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This paper is a study of the pricing behavior of airline monopolists toward potential entrant carriers from different strategic groups. The results suggest that formerly regulated carriers price lower when faced by potential entrants from the newly certified carrier group than they do when they face only potential entrants from their own group. These results are consistent with the heretofore-untested hypothesis from Caves and Porter (1977) and Porter (1979) that rivalry is greater across groups than within groups.

INTRODUCTION

The concept of strategic groups has been given considerable attention in the strategic management literature. For the most part, however, the work has consisted of using cluster analysis techniques to identify intra-industry groupings. (See McGee and Thomas, 1986, and Thomas and Venkatramen, 1988, for critical reviews of this literature.)

In the field of economics, theoretical work in this area has not advanced much beyond Porter's (1976, 1979) and Caves and Porter's (1977) seminal papers. Empirical work has been limited as well. Newman (1978), Porter (1979), Oster (1982) and Tassey (1983) are the only such papers of which the author is aware.

Recently, however, it has been suggested that this intermediate level of structural analysis may have great relevance for both industrial organization and strategic management. For example, it may prove to be a useful level at which to study the persistence of profits or competitive interactions among firms, It lends itself readily to the use of sophisticated statistical techniques, unlike the study of individual firms. Yet analysis at this level avoids the problem of obscuring too much detail which may occur at the industry level. Saloner (1991) flags this as a potentially fruitful area of research and calls for a further refining of the theory of strategic groups. McGee and Thomas (1986) express the need for empirical work that tests the theory and deepens our understanding of its implications. Cool and Schendel (1987) echo this sentiment in their appeal for empirical analysis of the competitive effects of strategic groups.

This study is an attempt to begin to fill some of the gaps in our knowledge of strategic groups. It is an investigation of strategic groups in the airline industry and their effect on pricing behavior and rivalry. It represents the first economic study of the effects of strategic groups within a single industry. We have chosen the airlines industry because distinct strategic groups can be readily identified that are robust to re-examination (see Bailey and Williams, 1988). In addition, the industry is composed of many markets and is highly rivalrous in nature. The aim of the study is to examine some of Caves and Porter's (1977) and Porter's (1979) heretofore-untested hypotheses regarding strategic groups and market conduct. In particular, the question is addressed as to whether firms exhibit more rivalrous behavior toward members of other groups than toward members of their own group. The results offer limited support to suggest that this is so, in that prices are more often used by monopolists as a competitive weapon against potential entrants from other strategic groups than against potential entrants from its own group.

The paper is structured as follows. In the next section Porter's (1976, 1979) and Caves and Porter's (1977) hypotheses regarding the relationship between strategic groups and interfirm rivalry is discussed along with alternative hypotheses. The research design is described in the third section, including the industry setting, the strategic groups,

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the data and methodology. Results and conclusions are presented in the final section.

INTERFIRM RIVALRY WITHIN AND ACROSS GROUPS

Fundamental similarities and differences in the endowments of firms, in terms of their tangible and intangible assets, may give rise to perceptible patterns of strategic symmetry and asymmetry within an industry (Porter 1979). Groupings of firms, based on such endowments or on mobility barriers (Caves and Porter, 1977), may provide a useful analytical tool for understanding the competitive forces and nature of oligopolistic interaction within an industry. Porter (1976, 1979) and Caves and Porter (1977) recognized that there may be important implications of such symmetries and asymmetries for the competitive response pattern among firms. Expanding upon Hunt's (1972) model of strategic groups and rivalry, they hypothesized that rivalry is greater between members of different groups than between members of the same group. The argument is that structural similarity among firms predisposes them to respond in similar ways to disturbances from inside or outside the group. This in turn enables them to recognize their mutual dependence and to predict each others' reactions more accurately (Caves and Porter, 1977; Porter, 1979). Further, members of the same group are more likely to have common suppliers, distributors, and customers than are members of different groups (Porter, 1976, 1979). Repeated contact through these intermediaries increases the flow of information upon which oligopolistic co-ordination depends (Stigler, 1964). High cross-elasticities sensitize firms to each others' actions and reinforce their perception of mutual dependence (Caves, 1984). Altogether, these factors enable firms within a group to achieve tacit co-ordination more easily and to detect cheating quickly.

In contrast, firms in different groups, with dissimilar assets bases, have more heterogeneous cost structures and preferences regarding pricing strategies, service levels, and the like. They will be less able to predict each others' responses and less able to reconcile their divergent goals. Implicit collusion will be much more difficult to achieve and even harder to sustain under these conditions.

Porter (1976, 1979) discusses other factors that affect the extent of interfirm rivalry. The difficulties of oligopolistic co-ordination multiply as the dimensions and the degree of strategic differences between firms increase. Other things being equal, then, rivalry should increase with the 'strategic distance' between firms (Porter, 1976, 1979). An important factor that may counterbalance this effect is the level of 'market interdependence' between firms. This refers to the degree to which firms are competing for customers in the same market segments (Porter, 1976, 1979). *Ceteris paribus*, rivalry is greatest when market interdependence is high.

While these propositions may be plausible, they are open to question. For example, the very concept of mobility barriers suggests that firms within a group are insulated from rivalrous behavior on the part of firms outside the group. Why, then, isn't rivalry relatively more intense within groups than across groups? Porter's (1976, 1979) and Caves and Porter's (1979) argument that rivalry is reduced within groups is suggestive of implicit collusion. Yet the difficulties of such oligopolistic co-ordination are well known. Without such co-ordination, rivalry might be greater among firms that are most similar along key strategic dimensions.[1]

Zajac and Jones (1989) argue that groups may serve to enhance interfirm co-operation across groups as well as within them. They contend that the existence of groups facilitates the information exchange so crucial to oligopolistic co-ordination. Rivalry may be reduced between members of different groups because their distinct differences enable them to signal clearly whether or not they are staying within the bounds of their strategy. In contrast to Porter (1976, 1979), Zajac and Jones (1989) predict that rivalry should decrease as strategic distance increases.

At this juncture there is a need for empirical research to help resolve this controversy and provide guidance for further theoretical work. Some work has been done on the topic of how groups affect the level of rivalry in the industry as a whole. See Newman (1978), for example, whose results suggest that heterogeneity at the industry level (measured by how concentrated are the strategic groups) increases rivalry. But virtually no work, to the author's knowledge, has been done to explain how groups might affect the patterns of rivalry within the industry. Recent work by Fiegenbaum and Thomas (1988), depicting strategic groups as 'reference groups', a term borrowed from social psychology, is related to this topic. Their findings indicate that group members use the group as a

normative and comparative benchmark and adjust their own strategic behavior accordingly. This suggests that groups implicitly serve a co-ordinating function which should reduce rivalry within the group.

This paper seeks to test the hypothesis that, other things being equal, rivalry is greater between members of different strategic groups than between members of the same strategic groups. Tests of the hypotheses regarding the effects of differences in strategic distance and market interdependence on interfirm rivalry are reserved for future work.

RESEARCH DESIGN

Industry Setting

The airlines industry was chosen as a setting for this study for a variety of reasons. First, it is noted for a high degree of rivalry, despite the dominance of even large markets by only a handful of firms.[2] Second, most firms are primarily single-business or dominant-business firms. This reduces the dimensions of strategy that must be considered and ensures that the arena for rivalry is relatively confined. Third, while groups may be identified at the industry level, there are numerous geographic markets in which to test their conduct. This, in essence, holds many variables constant that might obscure results in a cross-industry setting. Finally, the deregulation of this industry over the period 1978 to 1983 served to bring into being a new breed of carriers, distinct from their predecessors.[3] As argued below, this allows us to identify, on *a priori* theoretical grounds, two broad classes of firms, sufficiently different in their scope, resource base and strategic profile as to constitute separate strategic groups (see Thomas and Venkatraman, 1988).

Strategic Groups in the Deregulated Airlines Industry

The identification of strategic groups within an industry is always a problematic and somewhat arbitrary exercise. Groupings made on the basis of a single variable, such as size or R&D intensity, tend not to be robust to re-evaluation using other variables. Cool and Schendel (1987) have argued that, within a single industry, only a multidimensional approach to identifying strategic groups can be meaningful. They advocate distinguishing groups of firms on the basis of differences in scope and resource commitments.[4]

In the airlines industry there are two groups of firms that differ greatly over these dimensions. They are the formerly regulated carriers and the set of new-entrant carriers. Barney (1991) discusses the way in which unique historical conditions make resources imperfectly imitable. In the airline industry, scope and resource commitments were made by carriers during the regulatory period that cannot be replicated by newly certified carriers. The path-dependent nature of these resources and their 'stickiness' make rapid adjustments by the formerly regulated carriers to new environmental conditions and/or imitation by new entrant firms difficult (see Barney, 1991; Dosi *et al.*, 1990).

Prior to the Airline Deregulation Act of 1978, the ability of carriers to compete freely was severely circumscribed. The Civil Aeronautics Board (CAB) had complete authority over route structures as well as fare levels. As a result, competition was limited to non-price forms.[5] Even the least successful firms had little to fear from market discipline. The CAB made efforts to aid them by awarding them the most lucrative routes and arranging mergers for failing carriers. Bankruptcy was unknown. The CAB also controlled *de novo* entry into the industry. This they did with vigor. Despite scores of applications, *de novo* entry was a rare event.[6]

Managers operating in this environment developed a unique skill set more attuned to the political arena than that of managers in a free-market setting. Pralahad and Bettis (1986) describe how managers may acquire a common logic, underlying their management style, through years of joint experience. This 'dominant logic' shared by the management of formerly regulated carriers, is one of the chief factors that binds this group of firms together and sets it apart from the group of new-entrant firms.

First-mover advantages, in terms of locational endowments (particularly at slot-constrained or gate-constrained airports), also serve to distinguish the formerly regulated carriers from the new entrant group. Airport access is difficult for new-entrant carriers at congested airports that have insufficient facilities to accommodate newcomers. In the early years following deregulation, entry was made even more difficult at congested airports by restrictions

on the sale of slots. In addition, formerly regulated carriers entered the new era with a given fleet mix. This meant that, over the medium term, formerly regulated carriers and new entrants were differentially affected by factors such as long production lags for aircraft in high demand and the glut of some aircraft due to changing route structures.

Another factor differentiating these two classes of firms may be the name recognition and other goodwill assets built up over the years by the formerly regulated carriers.[8] The adoption of frequent flyer programs, which aid carriers with well-developed route networks more than new carriers, enhanced these assets.[9] Formerly regulated carriers also have better reputations for safety and reliability, particularly since new carriers tend to fly older aircraft, hire less experienced labor, and have higher bankruptcy rates.

Differences in factor costs are an additional distinguishing feature. Formerly regulated carriers entered the new era with high labor costs, due, for the most part, to strong unions. In contrast, new-entrant carriers have non-union labor. This gives them the advantage of more flexible work rules and a significantly lower wage bill.

In sum, the group of formerly regulated carriers can be distinguished from the group of new-entrant carriers on a number of dimensions. Many of these differences are the result of endowments or resource commitments from the regulated era with which the formerly regulated carriers entered into the new regime. They include a common managerial logic, first-mover advantages at thin-monopoly or congested space-constrained airports, a given fleet mix, goodwill assets, developed route networks, and higher factor costs.

While a finer classification might be used to separate the formerly regulated carriers into national carriers and regional carriers (see, for example, Bailey and Williams, 1988), there are much greater differences across a broad range of dimensions between the formerly regulated carriers and the set of new entrants than there are between any subgroups.[10] For this reason, we argue that the classification given here is not unreasonable, given that data limitations make any finer breakdown problematic for this study.[11] Furthermore, too broad a classification of the groups should bias the results against finding support for the Porter–Caves hypothesis. To the extent that the results support the hypothesis, they should be interpreted as having even greater strength.

The Hypotheses

From Caves and Porter (1977) and Porter (1976, 1979) we have the hypothesis that there is greater rivalry across groups than within groups. That is, a firm should exhibit greater rivalry toward a member of some other group than toward a member of its own group. While rivalry can be of a non-price nature, it is often expressed in pricing behavior. Lower prices are indicative of greater rivalry and more competitive behavior.

Rivalry is usually thought of in the context of a market, but it can occur at the boundary of markets as well. For example, monopolist firms may lower their prices if they feel threatened by a potential competitor. A less rivalrous response to potential entry would be to set high prices or to 'umbrella' price (see Gaskins, 1971). Although models of limit pricing have received a great deal of criticism, there has been considerable empirical support for them (Gilbert, 1988).[12]

As a partial test of the hypothesis that firms exhibit greater rivalry toward non-group members than toward same-group firms, the following is proposed.

We will examine the pricing response of monopolist airline firms toward different groups of potential entrants. If monopolist firms lower their prices more in the presence of potential entrants from outside their group than they do when faced by potential entrants from only their own group, then this result would be consistent with the Caves–Porter hypothesis. That is, we could not reject it. It would also be consistent with dynamic limit-pricing models. If there is no difference in the pricing response, then either the hypothesis should be rejected in this industry context *or* firms do not limit price in this industry. Given the weight of evidence for limit-pricing behavior (Gilbert, 1988), the latter is unlikely.[13] Therefore, absent a differential response, we should reject the hypothesis.

Data and Methodology

The sample of airline markets consists of all routes at least 300 miles long served by a single carrier during the first quarter of 1984. The data come from the Civil Aeronautics Board's Origin and Destination (O&D) Survey, which is a 10% survey of the tickets of all boarding passengers of non-commuter carriers. Markets shorter than 300 miles were eliminated from the sample because they are the domain

of commuter carriers. Ten additional markets were eliminated because they were being served by failing carriers that exited the industry in 1984. The final sample consists of 345 markets.

A multiple regression model was constructed to estimate the change in a monopolist's fare in response to different sets of potential entrants. Because costs, service quality, and other factors have an independent effect on fares, these must be controlled for.

Cost data at the city-pair level, however, are unavailable. The nearest proxy is a CAB fare formula known as the Standard Industry Fare Level, or SIFL.[14] This is a measure, constructed from industry average costs (including a 12% normal return), of what the fare would be under a regulated regime. It varies by length of haul, which is the variable that accounts for most differences in costs among markets. It does not vary by number of passengers or other factors that should influence market costs and therefore price.

To compensate for these problems, we regress the cost-adjusted fare (a ratio of fare to SIFL) on other control variables and a set of variables meant to capture the effects of group affiliation on interfirm rivalry. The general form of the regression model, then, is the following:

$$\text{Fare ratio} = f(\text{Control Variables; Group Affiliation}).$$

The Dependent Variable

Fare ratio: *FARE* — This is a ratio of the monopolist's average non-first-class fare to the SIFL.

The Control Variables

A number of factors that are inadequately controlled for in the SIFL may affect fares. Costs and service quality are affected by route distance, number of passengers, and the business/pleasure mix of passengers, through differences in demand for flight frequency, amenities, and load factor (the percentage of seats filled). Fares may be higher at slot-controlled airports due to scarcity rents. They may be lower if the monopolist's factor costs are lower than average. The variables that follow have analogues in much of the economics literature on airlines, beginning with Douglas and Miller's (1974) classic study. A similar set of control variables is utilized by Graham *et al.* (1983) and Bailey *et al.* (1985). Both studies provide a comprehensive discussion of the relevance and derivation of these controls.

Distance: *DIST* — The non-stop distance between each city pair. Although the SIFL partially controls for distance-related cost differences, it overstates costs for long-distance markets. The sign of this variable should be negative.

Passengers: *PAX* — The total number of passengers traveling from one city-pair endpoint to the other. Since costs per passenger and service quality (through increased load factor) decrease as the number of passengers increases, the sign on *PAX* should be negative. This variable is endogenous and is instrumented for by *POP* (average population of the two endpoints) in a 2SLSQ regression.

Average income: *INC* — The mean of the 1984 per capita disposable income for the two end-point cities in a market. These data come from the *1985 Survey of Buying Power*. This variable proxies for the business/pleasure mix, since hourly wage (income) affects a passenger's value of time. Higher values of time affect both service quality and costs, in equilibrium, through demand for convenient scheduling. This variable's sign should be positive. (Demand for scheduling convenience increases both costs and service quality.)

Tourist market: *TOUR* — A dummy variable, equal to one for markets known to attract much tourist traffic (Hawaii; Florida; Reno and Las Vegas, Nevada), and zero otherwise. It is another proxy for the business/pleasure mix and should have a negative sign since costs and service quality are lower on routes frequented by tourists.

New York City: *NYC* — A dummy variable for service to New York City, where slot restrictions have been in effect since 1969. Its sign should be positive, indicative of scarcity rents or opportunity costs.

Chicago: *CHI* — A dummy service to Chicago, also slot-restricted since 1969. Its sign should be positive.

Washington, DC: *WAS* — A dummy for service to Washington, DC, slot-restricted since 1969. Its sign should be positive.

Average cost: *AVCOST* — The monopolist's cost per scheduled available seat-mile for first quarter, 1984. These data come from the Oppenheimer and Co., Inc. *Industry Review*, 5 June, 1984. The SIFL estimates of industry average costs are based only on the costs of the higher cost carriers and so they are biased upwards. This variable corrects for that bias. Its sign should be positive.

The Group Affiliation Variables

Entry onto a route is easiest and least costly for carriers already serving other routes from at least one of the end points (Bailey and Baumol, 1984). Such carriers have already absorbed the costs of acquiring gates and setting up reservations, ticketing, baggage handling, and maintenance facilities. They have also created some awareness among potential customers that they offer service from the end point. Moreover, they have established relations with the local travel agents. For the purpose of this study, then, a potential entrant is defined to be a carrier offering service from at least one end point of the route, but not yet serving the route.[15]

As explained earlier, firms are classified into two groups: the formerly regulated carriers (designated *OLD*) and the new-entrant carriers (designated *NEW*). Former intrastate carriers, which were never subject to federal regulation, are included in the *NEW* category. The group of formerly regulated carriers (*OLD*) includes United, American, Delta, Eastern, Trans-World, Western, Pan American, Continental, Northwest, Republic, US Air, Frontier, Ozark, Piedmont, and Alaska. Since little rivalry is expected between firms when there are marked differences in size (Porter, 1979), only the largest of the new entrants have been included in the group *NEW*.[16] These include Pacific Southwest, People Express, and Southwest.

Incumbent firms on monopoly routes typically face many potential entrants, as defined above. In this model, the level of rivalry within a group is measured by the pricing response of a monopolist to a set of homogeneous potential entrants, whose group affiliation matches its own. The level of rivalry across groups is measured by the pricing response of a monopolist to a set of potential entrants which includes at least one carrier whose group affiliation does not match that of the monopolist.

The group affiliation variables are a vector of dummy variables defined as follows:

OLD-FACING-OLD: A dummy variable equal to one whenever a formerly regulated carrier (*OLD*) faces only *OLD* potential entrants.

OLD-FACING-NEW: A dummy variable equal to one whenever an *OLD* incumbent faces at least one *NEW* potential entrant.

NEW-FACING-NEW: A dummy variable equal to one whenever a new-entrant (*NEW*) monopolist faces only *NEW* potential entrants. There are no such observations in this data set.

NEW-FACING-OLD: A dummy variable equal to one whenever a *NEW* monopolist faces at least one *OLD* potential entrant. This variable has been excluded from the regression to avoid the dummy variable trap.

For the Caves-Porter hypothesis not to be rejected we must find that the coefficient of *OLD-FACING-OLD* is significantly greater than that of *OLD-FACING-NEW*. That is, we must find that monopolists price lower (more aggressively) when facing potential entrants from outside their own group than they do otherwise.

The Estimating Equation

We estimate the following equation in log-log form. The log-log specification allows us to interpret the estimated coefficients as elasticities, or the percentage change in the dependent variable for a 1% change in the independent variable.

$$\begin{aligned} FARE = {} & \beta_0 + \beta_1\, DIST + \beta_2 PAX + \beta_3 INC \\ & + \beta_4 TOUR + \beta_5 NYC + \beta_6 CHI \\ & + \beta_7 WAS + \beta_8 AVCOST \\ & + \beta_9 OLD\text{-}FACING\text{-}OLD \\ & + \beta_{10} OLD\text{-}FACING\text{-}NEW + \mu \end{aligned}$$

Because of the endogeneity of *PAX*, a 2SLSQ regression is estimated, using *POP* as the instrument for *PAX*. The equation explaining *PAX* is as follows:

$PAX_{ij} = F(FARE, DIST, INC, TOUR, POP)$. This is essentially a gravity model of demand, as is commonly used in transportation studies (see Bailey *et al.*, (1985).

RESULTS AND CONCLUSIONS

Descriptive statistics are reported in Table 1. Average fares in this sample exceed the cost-based fare by over 15%. A formerly regulated monopolist (*OLD*) faces only *OLD* potential entrants in 27% of the observations. An *OLD* monopolist faces at least one *NEW* potential entrant in 22% of the observations.

Table 1. Descriptive Statistics: 345 Observations

Variable	Mean	Standard deviation
Fare ratio	1.151	0.274
Distance	810.968	552.039
Passengers	331.568	507.677
Average income	11 157.310	885.061
Tourist market	0.241	0.428
New York City	0.049	0.217
Chicago	0.081	0.273
Washington, DC	0.035	0.183
Average cost	8.618	0.873
OLD-Facing-OLD	0.272	0.446
OLD-Facing-NEW	0.223	0.417

OLS results are presented in Table 2 and 2SLSQ results are reported in Table 3. The results in both regression forms are quite similar. From Table 3 we observe that the adjusted R^2 is 0.45. This indicates that the sample regression fits the observed data reasonably well. Furthermore, the set of variables taken as a whole is significant at the 0.01% level (F-test), indicating that the equation does have some explanatory power.

The control variables also perform very well. All coefficients have the expected sign, with the exception of two of the dummy variables indicating slot-constrained airports (New York City and Washington, DC). Neither is statistically significant. All other control variables are significant at the 10% level or better.

The coefficients on the group affiliation variables are of greater interest. Because of the complex structure of the dummy vector, they must be interpreted with care. *OLD-FACING-OLD* has a positive coefficient of 0.079, significant at the 2% level. This indicates that, on average, formerly regulated (*OLD*) monopolists, facing only *OLD* potential entrants, charge fares approximately 8% higher than *NEW* monopolists facing at least one *OLD* potential entrant (the omitted category, which serves as a base for comparison.) When *OLD* incumbents face at least one *NEW* potential entrant (*OLD-FACING-NEW*) their fares drop significantly. In this case, fares are nearly 9% lower than when *NEW* monopolists face at least one *OLD* potential entrant (the

Table 2. OLS Regression Model:[a] 345 Observations

Dependent variable: Fare ratio
$R^2 = 0.47$ Adj. $R^2 = 0.46$

Independent variable	Coeffecient	Standard error
Intercept	−3.3314	1.533[c]
Distance	−0.216	0.026[b]
Passengers	−0.085	0.017[b]
Average income	0.583	0.0160[b]
Tourist market	−0.060	0.026[c]
New York City	−0.056	0.140
Chicago	0.091	0.032[b]
Washington, DC	−0.044	0.078
Average cost	−0.097	0.048[c]
OLD-Facing-OLD	0.090	0.026[b]
OLD-Facing-NEW	−0.075	0.030[c]

[a] The F-test is significant at the 0.0001 level.
[b] $p < 0.01$; [c] $p < 0.05$; [d] $p < 0.10$. Standard errors are calculated from White's (1980) consistent covariance matrix to correct for heteroskedasticity.

Table 3. 2SLSQ Regression Model: [a] 345 Observations

Dependent variable: Fare ratio
$R^2 = 0.45$ Adj. $R^2 = 0.43$

Independent variable	Coefficient	Standard error
Intercept	−3.219	1.419[c]
Distance	−0.237	0.045[b]
Passengers	−0.129	0.075[d]
Average income	0.631	0.179[b]
Tourist market	−0.061	0.034[d]
New York City	−0.082	0.058
Chicago	0.097	0.044[c]
Washington, DC	−0.049	0.064
Average cost	−0.135	0.068[c]
OLD-Facing-OLD	0.079	0.033[c]
OLD-Facing-NEW	−0.089	0.036[c]

[a] The F-test is significant at the 0.0001 level.
[b] $p < 0.01$; [c] $p < 0.05$; [d] $p < 0.10$.

base)[17]. The order of the coefficients is

$$OLD\text{-}FACING\text{-}OLD > NEW\ FACING\text{-}OLD > OLD\text{-}FACING\text{-}NEW$$

It is the two variables *OLD-FACING-OLD* and *OLD-FACING-NEW* that we most wish to compare. By adding their coefficients, we find that an *OLD* monopolist charges fares approximately 17% higher when facing only *OLD* potential entrants than when there is at least one potential entrant from the other group (*NEW*).

A test of the significance of difference between the coefficients of *OLD-FACING-OLD* and *OLD-FACING-NEW* was performed; they were found to be significantly different at the 0.01% level, on the basis of a one-tailed test (see Table 4). An *F*-test of the overall relation of the subset of group affiliation variables to the dependent variable is also significant at the 0.01% level.

These results provide limited support for the hypothesis that price competition, a form of inter-firm rivalry, is reduced among members of the same group and increased among members of different groups. Although the equation controls, in part, for differences in service quality, these results only show that airlines are less inclined to engage in price competition with members of the same group than with members of other groups. There may be vigorous competition in service equality and other non-price dimensions among members of the same group. This would not be too surprising, given that the formerly regulated carriers have a long history of competition restricted to the non-price arena. The magnitude of the difference in pricing response within and across groups suggests that any oligopolistic co-ordination across groups (see Zajac and Jones, 1989) must be relatively small.

The effects of market interdependence were not addressed explicitly in this study. The underlying assumption is that *NEW* carriers as well as *OLD* carriers generally compete for the same customers. If *OLD* carriers target primarily business class passengers while *NEW* carriers target the pleasure class, these groups of firms may be less market interdependent. This would bias the results in the direction of reducing the level of rivalry between the two groups. Such a bias, if it exists, only serves to underscore the strength and significance of these results.

Another interpretation of these results, consistent with that offered here, is that the observed pattern of rivalry reflects differences in the degree of multimarket contact experienced within and across these two groups. *OLD* carriers face other *OLD* carriers in many more geographic markets than they face *NEW* carriers (and have done so longer). Consequently, they have learned to compete less aggressively with other *OLD* carriers for fear of retaliation in other markets. These two interpretations cannot be further disentangled here, but may be the subject of future research.

In sum, this study validates to some extent heretofore untested theory regarding intra-industry rivalry. It provides evidence in support of the proposition that groupings of firms give rise to predictable patterns of rivalry. This, in turn, suggests ways in which the analysis of intra-industry structure may provide fruitful insight into the nature of competition and firm behavior.

Further research is warranted to test the robustness of these conclusions. Tests of the hypothesis using other markets, time frames, industries, and models of rivalry would be enlightening. The question of how strategic distance and market interdependence affect rivalry should also be addressed. Further work may be warranted as to the conditions under which intergroup rivalry rather than intragroup rivalry is dominant. Because the study of patterns of rivalry among competitors has strong implications for strategic management, this topic should be explored further by empirical and theoretical researchers alike.

Table 4. Tests of Statistical Significance of the Group Affiliation Variables

Test		F-value
(1)	Test of significance of difference between the means of OLD-Facing-OLD and OLD-Facing-New.	24.2132[a]
(2)	Test that this subset of variables (OLD-Facing-OLD and OLD-Facing-New) is significant as a whole.	12.202[a]

[a] $p < 0.0001$.

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NOTES

1. As Caves and Porter (1977) point out, however, even in the absence of collusion, group members have incentives to contribute to their joint mobility barriers which will divert them from rivalrous activity.
2. See Levine (1987) for an excellent characterization of the industry.
3. During the period following the Airline Deregulation Act of 1978, the regulatory agency gradually lost authority over routes and fares. Route authority ended on 31 December, 1981. Fare authority ceased on 1 January 1983 (Bailey, *et al.*, 1985).
4. Cool and Schendel (1987, p. 1106) define a strategic group as a set of firms competing within an industry on the basis of similar combinations of scope and resource commitments.
5. See Douglas and Miller (1974). See also Bailey *et al.* (1985) for a well-documented description of the regulatory era.
6. In 40 years of regulation, only one new trunk-class (major) airline was permitted to enter the industry (Meyer and Oster, 1984).
7. Prahalad and Bettis (1986) use this term to describe factors that unify a management team within a single firm. The application of this term to groups of managers from different firms seems apt, however, when they too have a history of shared experience.
8. See Peteraf (1992), for some empirical evidence that suggests that major carriers have goodwill assets independent of their CRS share, frequent flier plans, and other effects associated with airport dominance.
9. American Airlines initiated the frequent flier plan in 1981.
10. While Bailey and Williams (1988) identify the trunks and the regionals as strategic groups, they also identify the new-entrant carriers as a distinct strategic group.
11. It was not possible to construct a complete vector of group affiliation variables using trunks, locals, and new entrants as the groups. For example, there are no observations in which trunks face no local potential entrants, nor are there markets in which local monopolists face no trunks. Some empirical results using this finer classification were obtained, however. In general, they are consistent with the results reported here. Specifically, we find that trunks charge significantly higher prices when facing no potential competitors from the new-entrant group than they do otherwise. This is true of local monopolists as well.
12. Judd and Petersen's (1986) model with financial constraints, as well as the noisy signalling models of Matthews and Mirman (1983) and Harrington (1984), provide rational theoretical underpinnings.
13. Limit pricing behavior has been observed in airline markets. See, for example, Borenstein (1989), Call and Keeler (1985), and Morrison and Winston (1988).
14. See Bailey *et al.* (1985) for a detailed description. See also Call and Keeler (1985) for a similar empirical model.
15. This is the most commonly used definition of potential entrants in airline industry research. See Bailey and Baumol (1984), Morrison and Winston (1987), and Peteraf (1992).
16. If the group *NEW* is expanded to include all new entrants, the results are only slightly weaker. The coefficient signs and significance levels remain the same, with the exception of the coefficient for *OLD-FACING-OLD*, which loses its significance. This should not alter the basic conclusions.
17. This suggests that mobility barriers and resulting patterns of rivalry are not symmetric. See Porter (1979) and Hatten and Hatten (1987). *NEW* monopolists facing *OLD* potential entrants may exhibit less rivalry than when *OLD* monopolist face *NEW* potential entrants because they can less credibly signal aggressive post-entry behavior. For example, *OLD* firms have deep pockets and better access to financing, which makes them better able to sustain a price war.

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