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The Dynamics of Airline Pricing and Competition

By STEVEN A. MORRISON AND CLIFFORD WINSTON*

Like the prices of many goods and services, air fares exhibit cyclical fluctuations. Unlike other price fluctuations, air fare cycles spark debate about industry policy. The rise in fares during the most recent cycle prompted a congressional investigation of competition at hub airports, provoked the Secretary of Transportation to stress that proposed airline mergers would be evaluated much more carefully, and encouraged Congress and the Secretary to indicate their opposition to leveraged buyouts that might lead to bankruptcy. These official reactions have been accompanied by popular concern with airline deregulation and an interest in some form of reregulation.

According to our investigation, during the past decade of deregulation fares were consistently lower than they would have been if the industry were still regulated. To address concerns about recent fare increases, we examined whether market forces are operating as freely as possible in fare determination. Among our findings are that fares fall with increased competition, but this effect is limited at slot-controlled airports, and that an airline's entry and exit behavior is significantly influenced by its own (but not its competitors') networks. We discuss the implications of these findings for public policy at the conclusion of the paper.

I. Fares under Deregulation

The trend in U.S. domestic air fares since deregulation in 1978 is shown in Figure 1. Yields (revenue per passenger mile) were calculated from the Department of Transportation *Ticket Dollar Value Origin and Destination Survey* (Data Bank 1A). Despite significant fluctuations, the nominal yield at the beginning of 1987 was lower than the nominal yield during 1980. Fares climbed substantially during 1987 and 1988; the increase in 1988 alone was 20 percent. But during 1989 fares turned down.

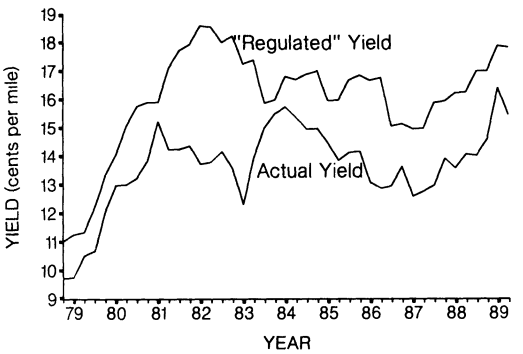

FIGURE 1. ACTUAL VS. "REGULATED" YIELD

Skeptics of deregulation see rising fares as evidence that deregulated competition has failed to replace the discipline that the Civil Aeronautics Board (CAB) once placed on carriers. We used the Standard Industry Fare Level (SIFL), used during regulation by the CAB to set fares (and still calculated by the Department of Transportation for other purposes), to predict what fares would have been if they were still regulated. It was necessary to recalculate the SIFL using only those airlines that were included in its calculation under regulation, and to adjust the costs that enter the SIFL so that they did not reflect changes in productivity growth and in factor prices that are attributable to deregulation.[1]

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[1]Details underlying this calculation are available from the authors.

Yields during the past decade if airlines had been regulated are also shown in Figure 1.[2] Although the gap has narrowed in the last few years, regulated yields always exceed actual yields. On average, deregulated fares are lower than regulated fares by 18 percent, amounting to an average annual saving to travelers of roughly $6 billion (1988 dollars). Of course, yields disguise considerable variance in deregulated fares; for some travelers and on some routes fares are significantly greater than regulated fares would have been. For example, because fares on long-distance routes were deliberately set very high under regulation (and short routes had low fares) deregulation reduced fares for trips that exceeded 900 miles (one-way) and increased them for trips less than 900 miles.

TABLE 1—FARE REGRESSION

Variable	Coefficient	Standard Error
Distance (miles)	.501	.003
Number of effective competitors on routes without slot airports		
1978–81	−.037	.010
1982–88	−.119	.006
Number of effective competitors on routes with slot airports		
1978–81	.006	.013
1982–88	−.035	.008
Minimum number of effective competitors at a route's endpoints		
1978–81	−.015	.009
1982–88	−.201	.005
Potential carriers		
1978–81	$-.55E-02$	$.06E-02$
1982–88	$-.14E-02$	$.04E-02$
$n=18,573$; $R^2=.99$		

Note: All variables are natural logarithms.

II. Competition and Fares

Critics of deregulation claim that fares have increased, especially during the past few years, because competition has eroded. Although the number of effective competitors at the national level has fallen from 8.7 in 1978 to 7.7 in 1988 (with a peak of 11.2 in 1985), the number of effective competitors at the route level, where competition actually takes place, has risen from 1.52 to 1.90 during this period (with a peak of 1.96 in 1986).[3] Furthermore, the percentage of travelers flying on carriers with 90 percent or greater market share has fallen from 28 percent in 1978 to 17 percent in 1988; the percentage of travelers flying on carriers with 20 percent or less market share has risen from 7 to 17 percent during the same period.

Like fares, the number of effective competitors has changed during the decade. To what extent does competition affect fares, and should public policy simply focus on increasing the number of competitors in a market? Or are there other factors underlying the relation between fares and competition?

Several writers have addressed these questions by estimating cross-section regressions of fares as a function of potential and actual competitors, route characteristics, and airport characteristics. We employed this specification to investigate whether the relation between fares and competition has remained stable over time using a pooled cross-section time-series sample of route activity from 1978:4 to 1988:4.[4] We included separate constants for each year, but to save space, we did not include them in the results presented in Table 1.

Based on regressions not shown here, the impact of the number of effective airlines in a market on fares has remained stable following the transition to full deregulation of

[2]The initial gap between "regulated" yield and actual yield reflects deregulation induced productivity changes and fare cuts that took effect before statutory deregulation in October 1978. Comparison of regulated yield and *fully* deregulated yield should be made beginning in 1983.

[3]Effective competitors refers to the number of "equivalent equal size competitors" calculated by inverting the appropriate Herfindahl index.

[4]It has been argued on theoretical and empirical grounds that competition can be treated as exogenous in this specification, but there is some resistance to this assumption. Our entry model below suggests that to the extent competition is influenced by fares, the appropriate variable is the *relative* fare and not the actual fare in the market. Data for this regression are from Data Bank 1A.

entry in 1982 and was not lower on routes involving a carrier's hub. For routes that do not have a slot-controlled airport, the long-run elasticity in Table 1 is −.12, which is consistent with previous cross-section evidence. For routes involving a slot-controlled airport, the long-run elasticity falls to −.04. An explanation for this finding is that fares on slot-controlled routes reflect the opportunity cost of the slot (that depends on total airport demand) and not just on competition on any single route. We also found as an airport (endpoint) became more concentrated, fares rose. This effect has grown during deregulation, possibly because of frequent flier programs, while the impact of potential competition in reducing fares has fallen.

III. Entry and Exit

We have corroborated that an increase in airline competition does indeed lower fares. How does competition arise? This question has become especially important because during 1987:1–1989:1, industry fares increased by 30 percent while factor prices increased by 13 percent, prompting concern about the existence of entry barriers and the adequacy of competition, particularly on routes with airports dominated by one carrier.

We analyzed the determinants of a carrier's decision to provide direct service, identifying the importance both of its own, and of other carriers', activity at the airports in the market. Using the Service Segment data base, we constructed a sample of quarterly entry decisions for 1979:1–1988:4 by 13 airlines formerly classified as trunk and local service carriers. For a given quarter, carriers were given the opportunity to enter any sampled market receiving airline service that they did not serve in the previous quarter. The influence of a carrier's network on its entry decision was captured by the carrier's maximum share of total enplanements at the origin and destination airports during the previous quarter (*OWNNET*). The influence of its competitors' networks on its entry decisions was captured by the maximum share of any other carrier's total enplanements at the origin and destination airports (*COMPNET*). The specification also accounts for the influence of fares on entry, as defined by the yield on the route in the previous quarter divided by the yield for routes of the same distance in the previous quarter *RELFARE*).[5] The effect of potential traffic volume on entry is accounted for by the product of the origin and destination populations (*POP*). Finally, we included the number of slot-constrained airports (*SLOTS*) on the route. Data for the explanatory variables were from the *Origin-Destination* Data Bank 1A.

The expected signs of all the variables except *RELFARE* are straightforward: *OWNNET* and *POP* should have a positive effect on the likelihood of entry; *COMPNET* and *SLOTS* should have a negative effect on the likelihood of entry. A natural expectation of the effect of *RELFARE* is that it will be positive—relatively higher fares attract entry. However, if fares are set to deter entry, *RELFARE* should have a statistically insignificant effect. Alternatively, high fares could signal entry barriers (say, frequent flier programs) or indicate that incumbent carriers will respond aggressively to entry; thus *RELFARE* would have a negative effect on entry. Relatively higher fares could also signal relatively higher costs.

We estimated probit entry models for each of our carriers during partial deregulation (1979:1–1982:4) and full deregulation (1983:1–1988:4). To save space, we present our findings for American Airlines in Table 2 and describe the findings for other carriers in conjunction with these results. American's activity at origin and destination airports (*OWNNET*) had a significant impact on its entry decisions. Indeed, this effect was statistically significant for all carriers. In some cases its magnitude grew during the transition to full deregulation, and in others, like American's, it fell. Other carriers' activity at origin and destination airports

[5] *RELFARE* is set by *all* carriers in a market before each carrier (not serving the market) makes its entry decision. *RELFARE* is thus unlikely to be caused by an entry decision.

TABLE 2—PROBIT ENTRY MODEL PARAMETER ESTIMATES: AMERICAN AIRLINES

	1979–82	1983–88
Constant	−1.18	−1.30
	(.136)	(.104)
OWNNET	1.90	1.05
	(.252)	(.221)
COMPNET	−1.77	.011
	(.207)	(.141)
RELFARE	−.032	−.252
	(.113)	(.083)
POP	.242*E*−07	.335*E*−07
	(.380*E*−08)	(.364*E*−08)
SLOTS	−.116	−.367
	(.073)	(.075)
No. of observations	7217	5366
Log likelihood at zero	−5002	−3703
Log likelihood at convergence	−1246	−1607

Note: Standard errors are shown in parentheses.

(*COMPNET*) discouraged entry by American during partial deregulation, but by full deregulation American's entry decisions were unaffected by this activity. This finding persisted for the vast majority of carriers. It appears that carriers' networks have become sufficiently developed that entry decisions are dictated by their own strength in particular markets without consideration of the activity of other carriers.

During full deregulation, most carriers' entry decisions, including American's, were negatively affected by *RELFARE*, suggesting that fares signal entry barriers, relatively high costs, or incumbents' response to entry, or all three. For most carriers the magnitude of *RELFARE* increased during the transition from partial to full deregulation, when entry barriers such as frequent flyer programs were firmly established. However, this does not imply that high fare routes are immune from entry. In conjunction with the *OWNNET* finding, a carrier that wishes to enter a high-fare route needs a strong network: a fare 10 percent above average is offset for American Airlines by a 2.4 point larger share of traffic at the origin or destination. Finally, as expected, *POP* and *SLOTS* have a positive and negative effect, respectively, on entry.

As an extension and a check of the internal consistency of our findings, we estimated a probit model of exit behavior. The signs for *OWNNET* and *COMPNET* were reversed, as expected, and *COMPNET*'s influence generally declined under full deregulation. *OWNNET*'s effect was always statistically significant and far greater than its effect on entry. Its elasticity for entry was usually close to .1, but its elasticity for exit was typically around −.5 and as high as −1.0. This suggests that one of the most important effects of a well-developed airline network is that it preserves competition on routes that are served. *RELFARE* had a positive effect on exit, perhaps indicating that carriers that leave markets with relatively high fares face promotional disadvantages or anticipate aggressive behavior by the other carriers.

IV. Policy Implications

One immediate policy implication of our analysis is that although CAB-style fare regulation could eliminate the spread in fares for similar trips, it would not lower the level of fares. Even though yields did rise dramatically during 1987–88, fares would have been greater had they been regulated as before. Although in principle a more "enlightened" form of fare regulation could reduce the spread of fares without increasing their level, it is difficult to believe such benign regulation could occur in practice.

Public policy should focus on enhancing the effect of competition on fares and on increasing the number of competitors in markets. Because slots limit the effect of competition on fares and the number of competitors, they should be eliminated and replaced by congestion-based takeoff and landing fees. Congestion pricing would reduce travel delays efficiently (see our 1989 paper), and could enhance competition.

We found that fares are higher on routes with greater carrier concentration at airports. This problem is believed to be most serious when one of the airports is a carrier's hub. A common explanation is that hubs pose entry barriers and therefore limit competition. We have found that hubs do not

limit the *effect* of competition on fares, and that they no longer explicitly affect carriers' entry decisions. But because airlines initially developed their networks from their historical "hubs," they have been slow, especially during partial deregulation, to expand into routes that are connected to competitors' hubs. But as carriers continue to expand their networks, they should come into direct competition more often on routes where one of the airports is a competitor's hub. Further, because they will be entering these routes from a position of strength, they will be less likely to exit them.

To be sure, hubs may exacerbate barriers to entry created by frequent flyer programs, an effect that may have been captured in our analysis by the negative effect of fares on entry. But an appropriate (although difficult) policy response, which could benefit air travelers (see our 1989 paper), is to tax or eliminate frequent flyer programs.

Because hubs have a beneficial effect on a carrier's entry and exit behavior, and because they enable carriers to provide better service (see our 1986 study), it would be inadvisable to deter the formation of new hubs or dismantle existing ones. The higher fares associated with hubs should erode as carriers expand their networks. And if future entry by foreign airlines (cabotage) is to help lower fares, these carriers must be allowed to form hubs from which to enter domestic routes. Ironically, abolishing hubs in the hope of promoting competition may achieve the opposite effect.

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