(.10)	(.11)		(.15)	(.14)		(.24)	(.21)
1001 to 1500	17	.52	.43	12	.58	.48	11	.79	.65
		(.12)	(.12)		(.21)	(.18)		(.24)	(.20)
1500+	17	.44	.42	15	.53	.53	6	.78	.62
		(.13)	(.13)		(.09)	(.12)		(.16)	(.15)
Average of All Distances:	96	.46	.40	98	.55	.46	121	.74	.64
		(.13)	(.13)		(.16)	(.16)		(.27)	(.25)

* Standard deviations in parentheses.
Source: Herfindahl indexes are based on each airlines' share of nonstop flights in a market as reported in the *Official Airline Guide*.

TABLE 3 Average Fares as a Percentage of DPFI Fare Formula Year Ending June 1981*

	Market Size Category					
	Top 100 Markets		Second 100 Markets		Sample of Smaller Markets	
Market Distance	Number of Markets	Fares	Number of Markets	Fares	Number of Markets	Fares
0–500 mi.	36	89 (20)	40	97 (24)	79	113 (22)
501–1000 mi.	26	98 (16)	31	96 (14)	25	101 (12)
1001–1500 mi.	17	82 (11)	12	89 (12)	11	97 (17)
1500+ mi.	17	66 (11)	15	84 (11)	6	91 (5)
Average of all Distances:	96	86 (20)	98	94 (19)	121	108 (21)

* Weighted average of all coach fares. Weights are based on the number of passengers. The average *DPFI* formula fare is the average of the three different formula fare levels effective during the period, weighted by the number of origin and destination passengers carried during the effective period of each fare level. Standard deviations are in parentheses.

Sources: Fare data are obtained from CAB, *Origin-Destination Survey of Airline Passenger Traffic,* Domestic Fares. Data are not published, but are retained in a CAB computerized data bank.

formula adjusted for inflation.[8] Of course, even when the industry was regulated, average fares in a market differed from the fares prescribed in the Board's distance-based formula (commonly referred to as the *DPFI* formula).[9] Average fares were sometimes less than *DPFI* coach fares because of the availability of discounts. Before the Super Saver fares, however, discounts did not generally exceed 25% and were offered to relatively few passengers. At the same time, local service carriers could charge 30% above the fare formula so that fares were generally higher than the formula fare in markets where local service carriers were the dominant ones.

In 1980, as expected, fares in small, short-haul markets were above the *DPFI* formula. Average fares were below the formula in the top 200 markets, and in smaller markets above 1,000 miles. Fares tended to decline as a percentage of the *DPFI* coach fares as distance and market density increased, with the top markets between 501 and 1,000 miles as the sole exception. Average fares varied widely around the *DPFI* coach fare, which suggests that airlines are exercising their fare flexibility to a considerable degree.

[8] Market fare data are not available prior to 1979; therefore, it is not possible to compare directly fares paid before and after deregulation.

Keeler (1981, p. 74) shows that in 1980, 58 of the largest 90 interstate markets had available unrestricted fares that were 15% or more below the standard CAB fare.

[9] The formula was developed in the *Domestic Passenger Fare Investigation,* U.S. Civil Aeronautics Board (1974). The *DPFI,* which was completed in 1974, made significant changes in the CAB's regulatory policies. In the *DPFI* the Board decreased the price of long-haul travel relative to short-haul travel, adopted a 55% load factor and seating density standards, and limited the degree to which airlines could use discount fares. The *DPFI* reduced, to some extent, airlines' incentives to engage in nonprice competition. Nevertheless, since the *DPFI* was based on industry average costs, it established fares that were substantially different from the cost of service in most markets. Because the Board based its fare policies on the *DPFI,* that formula provides a useful baseline for considering the average fare levels in the deregulated environment.

□ **Load factor and equipment size.** There are economies of scale and economies of utilization in providing air service on a given route: airlines can reduce costs by operating larger aircraft at higher load factors. Passengers' demand for convenient service, however, generally requires carriers to operate more frequent flights, using smaller aircraft at lower load factors, than simple cost minimization dictates. This is especially true in short-haul markets, where surface transportation is quite competitive with air travel. Deregulation has given carriers the operating flexibility to choose the combination of fares, aircraft size, and load factor to maximize profits in each market.

Aircraft size and load factor will tend to be higher in markets where travelers place relatively little value on convenience; passengers in vacation markets, for example, are generally not very time sensitive.[10] In addition, heavily traveled routes should have larger aircraft and higher load factors because there are probably diminishing returns in terms of passenger's willingness to pay for increased convenience. As traffic increases, carriers will substitute larger aircraft and operate them at higher load factors rather than increase the number of flights proportionately. (Moreover, in large markets it is likely that a given level of convenience can be achieved with a higher load factor, because the law of large numbers will tend to smooth out the random fluctuations in demand.) Finally, longer haul markets will tend to have larger aircraft and higher load factors. The economies of larger aircraft are greatest in longer markets. Load factors will tend to rise because the cost of available capacity increases with distance, whereas there is no reason to expect that the typical traveler's willingness to pay for convenience will increase.

Table 4 relates load factor and equipment size to distance and density. Average aircraft size increases with market size. Also, for each density interval, average aircraft size increases with market distance. The relationship between load factor and distance and density is less clear. Nevertheless, a statistical analysis in the next section indicates that load factors do indeed increase with market distance and density.

Table 5 presents the load factor and equipment size for 32 long-haul markets which are classified according to whether they are tourist markets. Since travelers in tourist markets are by definition less time-sensitive, we would expect the demands for low cost service—large aircraft operated at higher load factors—to be greatest in these markets. Indeed, this table suggests that tourist markets have lower operating costs than do non-tourist markets.[11] Table 5 indicates that these cost savings contribute to lower fares in tourist markets. Such fare differentials were not permitted under regulation, and the fact that they have evolved under deregulation suggests that markets have become more efficient. In general, the pattern of fares, load factors, and aircraft sizes across markets are roughly consistent with market efficiency. The price and quality of service appear to vary by distance, density, and passenger time sensitivity in the way predicted by Douglas and Miller (1974).

3. Excess capacity hypothesis

■ The excess capacity hypothesis posits that regulated fares were too high in most markets, so that service competition led the airline industry to supply more than the economically efficient number of flights and seats. Moreover, the hypothesis implies that excess capacity would be more pronounced in some markets than others, because the structure of regulated fares did not match the structure of costs. Under this hypothesis, the pattern of load factors and equipment sizes under regulation should have differed from those just described in Tables 4 and 5. In this section, we develop tests of the excess

[10] For a discussion of these issues, see Douglas and Miller (1974). They examine the surplus maximizing solution to this choice problem. Our discussion is based on their analysis.

[11] We define tourist markets as those involving service to Florida, Hawaii, and Reno and Las Vegas, Nevada.

TABLE 4 Average Load Factor and Equipment Size (Available Seats per Flight), Year Ending June 30, 1981*

	Market Size Category								
	Top 100 Markets			Second 100 Markets			Sample of Smaller Markets		
Market Distance	Number of Markets	Load Factor	Average Equipment	Number of Markets	Load Factor	Average Equipment	Number of Markets	Load Factor	Average Equipment
0–500	36	59	130	40	57	126	79	55	108
		(5)	(20)		(5)	(28)		(11)	(20)
501–1000	26	57	146	31	58	133	25	56	125
		(3)	(21)		(4)	(17)		(6)	(24)
1001–1500	17	58	164	12	59	141	11	58	137
		(3)	(22)		(3)	(14)		(4)	(12)
1500+	17	63	269	15	54	214	6	56	216
		(7)	(61)		(5)	(62)		(2)	(62)
All Distance:	96	59	162	98	57	140	121	56	122
		(5)	(59)		(5)	(40)		(9)	(37)

* Standard deviations in parentheses.
Source: *Service Segment Data* (ER-586).

TABLE 5 Fares, Load Factors and Aircraft Size: Long-Haul Tourist Markets vs. Nontourist Markets, Year Ending June 1981

	Top 200 Markets		
	Number of Markets	Mean	Standard Deviation
Fares as Percent of *DPFI:*			
Nontourist Markets	27	75	12
Tourist Markets	5	56	5
Average Load Factor:			
Nontourist Markets	27	58	5
Tourist Markets	5	70	5
Average Seats per Aircraft:			
Nontourist Markets	27	240	59
Tourist Markets	5	308	58

Source: Fare data are obtained from CAB, *Origin-Destination Survey* of Airline Passenger Traffic, Domestic. Load factor and seating capacity data are obtained from CAB, *Service Segment Data,* (ER-586).

capacity hypothesis based on the pattern of load factors observed before and after deregulation.

Under CAB fare regulation, the airlines chose the profit-maximizing level of convenience, given the fare. Consequently, the load factors in any given market depended upon CAB policies as well as on the market characteristics described above.[12] *Ceteris paribus,* load factors are expected to have been lower in markets where fares were set high relative to costs. The CAB deliberately set fares higher than cost in the long-haul markets and did not consider density or the value of convenience. Hence, in moving to a competitive pricing regime, load factors should have risen most in long-haul markets and in relatively dense markets.

The number of airlines serving the market could also be expected to affect load factors under regulation. A monopolist would add flights only up to the point where the added revenues from increased travel stimulated by the increase in convenience covered the cost of the flight. But if several carriers were allowed in the market, each would also perceive that added flights would draw traffic away from its competitors' flights. The perceived payoff to adding flights increases as the number of airlines increases, so that a greater expansion of capacity and lower load factors will result.

Under deregulation, increased emphasis on price competition and decreased emphasis on service competition should reduce the relationship between market structure and load factor from the one that existed when the industry was regulated.

To test the excess capacity hypothesis, we compare the relationships between load factor, distance, concentration and traffic volume observed in 1980 and 1976 with the relationship reported by Douglas and Miller (1974) for 1969. The year 1976 provides a

[12] Douglas and Miller (1974), Panzar (1975), and Schmalensee (1977) have examined the comparative static behavior of airlines under regulation. Panzar and Schmalensee provide explicit models of monopolistic competition for predicting airline behavior. Airlines are assumed to choose the profit-maximizing capacity, given the market fare. The models predict that with limited entry, profits will not be driven to zero by nonprice competition. Whereas the earlier studies examine the case in which each airline's demand is assumed to be proportional to its share of flights in the market, Schmalensee considers three general demand assumptions. He shows that when the regulated fare is increased, there is a corresponding decrease in load factor. Profits may rise, fall, or remain unchanged depending upon the exact form of the demand function. He also shows that entry will reduce load factors and profits.

transitional observation because it comes after the *DPFI,* but before fare regulation was liberalized.

Using a sample of 324 markets, we estimated the same type of equation used by Douglas and Miller.[13] The main difference between our approach and that of Douglas and Miller is that instead of measuring concentration by the number of carriers, we use the Herfindahl index, based on carriers' shares of departures. This allows us to account for the fact that carriers' market shares may differ widely from each other. We estimate load factor equations for 1976 and 1980 by using ordinary least squares (OLS) and two stage least squares (2SLS). Use of 2SLS is suggested because the preceding discussion of density and service quality implies possible correlation between the density variable and the error term. High load factors reduce service quality and thereby reduce traffic.[14] Our results are presented in Table 6. The Herfindahl index was treated as exogenous in each case.

Equations (1) and (2) present the OLS and 2SLS coefficient estimates for 1980. They both show that load factor increases with distance, density, and concentration. The coefficients are all highly significant. The 1976 relationship is similar. In 1969, however, the distance coefficient is negative. Fitted values of load factor are plotted against distance in Figure 1.

Douglas and Miller interpreted the downward sloping load factor curve in 1969 as strong evidence that airlines were supplying excess capacity in potentially profitable long-haul markets. The estimated relationships in 1976 and 1980, in contrast, indicate that load factor rose with distance in these years and was higher than the 1969 load factor overall at each distance. This latter finding is particularly notable because 1980, like 1969, was a recession year in which demand for long-haul travel was hard hit.[15] These findings indicate that the CAB had imposed the wrong structure of fares in the late 1960s. They also suggest that the fare structure created in the *DPFI* helped mitigate the excess service competition caused by the mismatch between fares and costs in long-haul markets.

Load factors increase with market density in each of the three sample years. As noted above, the excess capacity hypothesis implies that if there were economies of scale at the

[13] Our sample of markets came from the top 200 markets ranked in terms of origin and destination traffic, in the year ending June 1978, and a random sample of 129 smaller markets. Fifteen of the top markets had insufficient data.

[14] In the 2SLS equation, we estimated the number of passengers by using data on population, income, and distance. Population and income data come from "Survey of Buying Power," *Sales and Marketing Magazine* (July 23, 1979). We used coach load factor from the Board's Service Segment Data (ER-586); Herfindahl indexes were derived from the November *Official Airline Guide,* in the various years. Generally, load factors during the periods under consideration were probably not high enough to have substantially affected traffic. In that case, OLS gives a reliable parameter estimate.

When both the Herfindahl index and the number of passengers were treated as endogenous, each of their coefficients doubled. (This is true in 1976 as well as in 1981.) We believe this reflects a high degree of collinearity between the systematic portion of Herfindahl and passengers, such that the two coefficients are not truly partial effects. While the correlation between passengers and Herfindahl is .56 in 1980, the correlation between the fitted values is .79. Although the relative magnitudes between 1976 and 1980 are consistent with the pattern reported in the text, they are far different from the 1969 estimates. Since we believe these results are not comparable with the 1969 results, we have reported the 2SLS estimates only for the case in which the number of passengers, and not the Herfindahl index, is endogenous. We performed specification tests similar to those described in footnote 26 below to test the exogeneity of the Herfindahl index in the 1980 equation; we found that we could not reject the hypothesis that the index was exogenous.

[15] It should be noted that in 1976 the economy was expanding rapidly after the recession of 1974 and 1975. In addition, there was considerable technological change between 1969 and 1976 involving the introduction of wide-bodied aircraft. On balance, this would be expected to cause load factors to fall in long-haul markets because the wide bodies were specifically designed for long-haul routes, and they offered many more seats per flight with reduced costs per seat. On the other hand, the rapid increases in fuel prices in 1973–1974 and again in 1979–1980 would have led to an increase in equilibrium load factors regardless of changes in regulatory policies.

TABLE 6 Equations Explaining Average Load Factors*

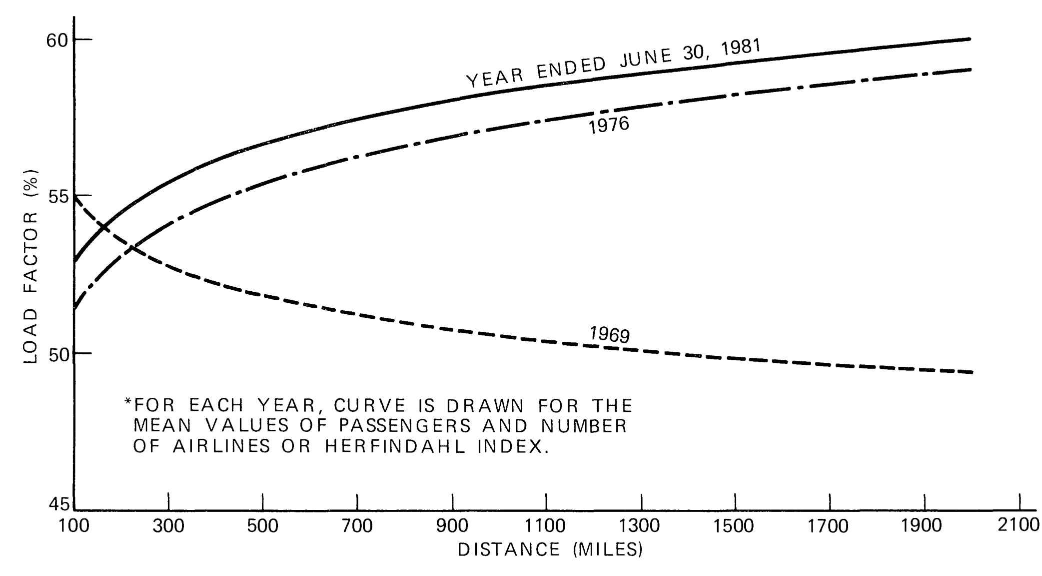
	Constant	ln *Distance*	ln (*Passengers Per Day*)	ln (*Herfindahl*)	$\bar{R}^2$
1980–1981 (324 Observations):					
(1) OLS	.130	.026	.045	.061	.33
	(3.87)	(5.09)	(8.14)	(4.37)	
(2) 2SLS	.056	.018	.068	.103	
	(1.21)	(2.81)	(6.25)	(4.66)	
1976 (324 Observations):					
(3) OLS	.123	.029	.047	.127	.29
	(3.21)	(5.88)	(7.83)	(8.20)	
(4) 2SLS	.042	.025	.067	.162	
	(.77)	(4.53)	(5.87)	(6.93)	
Douglas-Miller 1969 Estimates (347 Observations):				ln (number of carriers)	
		−.019	.073	−.146	.14
(5) OLS	.357	(−1.8)	(7.0)	(−5.5)	

* Herfindahl indexes are based on each airline's share of nonstop flights in a market as reported in the *Official Airline Guide.* Equation (5) is taken from Douglas-Miller (1974, p. 53). The t-statistics are in parentheses.

market level, load factors should have risen most in denser markets, *ceteris paribus,* as the result of deregulation. In our equations this would be reflected by a larger coefficient for the density variable in 1980. In fact, in the ordinary least squares regressions, the passenger volume coefficient for 1969 is larger than for either 1976 or 1980. In 1969, however, wide-bodied aircraft were not widely available, so that any economies of scale in serving high volume markets would have been much smaller than in subsequent years; therefore, the inducement for providing excess capacity in large markets was smaller in

FIGURE 1

LOAD FACTORS AND DISTANCE*



1969. (Wide bodies accounted for about 35% of trunk airline capacity in 1976 and 1980.) Comparing 1976 with 1980, we find that the density coefficients are virtually identical. The implications of the excess capacity hypothesis for the effects of density appear not to be observed in this sample of markets.

In 1980, under deregulation, market concentration had a smaller effect on load factor than it had (before deregulation) in either 1976 or 1969. This is true whether the OLS or the 2SLS estimates are used. To illustrate, suppose the number of equally sized firms in a market increases from two to three. Our OLS estimate of the Herfindahl coefficient for 1980 predicts a drop in load factor of 2.1 points. The 1976 OLS estimate is 7 points, and the Douglas and Miller coefficient on the number of firms predicts a 7.3 point drop in load factor. Using the 2SLS estimates (available only for 1980 and 1976), we find that the estimated 1980 effect is a 3.4 point drop as compared with a 5.5 point decrease in the 1976 equation. These results support the hypothesis that carriers engaged in service competition under regulation and that this has been substantially replaced by price competition since deregulation. Figure 1 shows that the 1980 load factor curve lies everywhere above the 1976 and the 1969 curves.

Although the higher load factors in 1980 imply that average convenience has deteriorated, because flights are less accessible when load factors are higher, there is evidence that the quality of service has not deteriorated for time-sensitive passengers—those who value high-convenience service most. Carriers have increasingly moved to peak-load pricing systems; this shifts some travelers to offpeak flights, thereby increasing time-sensitive passengers' access to peak flights. Other airlines achieve the same effects with reservation systems that set aside a number of seats on each flight for full-fare passengers, thereby providing these time-sensitive passengers with low load-factor, high-access service. Remaining seats are sold at a discount to passengers who usually must satisfy advance purchase or minimum stay requirements, which are often chosen to take account of the carrier's system load. The net effect of both pricing systems is to provide high quality service to those who value it most. Therefore, the quality of service for time-sensitive passengers has not fallen so much as the rise in average load factors would seem to suggest; conceivably, it has not fallen at all.

4. The potential competition hypothesis: testing for market power

■ To estimate the effect of market concentration on fares, we begin by developing a model of the equilibrium average fare in an airline market. This model explains the equilibrium fare by using the variables discussed above (distance, concentration, traffic volume, and travelers' valuations of time) as well as an airline-specific variable related to airlines' cost structures. Our test of the potential competition hypothesis is based on the extent to which firms in highly concentrated markets set fares above the levels prevailing in less concentrated, but otherwise similar markets.

□ **The model.** As we have already observed, the cost of air service depends on a market's distance and traffic volume, as well as on the level of convenience demanded. A number of other variables affect the costs of serving a market. First, the opportunity cost of serving a market depends on whether the market involves one of the four airports at which the FAA constrains access: Chicago O'Hare, Washington National, and New York's Kennedy and LaGuardia airports. To serve one market that includes a slot-constrained airport is necessarily to forego serving another profitable market that also involves that airport.[16]

[16] Service to New York City includes service to Newark International Airport, which is not slot-constrained. The CAB *O&D Survey*, however, does not distinguish among service to the New York City airports and thus, neither do we. Service to Washington National is restricted to cities that are less than 650 miles away and to

Dummy variables are included to account for this effect. Also, costs are affected by a host of airline-specific factors. There is a fairly clear difference in costs between newly certificated carriers and the trunk and local airlines with the new carriers' costs being lower. This will reduce average fares in markets where the new carriers are present.

Thus, we can write the long-run marginal cost of providing a particular level of service convenience as follows:

$$LRMC = C(D, Q, LF, NYC, CHI, WAS, NEWCERT), \tag{6}$$

where

D = distance
Q = number of passengers
LF = load factor
$NEWCERT$ = presence of newly certificated carrier
NYC = New York City dummy
CHI = Chicago dummy
WAS = Washington dummy.

Quantity demanded depends on price and service quality, which in our simple model depend upon load factor and flight frequency. Demand for service quality derives from a desire to minimize the difference between a passenger's desired and actual arrival time; it is related to his time sensitivity. Time sensitivity cannot be measured directly, but two proxies are readily available. First, wage rates reflect consumers' marginal valuations of time. Therefore, per capita incomes of the cities served by a market provide a proxy for the time sensitivities of passengers traveling between those cities. Second, we have already noted that passengers in tourist markets are less time-sensitive. Thus, a tourist-market variable provides another proxy for the demand for service convenience. These variables will affect the equilibrium level of service quality and, hence, the equilibrium fare. The reduced form expression for service quality is

Service Quality $\equiv S = S(TOURIST, INC,$ other exogenous variables)
$TOURIST$ = 1 for markets involving service to Florida, Hawaii, Las Vegas, Reno and 0 otherwise;
INC = product of per capita income in the two cities at the ends of the markets.

The ability of carriers to mark fares up above $LRMC$ is a function of the price elasticities of demand faced by incumbent firms. Demand elasticities are smaller if there are entry barriers and the market is highly concentrated. If there are no entry barriers, and entry can be accomplished quickly and cheaply, firm demand is highly elastic regardless of market concentration. The presence of entry barriers means that the elasticity of firm demand will fall as market concentration increases.

Since surface transportation is less attractive as distance increases, fare markups over $LRMC$ presumably can increase with distance, at least up to a point. In very long distance markets, however, passengers have many routing and connecting possibilities open to them. Thus, the theoretical net effect of distance on markup is unclear. Finally, firms' price elasticities of demand should be higher in tourist markets than in nontourist markets, because tourists are often willing to use alternate modes of transportation or even to

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certain grandfathered cities. Nevertheless, many long-haul markets receive substantial amounts of either one-stop or connecting service from National Airport in addition to nonstop service to other airports in the metropolitan area. We, therefore, do not distinguish between cities that are served nonstop from National and those that are not.

change destination if air fares rise. For nontourist travelers, the options are often limited to telecommunications or the mail.

Summarizing this discussion, the equilibrium market price can be written as[17]

$$P = LRMC \times MARKUP,$$

where *MARKUP* depends on barriers to entry, concentration, the competitiveness of ground transportation, and whether a market is a tourist market. Thus *MARKUP* can be written as a function $M(H, D, Tourist)$ where $\partial M/\partial H > 0$ if there exist any entry barriers.

Substituting the reduced form expression for S into the function for *LRMC*, we have the following price equation:

$$\begin{aligned} P &= LRMC \times M(H, D, Tourist) \\ &= P(D, Q, H, NYC, CHI, WAS, TOURIST, INC, NEWCERT). \end{aligned} \quad (7)$$

We wish to estimate the magnitude of $\partial P/\partial H$ and to test whether it is significantly greater than zero. On the right-hand side of (2), Q and H may be considered endogenous variables. Therefore, we provide two-stage least squares estimates as well as ordinary least squares estimates of the price equation.

□ **Data and measurement of variables.** Our model is most applicable to large markets where there typically is a substantial amount of local traffic. It does not explicitly treat the phenomenon of networking, i.e., the joint production of air service in a number of markets. Hence, we limit our estimates of the model to a sample of 194 of the most heavily traveled markets.[18]

We measure price by average yield (coach fare per revenue passenger mile) for local coach passengers (including discount and normal economy). Yields are obtained from the CAB's *Passenger Origin and Destination Survey* and cover nonstop, one-stop, and multistop traffic. The other variables reflect only nonstop service. This should not cause significant measurement error, because the markets in our sample are large and passengers in these markets generally use nonstop service. Density is measured by the total number of passengers transported in the market as reported in the CAB's Service Segment Data. Distance is the nonstop distance reported in the *Origin and Destination Survey.* The Herfindahl index is based on departure shares and is derived from the *Official Airline Guide.*[19] Income is obtained from a survey of buying power published in July, 1979.[20]

The model is estimated using data for the fourth quarter of 1980 and the second

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[17] The fare equation arrived at below can be thought of as arising from a Cournot equilibrium in which firms choose price, number of flights, load factor, and capacity. Let b equal the constant marginal operating cost and B the marginal capacity cost, which we assume constant in our sample of 194 large markets. Then in Cournot equilibrium price is given by

$$P = \frac{\eta}{\eta - 1}\left(b + \frac{B}{LF}\right),$$

where LF = load factor and η is the firm-specific price elasticity of demand. Substitute the reduced form load factor equation into this expression, define $\eta/(\eta - 1)$ as the *MARKUP,* and the resulting expression motivates our estimating equation.

[18] See, however, Sibley, Jollie *et al.* (1982) for a discussion of networking and entry barriers. Our results are consistent with those obtained for a much larger sample of markets. See Graham and Kaplan (1982).

[19] In regressions not reported here, we also estimated the fare equation by using Herfindahl indexes based on true *O&D* traffic in each market and on online feed traffic in each market. The results were similar to those reported here.

[20] "Survey of Buying Power," *Sales and Marketing Management Magazine* (July 23, 1979). The population data also came from this publication. The income variable used is disposable income divided by the number of households in each metropolitan area. In estimating the equations, we divided the computed income variable by 10^9.

quarter of 1981.[21] Table 7 presents the sample means and standard deviations of the variables for the two quarters.

□ **Findings.** The fare equation was estimated in the semilog form, with interaction or polynomial terms included for distance, density, and the Herfindahl index. This function is fairly flexible, and results in an estimating equation in which terms involving H are multiplicatively separable from other variables, as suggested by equation (7). Ordinary-least squares estimates are reported in Table 8; Table 9 reports the estimates using two-stage least squares.[22] The results of the OLS and 2SLS estimates are quite similar.

As we shall discuss below, the presence of newly certificated carriers apparently has a substantial impact on fares in the markets they serve. Therefore, to determine the robustness of our estimates, we also estimated the model for a subsample of markets where these airlines do not operate. These regressions also appear in Tables 8 and 9.

TABLE 7 Sample Means and Standard Deviations

	1980—Fourth Quarter		1981—Second Quarter	
	Mean	S.D.	Mean	S.D.
Yield	.170	.070	.177	.072
Herfindahl	.467	.160	.465	.160
Distance*	868	669	868	669
Density*	170379	167270	186139	183122
Tourist	.160		.160	
Newly Certificated Carrier	.201		.247	

* For purposes of scaling the estimated coefficients, distance is entered in the regressions in units of 1,000s of miles and density is entered in millions of passengers.

[21] A high degree of fare flexibility was not introduced until May, 1980. The PATCO strike and subsequent firing of air traffic controllers in the summer of 1981 probably distorted traffic and fare data. Hence, our two sample periods, which lie between these major events, are as representative of an unregulated environment as any data presently available.

[22] Our 2SLS estimates are based on the following four-equation model, which can be derived from the Cournot model described in footnote 17 above:

$$Fare = F(D, Q, S, TOURIST, INC, NYC, CHI, WAS, NEWCERT, H) + u_1 \quad \text{(i)}$$
$$Q = Q(D, FARE, S, POP, INC) + u_2 \quad \text{(ii)}$$
$$H = H(D, Q, S, LHUB, SHUB, BAL, FLL) + u_3 \quad \text{(iii)}$$
$$S = S(FARE, Q, H, D, INC, TOURIST) + u_4. \quad \text{(iv)}$$

The variables that have not yet been defined are:

POP = the product population in city A and city B;
$LHUB$ = 1 if the endpoints of a market are both large hubs, and 0 otherwise;
$SHUB$ = 1 if either of the endpoints of a market is a small hub, and 0 otherwise;
BAL = 1 if a market serves Baltimore, and 0 otherwise;
FLL = 1 if a market served Fort Lauderdale, and 0 otherwise.

Since we are primarily interested in fares, we have in effect substituted for S in equations (i)–(iii) and have not estimated equation (iv).

The specification of the H equation derives from assuming that concentration depends on the carriers' route networks, of which the market in question is part. For this purpose, it is important to know whether a market involves a large hub, a small hub, or a satellite airport. The $LHUB$ and $SHUB$ variables are intended to reflect the fact that concentration will tend to be lower in markets which have many airlines serving at the end points, and concentration should tend to be higher when few airlines operate at the endpoints. Baltimore and Fort Lauderdale are satellite airports operating near major hubs. Typically their markets were more concentrated than those of other similar airports, and hence dummies were included to account for the differences.

TABLE 8 OLS Fare Equations for Semilog Specification, Dependent Variable = ln (Average Yield)*

	C	*D*	D^2	D^3	*QD*	*Q*	*H*	H^2	*NYC*	*CHI*	*WAS*	*TOURIST*	*INC*	*NEWCERT*	$\bar{R}^2$
							Fourth Quarter 1980								
All Markets (194 Observations):															
(8)	−1.405	−2.02	1.08	−.206	.035	−.155	.961	−.718	.131	.120	.076	−.090	.608	−.141	.84
	(−10.33)	(−11.18)	(6.69)	(−5.10)	(.38)	(−1.54)	(3.20)	(−2.98)	(4.52)	(3.64)	(1.60)	(−2.78)	(2.19)	(−4.03)	
Markets without Newly Certificated Airlines (155 Observations):															
(9)	−1.419	−2.15	1.19	−.233	−.061	−.040	1.189	−.874	.076	.061	.025	−.092	.626		.88
	(−9.25)	(−12.23)	(7.69)	(−6.02)	(−.32)	(−.21)	(3.94)	(−3.75)	(2.75)	(1.95)	(.54)	(−2.76)	(2.20)		
							Second Quarter 1981								
All Markets (194 Observations):															
(10)	−1.197	−1.76	.844	−.154	.119	−.155	.288	−.133	.112	.133	.058	−.104	.513	−.220	.83
	(−9.03)	(−9.56)	(5.16)	(−3.77)	(1.38)	(−1.70)	(.97)	(−.56)	(3.81)	(3.98)	(1.19)	(−3.15)	(1.81)	(−6.78)	
Markets without Newly Certificated Airlines (146 Observations):															
(11)	−1.161	−1.92	.964	−.182	.092	−.325	.630	−.393	.073	.074	−.010	−.137	.478		.83
	(−7.68)	(−10.58)	(5.95)	(−4.50)	(.45)	(−1.39)	(2.09)	(−1.68)	(2.39)	(2.31)	(−.20)	(−3.87)	(1.62)		

* The *t*-statistics are in parentheses.

TABLE 9 2SLS Fare Equations for Semilog Specification, Dependent Variable = ln (Average Yield)*

	C	D	D^2	D^3	$\hat{Q}D$	$\hat{Q}$			NYC	CHI	WAS	$TOURIST$	INC	$NEWCERT$
							Fourth Quarter 1980							
All Markets (194 Observations):							H	H^2						
(12)	−1.538	−2.02	1.11	−.213	−.160	.516	1.311	−.886	.109	.126	.089	−.090	.353	−.185
	(−9.54)	(−9.72)	(6.00)	(−4.59)	(−1.16)	(1.89)	(3.59)	(−3.18)	(3.19)	(3.42)	(1.65)	(−2.46)	(1.07)	(−4.31)
							$\hat{H}$	$\hat{H}^2$						
(13)	−1.072	−1.97	1.08	−.209	−.195	−.406	−.462	.734	.104	.112	.083	−.109	.322	−.217
	(−2.80)	(−8.54)	(5.28)	(−4.07)	(−1.22)	(−1.20)	(−.36)	(.60)	(2.52)	(2.48)	(1.44)	(−2.77)	(.91)	(−3.64)
Markets without Newly Certificated Airlines (155 Observations):							H	H^2						
(14)	−1.631	−2.11	1.19	−.234	−.306	.686	1.536	−1.038	.061	.062	.021	−.098	.546	
	(−8.30)	(−10.89)	(7.30)	(−5.78)	(−.98)	(1.56)	(4.14)	(−3.96)	(2.02)	(1.89)	(.45)	(−2.79)	(1.83)	
							Second Quarter 1981							
All Markets (194 Observations):							H	H^2						
(15)	−1.340	−1.82	.895	−.165	.065	.293	.770	−.427	.094	.140	.068	−.091	.339	−.259
	(−8.58)	(−8.95)	(5.00)	(−3.68)	(.56)	(1.26)	(2.03)	(−1.49)	(2.89)	(3.88)	(1.29)	(−2.54)	(1.07)	(−6.69)
							$\hat{H}$	$\hat{H}^2$						
(16)	−.874	−1.71	.820	−.150	.046	.173	−1.268	1.648	.087	.126	.061	−.110	.343	−.274
	(−2.15)	(−6.55)	(3.60)	(−2.64)	(.29)	(.47)	(−.90)	(1.24)	(1.84)	(2.60)	(.92)	(−2.48)	(.87)	(−5.01)
Markets without Newly Certificated Airlines (146 Observations):							H	H^2						
(17)	−1.501	−2.03	1.06	−.200	−.104	.968	1.261	−.703	.076	.077	.034	−.129	.354	
	(−6.01)	(−8.41)	(5.31)	(−4.08)	(−.23)	(1.34)	(2.59)	(−2.12)	(2.03)	(1.96)	(.53)	(−2.96)	(.97)	

* $\hat{Q}$ and $\hat{H}$ were fitted using OLS reduced form equations and the fitted values were used to calculate $\hat{Q}D$ and $\hat{H}^2$. These fitted values were then used to obtain OLS estimates of the fare equation. The fare equations' residuals and coefficient standard errors were adjusted as specified in Maddala (1977, p. 239). The numbers in the parentheses are the adjusted t-statistics.

The estimated parameters generally conform with our expectations, and typically are statistically significant. The OLS equations have $\bar{R}^2$'s ranging from .83 to .88, indicating that the equations explain a large share of the variation in the average fare per mile. The coefficients of distance are all highly significant. The average fare per mile declines over a broad range up to about 1,000 miles, and then remains relatively flat until about 2,000 miles, where it declines again.[23] Density, however, has a small and insignificant effect on fares. In 1981 it is positive in the 2SLS equations, though it is negative in the OLS specifications. Although we expected market density to influence fares, this regression finding is consistent with the results in Table 3, which showed that, except for markets of 1,500 miles or more, there were not substantial differences between fares in the top 100 and the second 100 markets.

As expected, fares are related to the passengers' value of time. The coefficient of *TOURIST* is consistently negative and significant, and indicates that fares in tourist markets are approximately 10% lower than fares in other markets. The coefficient *INC* is positive, as predicted, though it is significant only in the OLS estimates for 1980 (equations (8) and (9)).

Fares in markets served by the slot-constrained airports tend to be higher; except for Washington, the coefficients are significantly positive. For the sample that excludes markets served by newly certificated carriers, the coefficients of the slot dummies all decline. This reflects the fact that a substantial proportion of the top 200 markets involving these airports is served by newly certificated airlines.

The coefficients of *NEWCERT* show that average fares in markets served by newly certificated carriers were 19% lower in 1980 (equation (12)) and 26% lower in 1981 (equation (15)).[24] The estimated effect of *NEWCERT* was four percentage points less in the comparable OLS equations. The sharp jump in the coefficient of *NEWCERT* between 1980 and 1981 probably reflects the fact that the newly certificated airlines' share of traffic grew between the two periods, as well as the fact that the larger established airlines increasingly cut fares to meet the competition from these new, lower cost airlines.

We estimated the fare equation by assuming first that the Herfindahl index and the error term were uncorrelated and then that they were correlated. When H (and H^2) are treated as exogenous but density is endogenous, the coefficient of H is positive, that of H^2 is negative, and both tend to be significant (equations (12), (14), (15), and (17)). The results are roughly similar for the OLS equations (equations (8)–(11)), except that the OLS regression for the second quarter of 1981 yields insignificant coefficients for H and H^2 (equation (10)). This overall uniformity in the effect of H holds for both the full sample and the subsample with *NEWCERT* markets excluded.

When H and H^2 are considered endogenous variables, the point estimates often switch signs, and the estimates become insignificant (equations (13) and (16)).[25] We conducted specification tests to determine whether H (and H^2) are correlated with the error term in the fare equation. The test results suggest that H is not significantly correlated with the error term of the fare equation, and thus the specification treating them as exogenous is appropriate.[26]

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[23] The B-727-200, the most widely used aircraft in the industry, is well suited for markets of about 1,500 miles, but begins to operate at a cost penalty in longer haul markets. Larger, wide-bodied aircraft are best suited for use in dense, longer haul markets. Thus, the predicted relation between average fare and distance is consistent with the existing fleet mix.

[24] Since we do not have data on the fares of Midway in 1980 and People Express in 1981, the true effect of the *NEWCERTS* is undoubtedly greater.

[25] An F-test of the joint significance of these variables indicates that the total effect of the Herfindahl index is not statistically different from zero in equations (13) and (16).

[26] Two different tests of the endogeneity of H and H^2 were tried. The first was proposed by Revankar (1978), the second by Hausman (1978). Nakamura and Nakamura (1981) have shown that Hausman's test is equivalent to Wu's proposed T_2 test. See Wu (1973, 1974).

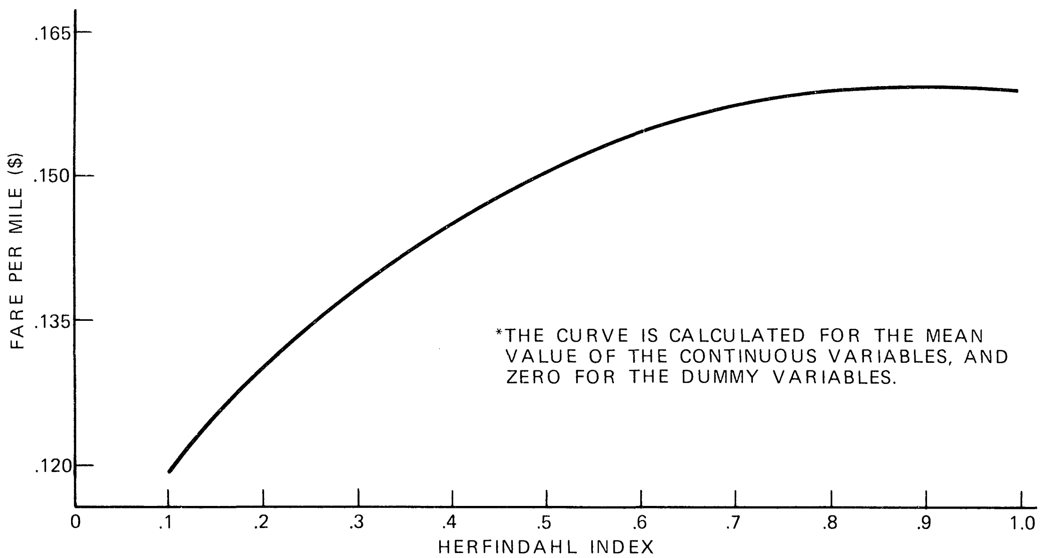
The fact that the Herfindahl index may be treated as exogenous may be due in part to the fact that regulation determined the broad outlines of carriers' route networks and that changes under deregulation have not removed the CAB's stamp on the networks. Alternatively, this finding may reflect the fact that airlines choose routes on the basis of how they fit entire networks of routes so that concentration in the city pair market is mainly determined by the networking characteristics of the market itself. This suggests that the network, rather than the city-pair concentration, be thought of as endogenous. For these reasons, we shall rely on the fare equations in which the Herfindahl index is treated as exogenous.

Our results show that the effect of concentration on fares is not uniform. As Figure 2 shows, the relation between fares and H is increasing and concave in the relevant region of H. This suggests that the effects of increased concentration are small for markets with medium to high levels of concentration. When the Herfindahl index reaches .5 or so, the percentage increase in fares that results from a .1 rise in H is very small.

Overall, the model yields a pattern of results that is quite plausible and robust. With the exception of market density, which has no consistent or statistically significant effect, the estimated effects of the variables agree with our expectations. Several interesting issues are touched upon by these results. First, we find that markets serving the slot-constrained

FIGURE 2

FARES AND MARKET CONCENTRATION*



Let

$$H = \pi_{11}X_1 + \pi_{12}X_2 + v_1$$

$$H^2 = \pi_{21}X_1 + \pi_{22}X_2 + v_2$$

be the reduced form equations for Herfindahl and Herfindahl squared. X_1 is the vector of X's that appear in the fare structural equation. In Revankar's test, the variables $T_1 = \pi_{12}X_2$ and $T_2 = \pi_{22}X_2$ (where the π are reduced form estimates) are entered into the fare equation and their joint significance is tested. The $F(2, 180)$ for this test was 2.64 in 1980 and 1.51 in 1981; thus we cannot reject the hypothesis that H and H^2 are exogenous. In Hausman's test the fitted values $\hat{H}$ and $\hat{H}^2$ are entered into the fare equation, along with H and H^2. The $F(2, 180)$ for the joint significance of three variables is 4.90 in 1980 and 2.57 in 1981; thus we reject the hypothesis of exogeneity in 1980 but not in 1981. We conclude that the weight of the evidence argues that H should be treated as an exogenous variable.

We found it impossible to explain more than about 25% of the variation in the Herfindahl index. A study of the determinants of market concentration in the airlines would be a useful topic for future research.

airports in New York and Chicago have higher fares. Second, our estimates suggest that airlines tailor operations and fares in a market to reflect travelers' valuations of time. Third, market concentration appears to have a positive impact on fares in the relatively unconcentrated markets, but not much incremental effect for markets with a Herfindahl index above .5 or so. Finally, the newly certificated airlines are producing lower fares in the markets they serve.

5. The new entrants

■ Since the passage of the Airline Deregulation Act, a dozen new carriers have begun scheduled interstate service and even more have applied for certification. Some are former intrastate carriers, others are former charter carriers, and seven are new enterprises. The operations of these carriers are significantly different from those of the formerly regulated carriers, and their rapid growth suggests that they will have far reaching effects on the industry.

The new entrants tend to offer fewer amenities and higher seating densities than the formerly regulated carriers. The most striking difference between the new entrants and the incumbents, however, is their cost structure. The new entrants generally pay lower wages and have much less restrictive work rules. For example, pilots at Southwest, a former intrastate carrier, average more than 50% more flying hours per month than pilots of the formerly regulated carriers. Moreover, the new entrants are less likely to have labor contracts that prohibit cross utilization of employees as, for example, using baggage handlers to load in-flight meals.

For the year ending June, 1981, Southwest's costs of operating a B-737 in a 200-mile segment are estimated to have been much less than the cost of two formerly regulated carriers who operated the same equipment, United and Piedmont. (See Table 10.) A major part of the difference between Piedmont's and United's cost of operating a B-737 stemmed from a union contract which required United to use a three-man cockpit crew. Piedmont and Southwest were able to use two-man crews; in the Fall of 1981 United renegotiated its labor contract so it too now uses a two-man crew.

In 1981 the new entrants accounted for 6.9% of the domestic traffic (as measured in revenue-passenger-miles), and they were the most rapidly growing segment of the

TABLE 10 **Comparison of Airline Costs of Operating B-737-200 over a 200-Mile Market***

Cost Category	Southwest	Piedmont	United
Operating and Aircraft Service Expense	1,345	1,720	2,144
Passenger Expense	273	713	659
Reservations, Sales and Advertising Overhead	135	403	508
Other	107	108	302
Fully Allocated Costs	1,860	2,944	3,613

* Estimates were derived from the CAB, "Domestic Fare Structure Costing Program, Version 6, Update." Data are for 12 months ending June 30, 1981. For all three airlines, we valued the aircraft at the used aircraft price as of January 1, 1981, and assumed that the average capital cost was 14%. United's stock of B-737-200s is relatively old; hence, their maintenance cost was high. We, therefore, assumed that United's maintenance costs were equal to their (lower) expense on a B-727-200, a larger, and typically more costly aircraft to maintain. This expense was comparable to Piedmont's maintenance expense for the B-737-200.

industry. In response to the competition posed by these carriers, the established airlines, as evidenced by United's agreement with its pilots, are taking steps to pare their costs.

6. Concluding remarks

■ Our analysis, which is based on the two quarters of available data, shows that in several important respects the airline industry appears to be evolving in the ways economists predicted it would. Load factors have risen. Market characteristics, such as distance and the demand for convenient service, explain a large share of the variation in fares across markets in ways which are broadly consistent with market efficiency criteria. Competition from newly formed airlines has had a substantial effect on fares. On the other hand, fares seem to be positively related to concentration, thereby indicating that potential competition is not strong enough at present to eliminate all attempts to raise price in concentrated markets.

It is tempting to ask whether the evidence reported in this article is consistent with the assertion that airline markets are perfectly contestable, as suggested in recent work by Bailey and Panzar (1981) and Baumol, Panzar, and Willig (1982).

This issue can be viewed from two perspectives. First, do airline markets display characteristics which are favorable to contestability? Second, is behavior in airline markets consistent with that implied by contestability?

Two factors have been proposed as features favoring contestability: the absence of sunk costs and an expectation by prospective entrants that incumbents' prices will not change in response to entry. It is frequently argued that sunk costs of entry are low in airline markets because capital is extremely mobile. Although capital may be highly mobile, other sunk costs may exist. In many cases, passengers exhibit a preference for incumbent carriers' flights because incumbents' schedules and service reliability are better known than the entrants' until the latter have been in the market for a while. In addition, price rigidity by incumbent firms is not characteristic of the deregulated airline industry. It is commonplace for incumbent carriers to announce publicly that they will match the fares of any entrants.

The literature on contestability does not provide an explicit way of empirically determining whether a market is contestable. Hence, it is not entirely clear whether our empirical results are consistent with what one would expect to observe in a contestable market. In the simplest, single homogeneous product case, Baumol, Panzar, and Willig (1982, ch. 2) show that in a perfectly contestable market the only effect that concentration has on price is that a monopoly market may have a higher price than one served by two or more firms. (Increasing the number of firms beyond two has no additional effect on price.) But even this effect is absent when one corrects for market size, as we do in our regressions. Thus, our finding that the Herfindahl index has a positive and significant effect on fares is inconsistent with this simplest version of the contestability hypothesis.[27]

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[27] It should be pointed out, however, that a major tenet of the contestability model is that market structure is determined endogenously, along with price and quantity. Equations (13) and (16) incorporate this endogeneity of market structure. They present 2SLS estimates of the H and H^2 coefficients. If markets are dense enough that economies of equipment size are exhausted, however, as they probably are in our sample of 194 large markets, concentration is not necessarily correlated with the error term of the fare equations. If it is not, then the 2SLS estimates in equations (13) and (16) may be adversely affected by our inability to predict H and H^2 well in the first stage.

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