The Determinants of Direct Air Fares to Cleveland: How Competitive?

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Introduction

Eleven years ago, Congress decided in the form of the Airline Deregulation Act of 1978 that the operational decisions of airlines—where planes can fly and what fares can be charged—would be better left to the airlines than to the regulators.

This decision has caused numerous changes in the industry: discount fares have become widespread and traffic has boomed, new carriers have come and gone, hub-and-spoke networks have emerged, and frequent-flier plans have become the rage. As long as the industry remains competitive, many analysts assert that travelers have little to fear from these continuing changes, since competition ensures that fares are held close to cost and that economically viable service is provided.

With the consolidation of the airline industry that started in 1986, many analysts have begun to wonder about its competitiveness, both now and in the future. The wave of mergers has resulted in an increase in the number of airlines that offer nationwide service, but this comes in the form of "fortress hubs." At such airports, the dominant carrier typically offers about three-quarters of the airport's flights. In addition, the national carriers now face less competition from regional and local service carriers, many of whom have been purchased by or signed operating agreements with the national carriers. The impact of these developments (and of possible future consolidations) on fares depends on the competitiveness of the markets for air travel.

To gain insight into the competitiveness of the airline industry, this paper examines the determinants of air fares for first-class, coach, and discount service to a particular destination: Cleveland, Ohio. We begin by examining two of the market models that have been proposed for the airline industry. The first is the traditional view that market competitiveness is determined by the number and concentration of firms in the market. The second is the theory of contestable markets, in which the number of actual competitors in the market plays only a small role. According to this theory, it is the number of carriers that could potentially enter the market that constrains fares.

We then discuss the implications for appropriate public policy. A reduced-form equation for air fares is constructed, and the data that were collected to estimate its parameters are described. Finally, we present and analyze the empirical results and discuss the implications for public policy.

Our results suggest that these markets (the airline routes) are not perfectly contestable. The number of actual competitors does influence the fares charged by the airlines, other things being equal. Thus, policymakers should act where possible to ease entry barriers in the industry in order to preserve and enhance competition.

I. Economic Models of Airline Competition

The traditional method of determining the amount of competition in a market is to examine the market shares of the largest firms operating in that market. This measure is relevant because, until recently, most economists thought that competitiveness was determined by the number and concentration of the actual participants in the market.

The U.S. Department of Justice uses a Hirschman-Herfindahl Index (HHI: the sum of the squares of all of the firms' market shares) as an aid in assessing the impact of proposed mergers on market competition. This index ranges from close to zero in the case of a perfectly competitive market to 10,000 (100^2) in the case of a monopoly.[1] The Department of Justice guidelines recommend rejecting mergers that result in markets with an HHI greater than 1,800 unless the resulting increase in the HHI is less than 50 or there are some other special considerations. The rationale is that fewer competitors reduce the competitiveness of the market, since there will be less pressure to hold down prices and costs and since the firms will find it easier to collude.

The airline industry appears to be very uncompetitive when one examines the HHIs of various airline routes. According to a recent Congressional Budget Office study, on a typical route only 2.5 carriers offer service. Even if these carriers each had an equal share of the market, this would result in an HHI of over 4,000.

The U.S. Department of Transportation—the agency charged with oversight of the airline industry—has taken a different approach than the Justice Department. Over the last few years, it has allowed mergers to occur between carriers even when many of their routes overlapped. For example, TWA and Ozark competed on many routes involving their joint hub of St. Louis, and their merger in 1986 resulted in a large increase in concentration on these routes. In 1983, the HHI was about 3,100; just after the merger, the HHI was about 5,800; and in 1988 the HHI had risen to about 6,800, with TWA offering about 82 percent of the flights out of St. Louis. The TWA-Ozark merger was clearly outside the Department of Justice's guidelines discussed above (however, there was the special consideration that Ozark was in financial difficulty and might have failed unless it was taken over).

In approving mergers such as this one, the Department of Transportation relied heavily on the relatively new theory of contestable markets developed primarily by Baumol, Panzar, and Willig (1982).[2] This theory states that under certain conditions, it is not necessary to have a large number of firms actually operating in a market in order for prices and output in that market to approximate the ideal outcome of a perfectly competitive market. If entry barriers into the market are low, and if there are no irrecoverable costs to exiting the market, then even markets with only a few firms will be constrained to follow the same marginal-cost pricing that perfect competition with many firms would. If the firms in the market tried to raise prices above marginal cost (the extra cost of producing an additional unit of output), then entrepreneurs could enter the market and charge a slightly lower price than the incumbent firms (taking away those firms' customers) and could earn an above-average profit. The ease of entry and exit from a perfectly contestable industry means that potential competitors also exercise competitive pressure on the firms in the industry.

There were several reasons to believe that the airline industry might approximate a perfectly contestable market after the Civil Aeronautics Board stopped regulating routes and fares, a process phased in over several years starting in the late 1970s. Planes now can quickly be shifted from one route to another, and many of the airlines rent a significant proportion of their aircraft fleets. In addition, there is a ready secondary market for used aircraft, so a major component of an airline's capital stock is much easier to acquire and dispose of than in most other industries.

Working against the idea that the airline industry is perfectly contestable are the current congestion problems in the air traffic control network. Also, new entrants find it difficult to acquire gate space and slots for takeoffs and landings at the more congested airports. Computer reservation systems, travel agent commissions, frequent-flier plans, and hub-and-spoke

1 Since the market shares are squared before summing, the market shares of the largest firms will influence the index the most.

2 The theory of contestable markets has been applied to a number of other industries. Whalen (1988) finds evidence that the banking industry is perfectly contestable.

networks are also cited as characteristics of providing air service that make entry into new markets difficult. Borenstein (1988) provides a more detailed investigation of these issues.

If the market for air fares approximates a perfectly competitive market, then there is very little need for government oversight of the economic conditions in the airline industry, although there still would be a role in the regulation of air safety. Actual and potential competitors force the airlines serving a market to provide the service that passengers want at the lowest possible fares. If the market is not perfectly contestable, then the government can ensure that entry into the market is as free as possible, and should enforce existing antitrust laws to protect consumers by preserving as much competition in the market as possible.

II. Empirical Model and Data

Although other researchers (for example, Bailey, Graham, and Kaplan [1985], Borenstein [1988], Butler and Huston [1987], and Call and Keeler [1985]) have explored the extent of competition in the airline industry by using models similar to the one we develop, none of these studies employs data as recent as ours (April 1987). Thus, not only are our data further away from the beginning of deregulation, but they also follow the latest wave of mergers that occurred in 1986.

The following observations will be useful in constructing the testable hypotheses. If the market were perfectly contestable, then the number of carriers serving a route would have no relationship to passenger fares. If potential competitors constrain the fare-setting abilities of existing carriers, then the market is imperfectly contestable and the effect of the number of carriers serving a route should have a significant, although small, effect on the fares charged. Lastly, if entry is so blocked that existing carriers have little to fear from new entrants, then the degree of competition on a route will be determined by the number of carriers currently serving the route, and the effect of an additional carrier on the route could cause a significant reduction in fares. This is the more traditional view of the relationship between the degree of competition and the number of competitors.

In comparing the fares charged with the number of carriers on the route across routes, one must allow for other factors that influence fares. In essence, we are estimating a reduced-form equation for air fares, so that anything that influences the demand for, or the cost of, air travel should be taken into account. The most important of these factors are the length of the route, the volume of traffic on the route, and whether one or both of the airports involved are hubs or are restricted in takeoff and landing slots.

The characteristics of a particular flight on a given route can also influence both the supply and the demand for the flight. The most important of these are the number of stops on a particular flight, whether a meal is provided, and the particular carrier offering the flight. Finally, the demand for air service on a particular route will depend in part on characteristics of the flight's origin and destination cities, such as their average per capita incomes and whether they are business or tourist centers.

We estimate the following model using ordinary least squares (OLS):

$$
\begin{aligned}
(1)\quad \text{'FARE} = {} & a_0 + a_1\,\text{CARRIERS} \\
& + a_2\,\textit{CARRIERS}^2 + a_3\,\text{PASS} \\
& + a_4\,\text{MILES} + a_5\,\text{MILES}^2 \\
& + a_6\,\text{POP} + a_7\,\text{INC} + a_8\,\text{CORP} \\
& + a_9\,\text{SLOT} + a_{10}\,\text{STOP} \\
& + a_{11}\,\text{MEAL} + a_{12}\,\text{HUB} \\
& + a_{13}\,\text{EA} + a_{14}\,\text{CO} + \text{error},
\end{aligned}
$$

where
FARE = one-way air fare;
CARRIERS = number of carriers;
CARRIERS^2 = number of carriers squared;
PASS = total number of passengers flown on route (all carriers);
MILES = mileage from the origin city to Cleveland;
MILES^2 = the number of miles squared;
POP = population of the origin city;
INC = per capita income of the origin city;
CORP = proxy for potential business traffic from the origin city;
SLOT = dummy variable equaling 1 if the origin city has a slot-restricted airport, 0 otherwise;
STOP = number of on-flight stops;
MEAL = dummy variable equaling 1 if a meal is served, 0 otherwise;
HUB = dummy variable equaling 1 if the origin city has a hub airline, 0 otherwise;

EA = dummy variable equaling 1 if the carrier is Eastern Airlines, 0 otherwise;

CO = dummy variable equaling 1 if the carrier is Continental Airlines, 0 otherwise.

This model is estimated separately for each of three classes of fares: first class, coach, and restricted discount.

The data to estimate this model were combined from a number of sources. The *Official Airline Guide* (April 1987) was the source of the fare information and the data on the flight characteristics, such as CARRIERS, STOP, SLOT, MEAL, EA, and CO. All of the data pertain to direct domestic flights terminating in Cleveland. Unfortunately, fares for connecting flights could not be analyzed here because only direct fares are reported in the *Official Airline Guide*. In future research, we hope to obtain such data.

TABLE 1

Summary Statistics of the Variables

Variable	First-class Fares Mean	First-class Fares Standard Deviation	Coach Fares Mean	Coach Fares Standard Deviation	Discount Fares Mean	Discount Fares Standard Deviation
FARE	330.17	123.63	201.78	89.60	62.65	29.85
CARRIERS	2.77	1.33	2.89	1.25	2.88	1.25
PASSENGERS	18,458.00	22,802.00	15,260.00	21,414.00	15,273.00	21,406.00
MILES	744.19	535.18	537.27	465.43	541.25	466.32
INCOME	13,996.00	1,766.00	13,709.00	1,643.60	13,727.00	1,656.10
COW	10.63	16.67	8.76	15.17	8.75	15.17
SLOT	0.22	0.42	0.19	0.39	0.19	0.39
STOP	0.46	0.60	0.41	0.63	0.42	0.63
MEAL	0.60	0.49	0.44	0.50	0.44	0.50
HUB	0.71	0.46	0.66	0.47	0.66	0.47
CO	0.16	0.37	0.08	0.27	0.08	0.27
EA	0.16	0.37	0.07	0.26	0.08	0.27
POP	4,046.30	4,668.20	3,497.60	4,184.90	3,493.40	4,187.80

SOURCE: **Authors' calculations.**

Data on passengers (PASS) and nonstop mileage from origin to destination (MILES) were taken from the U.S. Department of Transportation's *Origin and Destination City Pair Summary*. Data on per capita income (INC) of the origin cities were obtained from the *Survey of Current Business* (April 1986 issue). The number of Standard & Poor's companies headquartered in each origin city (CORP) was compiled to be used as a proxy for the business traffic likely to be generated by each city. Information on whether an origin city was considered to have a hub airline (HUB) was obtained from 1985 Department of Transportation statistics. For each of the three fare classes, summary statistics on the variables used in the analysis are provided in table 1.

III. Estimation Results

Tables 2, 3, and 4 report OLS estimates of equation (1) for first-class, coach, and discount fares. The amount of variation in fares explained in each estimated equation (the adjusted R-square statistics in tables 2 through 4) is generally high, and is higher for the first-class and coach categories than for the discount category. This is probably the result of the discount fares being less homogeneous than the other fare classes. For our discount fare, we always selected the least expensive restricted-discount fare reported in the *Official Airline Guide*, and these fares were not always subject to exactly the same restrictions[3]

In interpreting these results, recall that only direct flights to Cleveland were included in the data. Also note that since more than 90 percent of passengers travel on some type of discount fare,

3 It was not possible to select one particular type of discount fare for all of the routes because no type of discount fares were reported for all routes.

TABLE 2

First-Class Fare Estimates

Variable	Estimated Coefficient	Standard Error	T-Ratio
CARRIERS	−19.50	22.20	−0.878
CARRIERS²	2.79	4.42	0.632
MILES	0.233	0.455E−1	5.13
MILES²	−0.974E-5	0.197E−4	−0.495
POP	−0.598E−2	0.357E−2	−1.67
INC	−0.195E−2	0.285E−2	−0.686
COW	3.62	1.05	3.45
PASS	−0.818E−3	0.106E−2	−0.771
STOP	12.50	9.18	1.36
SLOT	7.13	23.90	0.299
HUB	11.30	12.60	0.900
MEAL	11.20	10.50	1.07
EA	−18.30	11.40	−1.60
CO	−66.40	11.60	−5.72
CONSTANT	212.00	40.60	5.21

NOTE: All values are authors' calculations. Number of observations = 163; R-squarec! = 0.863.

according to the Air Transport Association, this class of service is probably the most important for evaluating the competitiveness of the industry.[4]

The first issue is the effect of the number of carriers on fares. The estimated values for CARRIERS and CARRIERS² have the expected signs

TABLE 3

Coach Fare Estimates

Variable	Estimated Coefficient	Standard Error	T-Ratio
CARRIERS	−23.00	11.60	−1.99
CARRIERS²	4.00	2.19	1.83
MILES	0.277	0.231E−1	12.00
MILES2	−0.520E−4	0.104E−4	−4.98
POP	−0.114E−2	0.200E−2	−0.570
INC	−0.178E−2	0.168E−2	−1.06
CORP	1.22	0.487	2.51
PASS	−0.275E−3	0.522E−3	−0.527
STOP	7.64	3.59	2.13
SLOT	−0.746	11.20	−0.667E−1
HUB	4.18	5.16	0.810
MEAL	0.945	5.35	0.177
EA	5.80	7.48	0.775
CO	−56.50	7.42	−7.61
CONSTANT	126.00	22.00	5.75

NOTE: All values are authors' calculations. Number of observations = 323; R-squared = 0.871.

for all three classes of fares. These results suggest that as additional carriers begin service on a route, fares are lowered, since CARRIERS is negative. But because the coefficient of CARRIERS² is positive, each additional carrier lowers fares on the route less than the one before. After three or four carriers are serving a route, fares no longer appear to be affected by the number of carriers.

These coefficients are statistically significant for coach and discount fares, but are not significant for first-class fares. For discount fares, the addition of one carrier to a monopoly route would lower fares by about $11, other things being equal. Adding a third carrier to the route would again lower fares, but by only about $6.50. With a fourth carrier, fares drop even less, by about $2. Fares do not appear to fall any more once about four carriers are serving the route. At this point, discount fares are about $20 less than they would be if only one carrier served the route. Extrapolation beyond this point is not warranted since the maximum number of carriers on any route in our sample is only five.

The above result for first-class fares does not mean that these fares are perfectly contestable, however. If we estimate the same model as equation (1), but replace CARRIERS and CARRIERS2 with a dummy variable equal to one if there is more than one carrier on the route and zero otherwise, we find that the coefficient of this variable is significant and negative for first-class fares. First-class fares are about $21 lower on routes with more than one carrier, other things being equal. In other words, since fares are cheaper on routes with more than one carrier, these results do not support the notion that these routes are perfectly contestable.

Earlier studies that investigated whether the market for air fares was perfectly contestable also found little support for perfect contestability. As mentioned above, their data generally came from the early 1980s and thus may have been estimated too soon after deregulation for the airlines to have adjusted to their new environment. Because our study employs fare data from April 1987, it is unlikely that the lack of contestability is a result of the airlines' having insufficient time to adjust to the deregulated environment. This data set also has the advantage of being gathered about a year after the merger wave that peaked in 1986.

Not surprisingly, MILES has a positive and significant estimated coefficient for each class of fares. Coach and discount fares have a significant amount of "fare taper": as the flight distance increases, the cost per mile falls. First-class fares

■ 4 Cited in Kahn (1988).

do not exhibit this property to a significant extent. For a flight of average length, first-class and coach fares increase about $0.22 per mile and discount fares increase about $0.06 per mile.

The PASS, SLOT, and HUB variables all measure possible capacity constraints facing the airlines serving a given route.[5] HUB is not statistically significant at the 5 percent level for any type of fares. The density of traffic on a route as measured by the PASS variable significantly increases discount fares. Only discount-fare passengers pay the expected premium for flying into slot-restricted airports. Flying into a slot-restricted airport increases the one-way fare by about $18 for these passengers.

TABLE 4

Discount Fare Estimates

Variable	Estimated Coefficient	Standard Error	T-Ratio
CARRIERS	–17.50	4.76	–3.67
CARRIERS²	2.19	0.905	2.42
MILES	0.791E–1	0.961E–2	8.24
MILES²	–0.140E–4	0.434E–5	–3.23
POP	–0.868E–3	0.829E–3	–1.05
INC	–0.411E–2	0.679E–3	–6.05
CORP	–1.06	0.203	–5.22
PASS	0.853	0.217E–3	3.93
STOP	–3.85	1.48	–2.60
SLOT	17.70	4.63	3.82
HUB	–3.50	2.16	–1.62
MEAL	1.80	2.21	0.813
EA	–10.60	3.04	–3.49
CO	–4.17	3.09	–1.35
CONSTANT	113.00	9.10	12.40

NOTE: All values are authors' calculations. Number of observations = 323; R-squared = 0.799.

Flight characteristics, such as the number of intermediate stops on the flight, influence coach and discount fares, but not first-class fares. Coach passengers pay about $7.60 for each stop, whereas discount-fare passengers actually get compensated about $3.85 for each stop. The fare charged does not seem to depend on whether the flight includes a meal.

The characteristics of the cities involved influence the fare charged to the various classes of passengers. The larger the population of the origin city, the lower the fare for all three classes of service, although this result is statistically significant at the 5 percent level only for first-class fares. The per-capita income variable seems to affect only discount fares significantly. Discount fares fall as incomes rise, indicating that higher-income passengers expect compensation in the form of lower fares for flying with discount tickets, other things being equal. The more important the city is as a business center (as measured by CORP), the higher the first-class and coach fares tend to be. Discount fares, on the other hand, are lower.

Continental charges significantly less than other carriers for first-class and coach service, other things being equal. Conversely, Eastern charges significantly less for discount service than other airlines, other things being equal.[6] Texas Air may own both of these carriers, but they appear to follow different criteria in setting fares. Keep in mind that these carrier-based fare differentials reflect differing cost and demand characteristics, including quality of service.

IV. Conclusion

An understanding of forces setting fares and the level of competition in the airline industry is crucial in order to formulate effective public policies for the industry. Some analysts have suggested that the ease of entry into most airline markets after deregulation increased the competitiveness of fares, even though the actual number of carriers is relatively small. We found that the number of airlines serving a route does influence the fares charged for all classes of service. Thus, the airline industry is not perfectly contestable even when very recent data are employed.

The benefits to passengers of adding an additional carrier on a typical route are still sizable, with fares declining until about four carriers are serving the route. This result is the strongest for discount fares. Fares on routes with four to five carriers are about $20 less than fares on routes with only one carrier, other things being equal. This is about a third of the average one-way discount fare.

■ 5 It is reasonable to consider whether both the number of caniers and the number of passengers on a route should be treated as endogenous variables in equation (1). Hausman specification tests were performed and indicate that in setting the fare on a given route, these variables can be treated as exogenous variables.

■ 6 We only report results that controlled for Continental and Eastern Airlines, because only these two caniers appeared to behave differently from the other caniers in setting fares.

Since deregulation, the airlines' clear goal has been to maximize their profits. Thus, they charge the highest fare possible on all their routes, with competition among existing carriers and the ease of entry of new carriers limiting how high those fares can be on a particular route. It is important that policymakers look at both the actual number of competitors and the ease of entry for a particular route. Since the number of carriers serving the typical route has risen since 1983—even if one allows for the recent merger wave—this suggests that the market for air fares remains fairly competitive, but that public policies to ease the entry of more carriers per route could lead to increased benefits for consumers.

In short, these findings suggest that the traditional concepts of market concentration, such as the number of competitors, are still relevant in assessing the amount of competition on a given route, even in the deregulated environment. Consequently, the antitrust laws that are applied to other industries are pertinent to the airline industry.

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