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Mergers and Market Power: Evidence from the Airline Industry

By E. Han Kim and Vijay Singal*

This paper examines price changes associated with airline mergers during 1985–1988, a period of natural experimentation in which mergers were not contested by the government. The results show that prices increased on routes served by the merging firms relative to a control group of routes unaffected by the merger. Mergers may lead to more efficient operations, but on the whole, the impact of efficiency gains on airfares is more than offset by exercise of increased market power. (*JEL* L13, G34, L93)

It is well documented that corporate acquisitions via mergers and tender offers are wealth-increasing events for shareholders. The existing evidence shows that shareholders of acquired firms almost always gain, while the shareholders of acquiring firms do not lose.[1] When the wealth effects of acquired and acquiring firms are combined, evidence shows that the combined firm value in successful tender offers increases significantly, by 7–8 percent (Michael Bradley et al., 1988).

This increase in the stock-market value of the merging firms may represent either value creation or wealth transfers from other stakeholders of the firm. Value creation may arise from economies of scale or scope, increases in managerial efficiency, improvements in production techniques, or other synergistic gains. Wealth transfers from other stakeholders may include losses suffered by bondholders due to an increase in the default risk of outstanding debt, loss of jobs by employees or a reduction in wages, reduction in prices paid to suppliers, decreases in government tax revenue, or higher prices paid by consumers due to the exercise of increased market power.

The existence of these potential wealth transfers remains a contentious issue.[2] One

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[1]The shareholders of acquired firms in mergers and successful tender offers gain, on average, 20 percent and 32 percent, respectively. For the acquiring-firm shareholders, the gains are either small or not significantly different from zero. For a summary of empirical evidence see Michael C. Jensen and Richard S. Ruback (1983), Clifford W. Smith (1986) and Gregg A. Jarrell et al. (1988).

[2]On the issue of wealth transfers from bondholders, see Kim and John J. McConnell (1977), Paul Asquith and Kim (1982), Debra K. Dennis and John J. McConnell (1986), Kenneth Lehn and Annette B. Poulsen (1988), and Asquith and Thierry A. Wizman (1990). For the impact of mergers on employees, see Charles Brown and James L. Medoff (1987), Andrei Shleifer and Lawrence H. Summers (1988), Sanjai Bhagat et al. (1990), and Diane K. Denis (1990). Finally, on the issue of government tax revenue, see Alan J. Auerbach and David Reishus (1988) and Lehn and Poulsen (1988).

school of thought rejects the notion of wealth transfers from other stakeholders and attributes stockholder gains primarily to value creation. For example, Jensen (1988, p. 23) argues that "Takeovers do not waste credit or resources.... [The] value gains represent gains to economic efficiency, not redistribution between various parties.... Takeover gains do not come from creation of monopoly power." This rejection of monopoly power is based on previous studies that examine the impact of mergers on stock prices (B. Espen Eckbo, 1983, 1985; Robert Stillman, 1983; Eckbo and Peggy Wier, 1985).

The purpose of this study is to reexamine the question of whether mergers increase market power and lead to wealth transfers from consumers.[3] We provide a more direct test by using product price data instead of stock price data; specifically, we investigate the extent to which airline mergers have affected airfares. We recognize that any changes in the product prices of merging firms reflect the joint effect of increased efficiency, which may decrease airfares, and the exercise of increased market power, which may increase airfares. The direction of price changes will indicate which of these two effects dominates. Severin Borenstein (1990) has studied the effect on airfares of two airline mergers: the TWA-Ozark and Northwest-Republic mergers. He finds a significant increase in relative airfares on routes affected by the Northwest-Republic merger, but no evidence of fare increases associated with the TWA-Ozark merger.

Our study examines all airline mergers during 1985–1988 and all routes affected by those mergers for which data are available. We study not only fare changes, but also the relation between fare changes and changes in the degree of concentration, as well as the pricing behavior of rival firms operating in the same markets. We stratify the sample according to the financial health of the acquired firm and construct observation periods and subsamples of routes for which we expect different levels of efficiency gains. The results provide insights into how market power and efficiency gains interact in mergers and have important public policy implications.

In brief, we find that airline mergers during the 1985–1988 sample period led to higher fares, creating wealth transfers from consumers. Over the period from merger talks through merger completion, the merging firms increased airfares by an average of 9.44 percent relative to other routes unaffected by the merger. Rival firms responded by raising their prices by an average of 12.17 percent. The price effects of efficiency gains and market power vary across routes. For example, on routes where the merging firms used the same airport as a hub prior to the merger, the effect of efficiency gains is at least as pronounced as the effect of market power. For the total sample, however, efficiency gains are dominated by the exercise of increased market power. We conclude that, at least for airline mergers, wealth gains to the stockholders of merging firms do not arise through value creation alone, and relaxation of antitrust policy may result in nontrivial wealth transfers from consumers.

This paper is organized as follows. Section I reviews studies based on stock-market data and explains why we chose airline mergers to evaluate the role of market power. Section II describes the data and methodology. Section III develops the hypotheses, reports the relative price changes, and examines how the fare changes are related to changes in concentration. Section IV contains the summary and concluding remarks.

I. Background

A. *Previous Research Based on Stock Price Data*

Eckbo (1983, 1985), Stillman (1983), and Eckbo and Wier (1985) test for market power by examining the stock price reactions of rival firms in challenged mergers.

[3] In this paper, the term "mergers" is used synonymously with "successful tender offers."

They recognize that exercise of market power benefits rival firms, whereas efficiency gains have an adverse impact on the rival firms by placing them at a competitive disadvantage in the product market. These authors find that the announcement of mergers increases the market price of rival firms' shares. However, they characterize this increase in stock prices as an information effect; namely, rival firms are now more likely to be takeover targets. Since the announcement of an antitrust challenge reduces the probability of mergers, they reason that if mergers increase market power, an antitrust challenge should have a negative impact on the stock prices of rival firms. The authors find no statistically significant decreases in the stock prices of rival firms and reject the market-power hypothesis.

These studies are subject to several criticisms. First, the tests are weak. Even at the time of merger announcement, when the impact on rival firms should be most pronounced, the abnormal returns to rival firms are small relative to those of the merging firms. For instance, Eckbo (1983) finds that the average abnormal returns to target, bidding, and rival firms at the time of merger announcement are 18.58 percent, 2.68 percent, and 0.91 percent, respectively.[4] Thus, the negative impact that an antitrust challenge can have on rival firms' stock prices is likely to be very small. In addition, the period from the merger announcement to the antitrust challenge, during which the forthcoming antitrust challenge can be anticipated and discounted in stock prices is, on average, ten months.[5] This is too long to allow for a meaningful inference regarding the impact of an antitrust challenge on rival firms' stock prices.

Second, an antitrust challenge, by reducing the probability that the proposed merger will be successful, reduces both the positive effect of market power and the negative effect of efficiency gains. Since we can only observe the net effect through stock prices, the evidence of insignificant stock price reaction can be interpreted as either the absence of *both* market power and efficiency effects or their offsetting presence.[6]

Third, stock-market data aggregate a firm's performance in all of its markets. If a merger affects market power in a small fraction of the markets served by the rival (merging) firms, its influence on the rival (merging) firms' overall profits may be too small to generate a significant impact on the stock prices.

In short, the tests based on stock-market prices are at best indirect and probably weak.[7] A more direct test of market power requires an examination of product price changes. However, such a test will require controlling for a multitude of factors affecting product prices, such as changes in raw-material costs, labor costs, market demand, and general economic conditions. There is also the problem of scarcity of reliable product price and cost data.

B. *The Airline Industry*

The airline industry provides a unique opportunity to test for market power using product prices. In the airline industry, each route can be considered a separate market. The routes not affected by mergers can serve as a control group to capture industry-wide factors such as changes in fuel costs, labor costs, and seasonal variations in demand, as well as economy-wide factors that influence airfares. Thus, airfare changes on routes affected by a merger, computed relative to the control group, can be attributed to the

[4]These gains are measured from ten days before to five days after the announcement.

[5]The time period between announcement of a merger and filing of complaint varies from a few days to more than four years.

[6]R. Preston McAfee and Michael A. Williams (1988) examine the merger of Xidex Corporation with Kalvar Corporation, a challenged merger known to be *ex post* anticompetitive. Using the same methodology as Eckbo and Stillman, they demonstrate that the methodology leads to the conclusion that the merger was *not* anticompetitive. See also David M. Barton and Roger Sherman (1984).

[7]See Michael A. Salinger and Laurence Schumann (1988) and Bhagat et al. (1990) for further criticism of using stock-market data for testing market power.

merger. There are, on average, 196 unaffected routes for each route affected by a merger. Furthermore, there are hundreds of routes affected by each merger. Thus, each merger generates a large number of observations, each of which can be compared with its control group.

The airline industry offers several other attractive features. First, the Airline Deregulation Act of 1978 led to many new carriers entering on profitable routes, followed by price-cutting and reduced operating margins, with losing carriers filing for bankruptcy and consolidating through mergers. The restructuring process during the 1980's gave rise to many mergers. Second, the Department of Transportation has compiled a comprehensive data base on airfares by carriers and routes, which makes this empirical study feasible. Third, there are no easy substitutes for airline travel. Road and rail travel are potential substitutes, but mainly for short-distance nonbusiness travel.

Moreover, during 1985–1988, the airline industry was governed by the Department of Transportation,[8] and the DOT did not deny any of the mergers proposed for approval.[9] This environment provides a controlled experiment for the question: what would happen if the antitrust policy toward mergers were relaxed?

II. Data and Methodology

Our sample of routes is obtained from 14 airline mergers that were initiated during the period 1985–1988.[10] Although 27 airline mergers were identified during the sample period,[11] 13 have been dropped from the study because of inadequate data.[12] Table 1 lists the names of the acquired and acquir-

[8]The airline industry was governed by the Civil Aeronautics Board from 1938 to 1984. Under the Airline Deregulation Act of 1978, the industry was deregulated in stages. Effective January 1, 1982, all controls on entry and exit were removed, while airfares were deregulated from January 1, 1983. On January 1, 1985, the governance of the airline industry was transferred from the Civil Aeronautics Board to the Department of Transportation, which had the authority over proposed airline mergers until 1988.

[9]We cannot find any mergers that were disapproved by the Department of Transportation during 1985–1988. In addition, Paul S. Dempsey (1990 p. 13) states: "the DOT approved *every* airline merger submitted to it...." Similarly, Steven Berry (1989 p. 176) states: "After that decision [Northwest-Republic approval], many mergers were proposed and approved quickly before the DOT's power in the area ran out at the end of 1988." Finally, Alfred E. Kahn, former chairman of Civil Aeronautics Board and the architect of airline deregulation, was quoted in *Fortune* (1986 p. 64) as saying, "DOT never met an airline merger it didn't like."

[10]We choose the sample period of 1985–1988 for two reasons. First, as noted above, no proposed mergers were denied during this period, reflecting the relaxation of antitrust policy. Second, out of the 41 airline mergers that could be identified following the 1978 Airline Deregulation Act until 1988, 27 occurred during 1985–1988.

[11]Airline mergers were identified from several sources including (i) *Wall Street Journal Index* (*General News*), (ii) *Mergers and Acquisitions Journal*, (iii) Compustat Research file, (iv) CRSP (Center for Research in Security Prices) stock files, and (v) trade journals such as *Air Transport World* and *Aviation Week and Space Technology*. The *Wall Street Journal Index* was searched to find relevant information concerning these mergers, such as announcement dates, merger completion dates, government approvals, and financial status of merging firms. These reports were supplemented with the information contained in company annual reports, *Predicasts F&S Index*, *The New York Times Index*, *Antitrust and Trade Regulation Reporter*, and *Aviation Week and Space Technology*. When in doubt, we searched the text service of Dow Jones Retrieval Service.

[12]The mergers in which either the acquirer or acquired has the following characteristics are excluded from the sample:

(i) Airlines providing charter services only. Two mergers involving Key Airlines are dropped.
(ii) Airlines that are so small in size that no data on airfares are available for the quarter prior to their merger. Three mergers involving Colgan, Business Express, and Chapparal are excluded.
(iii) Airlines with extensive code-sharing arrangements. Some smaller airlines use the codes of a larger airline, making the two airlines indistinguishable in the data base. For example, "AA", the code for American Airlines was used by Command Air, which makes it impossible to determine whether the carrier was American Airlines or Command Air. There are eight airlines with extensive code-sharing arrangements: Command Air, Simmons, Wings West, Ransome, Britt Air, Rocky Airways, Provincetown–Boston Airlines, and Mississippi Valley Airlines.

ing firms, the number of passengers carried by each, the relevant announcement dates of merger bids, and the merger completion dates. The sample of 14 mergers generates 21,351 affected routes, which provide the basis for construction of our sample.

A. *Product Market Data, Sample Routes, and Control Groups*

Raw product market data are obtained from the Department of Transportation's Ticket Dollar Value Origin and Destination data bank, where they are reported on a quarterly basis.[13] From this data base we obtain domestic economy-class airfares and numbers of passengers by routes and carriers, which allow us to compute other relevant information, such as route distance, market shares of different airlines, concentration, and fare per mile. We exclude all foreign-travel tickets, first-class tickets, and any tickets that involve more than one connecting point on any directional trip.[14] We also exclude tickets for which the fare cannot be directly attributed to a route and airline.[15]

These data are used for construction of the sample. To be included in the sample, a route has to be served by at least one of the merging airlines with at least 1,200 passengers per year.[16] These criteria reduce the number of sample routes to 11,629.[17]

We define rival firms as those airlines that serve the 11,629 sample routes. When more than one rival firm operates on a route, we compute the average fare of rival firms (weighted by passenger-miles) and treat it as a single observation. Using the same criteria applied to the merging-firm

[13]The raw data base is very large with 1–2 million records per quarter. Although there are edited versions of the data base, we process it ourselves to construct a data base best suited to our requirements. The raw data base contains all of the data as reported by participating air carriers. The carriers are required to report every tenth ticket (i.e., 10 percent of all tickets issued by them). Each record identifies the point of origin, the airline carrier code(s), intermediate airports, the point of destination, the dollar fare, the number of passengers, the distance(s), and the fare class(es).

When airlines fly under different carrier codes but are controlled by the same parent, we change the carrier codes to reflect the control status of the carriers. The same changes are made when the acquired firm's carrier code continues to be used after the merger.

In addition, tickets with abnormally high fares are excluded to eliminate tickets with data-entry errors. The Department of Transportation calculates a "Standard Industry Fare Level" (SIFL), which is designed to check the reasonableness of airfares. During 1980–1989, the maximum SIFL for a 250-mile trip was 29 cents per mile. Allowing for a wide margin of error, we eliminate tickets when the fare is equal to or in excess of $3.00 per mile. This same upper limit is used by DOT to identify suspect fares. We also delete frequent-flyer tickets (with indicated price of zero) because frequent-flyer awards may have been earned on different routes during different quarters. In addition, if the fare per mile on any sample route is less (greater) than or equal to one-tenth (ten times) the fare per mile in its control group, then those routes are removed from further analysis.

[14]Thus, we include only direct flights and flights that involve a single change of plane. We do not distinguish between direct flights and single-connection flights. These flights could represent different markets, as a connecting flight requires the passenger to wait for a connection. We do not believe that ignoring the value of a passenger's waiting time would significantly bias our results, because our analysis is based on a comparison between sample routes and the control groups. There is no reason to believe that ignoring the value of passengers' time imparts a greater bias for sample routes than for the control groups.

[15]Specifically, we exclude (i) tickets with missing carrier codes, (ii) tickets that involve more than one carrier, (iii) tickets for which travel is neither one-way nor round-trip, and (iv) round-trip tickets with different intermediate stops on outward and return journeys.

[16]Note that 1,200 passengers per year is equivalent to 300 passengers per quarter. Since the data base contains only 10 percent of the population, 300 passengers will provide 30 observations, which we feel is the minimum required to draw reasonable statistical inferences about the population. Gloria J. Hurdle et al. (1989) and Borenstein (1990) use 1,000 passengers and 3,650 passengers, respectively, as their screens.

[17]These sample routes include cases in which more than one merger took place in the same quarter. This will overstate the impact of mergers on airfares if we examine only the unconditional fare changes. However, our formal test is conducted on the relation between fare changes and concentration changes. Because the concentration changes also reflect the impact of multiple mergers, the regression results will not overstate the significance of the relation between the two variables.

TABLE 1—THE SAMPLE OF AIRLINE MERGERS

Acquired firm-acquirer	Passengers (thousands)		Dates			
	Acquired firm	Acquirer	First bid for acquired firm	First bid by acquirer	Final bid	Completion
Muse Air-Southwest	1,980	10,698	85/03/11	85/03/11	85/03/11	85/06/25
Empire-Piedmont	1,084	14,274	85/09/26	85/10/03	85/10/03	86/02/01
Frontier-People	7,068	9,100	85/09/20	85/10/09	85/10/09	85/11/22
Republic-Northwest	17,465	14,539	86/01/24	86/01/24	86/01/24	86/08/12
Eastern-Texas	41,662	19,640	86/02/24	86/02/24	86/02/24	86/11/25
Ozark-TWA	5,541	20,876	86/02/28	86/02/28	86/02/28	86/09/12
People-Texas	11,907	19,640	86/07/03	86/07/03	86/09/16	86/12/30
Jet America-Alaska	774	3,132	86/08/07	86/08/07	86/09/08	86/09/30
Western-Delta	9,062	39,804	86/09/10	86/09/10	86/09/10	86/12/17
Air Cal-American	4,451	41,165	86/11/18	86/11/18	86/11/18	87/04/30
Horizon-Alaska Air	942	3,132	86/11/20	86/11/20	86/11/20	86/12/29
Pacific SW-US Air	9,049	19,278	86/12/09	86/12/09	86/12/09	87/05/29
Piedmont-US Air	22,800	21,725	87/01/28	87/02/18	87/03/06	87/11/05
Florida Ex-Braniff	1,415	2,557	87/10/23	87/10/23	87/12/15	88/06/15[a]

Notes: The numbers of passengers given are for the year prior to the merger. Dates are shown as year/month/date. Completion date refers to the date when the acquirer obtained control.

[a]This date may not be exact.

routes, we obtain 8,109 routes for the rival firms.[18]

For each route in the sample, we construct a control group. The control group consists of all routes on which neither of the merging firms operated during the period of analysis and on which the distance falls within 7.5 percent of that of the sample route (i.e., 92.5–107.5 percent of the sample route distance).[19] The average number of routes in the control group is 196.6 for merging-firm routes and 199.1 for rival-firm routes. The fare for the control group is the mean of the fares on the individual routes weighted by passenger-miles.

B. *Relative Fare Changes*

To identify price changes that can be attributed to mergers, we compare the fare change of a sample route with the average fare change in its control group. Industry-wide changes like fluctuations in fuel prices, changes in labor cost, and seasonal or cyclical variations in demand are likely to have an equivalent effect on routes of a similar distance.[20] We isolate the effect of the merger by comparing routes where a merger has taken place with routes where the merger has not taken place. Specifically, relative fare changes are computed as

$$(1)\quad \text{Lfarchg} = \log\left(\frac{\text{Fare}_e^s}{\text{Fare}_b^s}\right) - \log\left(\frac{\text{Fare}_e^c}{\text{Fare}_b^c}\right)$$

where the subscripts on Fare denote the ending (e) and beginning (b) of a period, while the superscripts denote the sample (s) and the control (c) routes. The expressions on the right-hand side of the equation are the continuously compounded rates of

[18]The only difference in selection criteria is that the requirement of 1,200 passengers per year is imposed on the sum of the passengers carried by the rival firms on each route.

[19]To the extent that there may be other mergers affecting the routes in the control group, the distinction between the control group and the sample routes will be diminished. This will weaken the power of the test and biases against finding a significant difference in airfares between the sample and the control routes.

[20]Local economic conditions may affect some routes differently. We hope the large number of observations in our sample averages out the noise.

change in fares for the sample route and for the control group. Thus Lfarchg represents the difference in the percentage change in fares between the sample and the control routes.

III. Hypotheses and Empirical Results

In this section, we develop hypotheses concerning the effect of mergers on the product prices of merging and rival firms and their relation to changes in concentration. We then present empirical results using the data and methodology described above.

A. *Hypotheses*

If a merger generates efficiency gains, it will reduce the marginal cost of the merged firm. In the absence of a change in market power, the decrease in marginal cost will lead to a lower price. If, on the other hand, there are no efficiency gains and the primary effect is the exercise of greater market power, the merger will lead to a higher product price. If both effects are present, then the direction of change in observed prices will indicate which of the two effects dominates. An increase in price implies that the market-power effect dominates efficiency gains; a decrease in price implies the dominance of efficiency gains. Thus, we first examine *whether or not mergers lead to an increase in airfares of merging firms relative to the control group*.

We expect that the greater the increase in market concentration resulting from a merger, the greater is the potential for the exercise of market power, and the greater is the increase in airfares. Notice, however, that the increase in concentration measures the extent to which a market is previously served jointly by the merging firms (i.e., the degree of overlap). By serving the same proportion of a market with one firm instead of two, it is possible to achieve efficiency gains through economies of scale. Since efficiency gains should lead to a price decrease, we would expect to see a negative correlation between price changes and changes in concentration, if the effect of efficiency gains dominates the market-power effect. On the other hand, if the market-power effect dominates the efficiency effect, the correlation should be positive. Thus, our primary test investigates *the correlation between price changes of merging firms and changes in concentration*.

A price change by the merging (or merged) firms may affect other firms serving the same market. If the merging (or merged) firms increase their price and the rival firms cooperate, we will observe an increase in the prices of rival firms. If the efficiency gain dominates and the merged firm decreases its price, rival firms are likely to reduce their prices to maintain their market share. Thus, a price increase by rival firms is consistent with market power dominating efficiency gains, while a price decrease implies that efficiency gains dominate market power. Likewise, the correlation between the price changes of rival firms and concentration changes will be positive if market power is the primary effect and negative if efficiency gains dominate market power.

To separate the effect of efficiency gains from the market-power effect, we consider two subperiods: the announcement period and the completion period. The announcement period is the quarter in which the potential or actual bid by the successful bidder could be identified in the press; the completion period is the quarter in which the successful bidder acquires control of the target. The "full period" extends from the announcement quarter to the merger-completion quarter. For each period, we compute relative fare changes from the quarter preceding the period to the quarter following the period.

The potential sources of efficiency gains include economies of scale or scope, improved production techniques, the combination of complementary resources, the redeployment of assets to more profitable uses, and more efficient management. Such synergies cannot be realized until the firms actually merge.[21] Since the marginal cost

[21] Michael Bradley et al. (1983) present evidence that the synergistic gains are not realized unless targets are successfully acquired by the bidder.

will not decrease until these synergies are realized, we expect the impact of efficiency gains to prevail only during the completion period.[22]

In contrast, exercise of market power does not have to wait until merger completion. Getting the two management teams together to discuss merger possibilities provides a relatively safe and convenient forum to arrive at mutually beneficial pricing strategies. Even without an explicit price-fixing agreement, the mere anticipation of a merger would make the participating firms more cooperative.[23] Further exercise of market power may take place during the completion period, if the exercise of market power during the announcement period is tempered by the uncertainty regarding the eventual outcome of merger discussions. In sum, we hypothesize that *fare changes during the announcement period are primarily due to the market-power effect, whereas the fare changes during the completion period reflect the joint, and offsetting, effects of market power and efficiency gains.*

To buttress the results from the subperiod analysis, we also examine subsamples that are constructed according to the potential sources of efficiency gains and market power. The hypotheses concerning the subsample analysis will be described later in the results section.

B. *Mergers Involving Financially Distressed Firms*

Some of the acquired firms in our sample were in financial distress prior to the merger. Since these firms may have pricing strategies different from firms not in financial distress, we choose to treat them separately. For firms in financial distress, for example, the need to raise cash for current operations may dominate the long-term benefits from cooperating with other airlines.[24] In addition, the possibility of suspension of service or the perception that airlines in financial distress provide poor service may make travelers reluctant to choose those airlines. One way to attract these customers is to discount airfares. We expect such pricing behavior to prevail until a failing firm is taken over by a more solvent firm.

We classify a firm as financially distressed if reports in the financial press indicate serious financial problems (such as denial of additional credit, debt postponement, and asset sales) or if *Moody's Transportation Manual* contains remarks by external auditors implying financial difficulty of the firm. In our sample, there are five such firms: Frontier Airlines, People Express, Eastern Airlines, Jet America, and Muse Air. Mergers involving these firms are defined as "failing-firm mergers"; mergers not involving these firms are defined as "normal firm mergers."

C. *Relative Fare Changes*

Table 2 reports the average beginning and ending relative fares and the mean value of Lfarchg for announcement, completion, and full periods.[25] The relative fare is de-

[22] Further efficiency gains may materialize even after the completion period. Obviously, these additional efficiency gains can be accounted for by increasing the length of the completion period. A longer sample period, however, will increase the noise in the data. We believe that the choice of one quarter after merger completion represents a reasonable trade-off.

[23] The same argument does not apply for efficiency gains. If the merging firms reduce prices in anticipation of efficiency gains, but without actually realizing the gains, they may end up losing money, because realization of efficiency gains is contingent upon the merger being successful. In contrast, collusion in anticipation of a merger is beneficial to both airlines, irrespective of whether the merger is ultimately successful or not.

[24] A management team, in order to avoid immediate bankruptcy or liquidation, may pursue a policy of revenue maximization rather than profit maximization. The revenue maximum occurs where demand is unit-elastic, which is a profit maximum only if marginal cost is zero. If marginal cost is greater than zero, the profit maximum will occur at a higher price, where demand is elastic. Thus, the price for revenue maximization is always less than or equal to the price for profit maximization.

[25] The full period is divided into announcement and completion periods only for those mergers where there is a gap of at least one quarter between the announcement and completion periods. For example, the Western-Delta merger was announced and completed in the third and fourth quarters of 1986, respectively. Since it is not possible to separate the effect of announcement from the effect of completion, such merg-

fined as the ratio of the fare on the sample route to the fare in the control group. To account for the possibility that high-density routes are estimated with greater precision, we also report (in parentheses) means weighted by the total number of passengers for each route. The overall conclusions that emerge from Table 2 are that airline mergers increase fares by about 10 percent,[26] mergers involving financially troubled firms result in distinctly different pricing behavior from mergers involving normal firms, and the rival firms closely mimic the merging firms.

The results are generally insensitive to whether or not the means are weighted by the number of passengers. The only exception is that the weighted-average relative fares are consistently lower than the unweighted averages, indicating that the relative fares are generally lower in high-density routes.

Whichever averages we use in the comparison, Table 2 shows that, at the beginning of the full period, routes in failing-firm mergers have considerably lower relative fares than routes in normal-firm mergers: the unweighted-mean relative fares are 0.76 and 1.03, respectively. This means that financially distressed airlines were initially setting prices well below the industry average (the industry average is equal to 1). Table 2 also shows a similar pricing difference among the rivals.

During the announcement period, both merging and rival firms in failing-firm mergers cut their prices by an average of 19 percent, further increasing the gap between their prices and the industry average. In contrast, merging and rival firms in normal-firm mergers increase their fares by 11 percent and 13 percent. This price increase suggests that discussions culminating in a possible merger between normal firms are conducive to cooperative pricing behavior. For the failing firm, however, the need to discount fares to attract reluctant customers or to raise cash for survival appears to outweigh the motive to collude.

During the completion period, both the merging and rival firms *decrease* their relative fares, by 9 percent and 5 percent, in normal-firm mergers. This price decline suggests that efficiency gains dominate any additional market power that may arise due to resolution of uncertainty. In contrast, the merging and rival firms in failing-firm mergers increase their fares, by 40 percent and 45 percent. These large price increases suggest that, having merged with presumably a more solvent acquirer, the failing firm no longer has the incentive to undercut prices. Furthermore, the exit of the failing firm enables greater collusion among the remaining airlines. The dual effect of these considerations appears overwhelmingly to dominate any efficiency gains that may arise in these mergers.

In sum, agreements to merge that are not motivated by financial distress are conducive to exercise of market power. These mergers result in large increases in relative airfares during the announcement period; but upon merger completion, efficiency gains offset much, but not all, of the impact of market power.[27] In contrast, the financially distressed firms continue to cut prices during the announcement period. It is only when the merger is successfully completed that they stop undercutting and dramatically increase fares to bring them closer to the industry level. These different pricing strategies are closely matched by rival firms operating on the same routes.

ers are included only in the full period. Thus, the full period has all 14 mergers, while the announcement and completion periods consist of only seven mergers.

[26]The relative fare changes are measured by Lfarchg. The skewness and kurtosis coefficients of Lfarchg are 0.85 and 3.32, which do not indicate serious departures from normality. Nevertheless, we test for the significance of Lfarchg using the sign test. The results for Table 2 are the same, except for two cells: Lfarchg values for "all mergers" during the completion period become significantly negative.

[27]Borenstein (1990) also reports that a substantial portion of the price increases in the Northwest-Republic merger took place before merger completion.

TABLE 2—CHANGES IN RELATIVE FARES OF MERGING AND RIVAL FIRMS

Variable	Merging firms			Rival firms		
	All mergers	Mergers between normal firms	Mergers with a failing firm	All mergers	Mergers between normal firms	Mergers with a failing firm
Full period:						
Sample size	11,629	8,511	3,118	8,109	5,578	2,531
Relative fares, beginning	0.9602** (0.8238**)	1.0325** (0.8982**)	0.7626** (0.6883**)	0.9140** (0.8645**)	0.9745** (0.9218**)	0.7807** (0.7588**)
Relative fares, ending	1.0159** (0.8850**)	1.0529** (0.9309**)	0.9148** (0.8015**)	0.9831** (0.9287**)	1.0085 (0.9472**)	0.9272** (0.8944**)
Relative fare changes: Lfarchg (percentage)	9.44** (9.75**)	3.25** (3.76**)	26.35** (20.66**)	12.17** (11.20**)	5.94** (4.42**)	25.90** (23.71**)
Announcement Period:						
Sample size	7,214	5,832	1,382	4,891	3,730	1,161
Relative fares, beginning	0.9792** (0.8575**)	0.9855** (0.8636**)	0.9530** (0.8376**)	0.9444** (0.8945**)	0.9499** (0.9093**)	0.9268** (0.8487**)
Relative fares, ending	1.0270** (0.8947**)	1.0754** (0.9440**)	0.8228** (0.7337**)	0.9807** (0.9208**)	1.0345** (0.9634**)	0.8079** (0.7882**)
Relative fare, changes: Lfarchg (percentage)	5.54** (3.81**)	11.32** (10.38**)	−18.85** (−17.66**)	5.06** (3.77**)	12.64** (9.73**)	−19.28** (−14.80**)
Completion Period:						
Sample size	7,557	6,140	1,417	5,304	4,105	1,199
Relative fares, beginning	0.9874** (0.8657**)	1.048** (0.9273**)	0.7247** (0.6528**)	0.9496** (0.8938**)	1.0201** (0.9507**)	0.7081** (0.7046**)
Relative fares, ending	0.9640** (0.8683**)	0.9652** (0.8724**)	0.9590** (0.8541**)	0.9764** (0.9296**)	0.9776** (0.9286**)	0.9725** (0.9332**)
Relative fare changes: Lfarchg (percentage)	0.21 (3.31**)	−9.00** (−6.82**)	40.11** (38.36**)	6.10** (7.13**)	−5.36** (−3.72**)	45.34** (43.24**)

Notes: Relative fare is the ratio of the fare on the sample route to the weighted average fare in the control group. The relative fares are measured at the start and end of each observation period. Lfarchg is the mean of the differences between the sample and control routes in the natural logs of the ratio of fares at the end to the beginning of each period. All numbers not in parentheses represent unweighted means of the variable. All numbers in parentheses are means weighted by the number of passengers on each route. For relative fares, statistical significance is tested using the t statistic with reference to a mean of 1.00, and for Lfarchg the significance is with reference to a mean of zero.

**Statistically significant at the 1-percent level (two-tailed test).

D. *Relation Between Fares and Concentration*

The relative fare changes examined in the preceding section suggest that airline mergers have an important impact on pricing behavior. In this section, we provide estimates of the relation between these price changes and changes in concentration.

Specification.—We measure level of concentration by the Herfindahl-Hirschman index (HHI).[28] Janusz A. Ordover et al. (1982) demonstrate that changes in the HHI can be useful indicators of the effect of mergers

[28]The Herfindahl-Hirschman index is calculated for each route as the sum of squares of the market shares of all airlines operating on the route.

when such changes are evaluated in light of other evidence—in this case, the other evidence being the relative fare changes. Like the relative fare change, the change in the concentration (Lhhichg) is measured relative to the control group. The Lhhichg is calculated using equation (1), with HHI instead of fares. For the complete sample of routes served by the merging firms, the mean Lhhichg for the full period is 5.62 percent if unweighted, and it is 10.16 percent if weighted by the total number of passengers. For the rival firms, the means are 6.50 percent and 10.15 percent.

We examine the relation between the fare changes and the changes in concentration by regressing Lfarchg on the following independent variables: (i) Lhhichg, a relative percentage change in HHI from the beginning to the end of a sample period, (ii) Fail, a dummy variable for mergers involving financially distressed firms, (iii) Normal, a dummy variable for mergers involving normal firms, and (iv) Ldist, the natural log of distance.

We use interaction terms between the Fail dummy and Lhhichg and between the Normal dummy and Lhhichg. This allows for different relations between changes in concentration and fare changes for failing-firm mergers and normal-firm mergers. Ldist is included in the regression to measure the effect of distance on fare changes. Since the substitution effect between air travel and rail or road travel would be greater for shorter distances, we use the natural log of distance.[29]

The regression relations are estimated using ordinary least squares under the following two specifications:

$$(2)\quad \text{Lfarchg}_i = \alpha + \beta_1 \text{Normal}_i \times \text{Lhhichg}_i + \beta_2 \text{Fail}_i \times \text{Lhhichg}_i + \beta_3 \text{Ldist}_i + \varepsilon_i$$

$$(3)\quad \text{Lfarchg}_i = \alpha + \beta_1 \text{Normal}_i \times \text{Lhhichg}_i + \beta_2 \text{Fail}_i \times \text{Lhhichg}_i + \varepsilon_i$$

[29]Hurdle et al. (1989) also use log of the distance to measure a nonlinear relation between airfare and distance.

Regression Results, Total Sample.—The regression results for the full, announcement, and completion periods for merging and rival firms are reported in Table 3.[30] All standard errors are adjusted for heteroscedasticity using Halbert White's (1980) correction. For the full period, the results portray a significant positive relation between fare changes and changes in concentration. This is true for rival firms as well as for merging firms in both failing- and normal-firm mergers. On the whole, the market-power effects dominate whatever efficiency gains are achieved in these mergers.

In addition, the regression coefficient on Ldist is significantly positive for both merging and rival firms for all periods. Road and rail travel become less of a substitute for air travel as distance increases; consequently, firms have greater latitude for the exercise of market power on longer routes. The positive coefficient on the distance variable indicates that airlines exploit more market power on routes for which there are fewer substitutes; namely, longer-distance routes.

During the announcement period, the regression coefficients on Lhhichg are significantly positive for normal-firm mergers and insignificant for failing-firm mergers. Apparently, firms in normal-firm mergers start to take full advantage of increased market power during the announcement period. Firms in failing-firm mergers, on the other hand, show no such inclination. These firms show a large and significantly positive regression coefficient on Lhhichg only during the completion period. This suggests that the failing firms are restrained from exercising market power until merger completion,

[30]The regression relations reported in Table 3 are based on ordinary least squares (OLS). Regressions are also estimated using weighted least squares, where the weight is equal to the number of passengers on each route. This is done to account for the possibility that variables are measured with greater precision for high-density routes. These regressions have a slightly higher explanatory power, but the results are generally consistent with the OLS results. For the sake of simplicity, we report only the OLS results.

TABLE 3—ORDINARY LEAST SQUARES REGRESSIONS FOR THE TOTAL SAMPLE

Models:

(2) $\text{Lfarchg}_i = \alpha + \beta_1 \text{Normal}_i \times \text{Lhhichg}_i + \beta_2 \text{Fail}_i \times \text{Lhhichg}_i + \beta_3 \text{Ldist}_i + \varepsilon_i$

(3) $\text{Lfarchg}_i = \alpha + \beta_1 \text{Normal}_i \times \text{Lhhichg}_i + \beta_2 \text{Fail}_i \times \text{Lhhichg}_i + \varepsilon_i$

Period and model	Regression coefficient (t statistic) Constant	Normal × Lhhichg	Fail × Lhhichg	Ldist	R^2_{adj}	Sample size
A. *Merging Firms:*						
Full period						
Model (2)	−0.6864 (−23.22)	0.0942 (7.14)	0.2331 (6.99)	0.1154 (25.00)	0.051	11,629
Model (3)	0.0855 (21.78)	0.1072 (8.09)	0.2438 (7.10)	—	0.013	11,629
Announcement period						
Model (2)	−0.2409 (−8.03)	0.2178 (10.44)	0.0094 (0.19)	0.0437 (9.28)	0.030	7,214
Model (3)	0.0511 (12.86)	0.2364 (11.16)	0.0220 (0.45)	—	0.022	7,214
Completion period						
Model (2)	−0.3173 (−10.75)	−0.0118 (−1.08)	0.4233 (7.06)	0.0465 (10.06)	0.035	7,557
Model (3)	−0.0046 (−1.10)	−0.0179 (−1.69)	0.4233 (6.92)	—	0.026	7,557
B. *Rival Firms:*						
Full period						
Model (2)	−0.7311 (−18.56)	0.1203 (6.47)	0.2253 (6.89)	0.1233 (20.64)	0.052	8,109
Model (3)	0.1098 (22.85)	0.1455 (7.76)	0.2333 (6.92)	—	0.016	8,109
Announcement period						
Model (2)	−0.3523 (−8.49)	0.3293 (12.05)	0.0210 (0.38)	0.0571 (9.14)	0.052	4,891
Model (3)	0.0378 (7.10)	0.3509 (12.65)	0.0409 (0.76)	—	0.042	4,891
Completion period						
Model (2)	−0.2132 (−5.32)	−0.0193 (−1.19)	0.3967 (6.31)	0.0387 (6.41)	0.028	5,304
Model (3)	0.0528 (9.85)	−0.0214 (−1.36)	0.3928 (6.18)	—	0.024	5,304

Notes: Lfarchg(Lhhichg) is the difference in the logs of the ratio of fares (concentrations) at the end to the beginning of each period between the sample and control routes. Ldist is the natural log of the route distance. The Fail (Normal) dummy is 1 (0) for failing-firm mergers and 0 (1) otherwise.

and they start to catch up aggressively with the industry level once the merger is completed.[31]

The results for the normal-firm mergers during the completion period are mixed; although the regression coefficient on Lhhichg turns negative, the significance level is low. We suspect that there are systematic differences across routes which are masked by the regression on the total sample. For this reason, we conduct a subsample analysis in the next subsection.

Finally, the regression coefficients for rival firms are almost indistinguishable from those of merging firms for all periods and under both regression specifications. Apparently, the joint effect of market power and efficiency gains due to mergers has similar pricing implications for both merging and rival firms. The parallel movement in prices and correlations leads us to suspect that some kind of tacit cooperation exists among airlines in setting prices.

E. *Subsample Analysis*

To further separate market-power effects from efficiency effects, we divide the sample into four subsamples according to the potential sources of operating synergies and market power. If the merging firms have a common hub at the same airport prior to the merger, then all routes to or from the hub are called "Hub" routes. If a route is served by both firms prior to the merger, then that route is called an "Overlapping" route. Given these distinctions, we divide our sample of routes into four subsamples: subsample Hub/Overlap consists of overlapping routes with a common hub; subsample Hub Only consists of a common hub with no overlapping routes; subsample Overlap Only contains overlapping routes with no common hub; and subsample Neither consists of routes which are neither overlapping nor have a common hub.

Subsample Hub/Overlap represents the set of routes with the maximum potential for operating efficiency, because the merged firm can better realize both "in the air" and "on-the-ground" synergies.[32] These are also the routes from which the merging firms can derive the maximum increase in market power, because they have the greatest degree of joint operation on these routes. Routes in subsample Hub Only can realize on-the-ground synergies, and the merged firm may also be able to exercise some additional market power because it is now in a better position to control the choices available to the traveler from the hub airport. Routes in subsample Overlap Only can realize in-the-air synergies and also have the potential for exercising additional market power by virtue of having reduced the num-

[31] For the announcement period, it is not clear which Lhhichg is the most appropriate measure to use. The first and most obvious one is the actual change in relative concentration during the announcement period, which is the one used for Tables 3 and 4. This measure, however, ignores the possibility of anticipatory pricing behavior. For instance, airlines may set prices based on the expected changes in market structure. Thus, an alternative approach is to assume that airlines have perfect foresight and use the Lhhichg of the full period. Yet another approach is to use a simulated Lhhichg assuming that the merger will occur with certainty, after which all services on overlapping routes will be consolidated with no other changes taking place in market structure. Such a simulation approach does not consider the rivals' reactions, nor does it account for the effect of the change in the relative power of merging airlines due to common hubs or multimarket contact (see footnote 35). Thus, we use the actual (rather than simulated) changes in concentration.

When the regressions are rerun using the full period's Lhhichg for the announcement period, (i.e., the perfect-foresight approach), the results for normal-firm mergers are qualitatively the same for both merging and rival firms. For failing-firm mergers, however, the coefficient on Fail × Lhhichg becomes significantly negative. This may be interpreted as evidence that the failing firms cut prices more, the greater the ultimate change in concentration. A possible explanation is that the causality is in the reverse; namely, when failing firms cut prices more they capture greater market shares, and when they are ultimately acquired, the change in concentration is greater. Since we are interested in the effect of concentration changes on airfares, we rely on the results using contemporaneous changes in concentration.

[32] "In the air" synergies may arise from use of fewer aircraft and a better load factor. "On the ground" synergies may arise from better use of gates/slots and ground crews.

ber of competitors by one. Routes in subsample Neither have no potential for direct operating synergies or for any increase in direct market power.[33]

We assume that company-wide, nonoperating synergies have no differential effect on fares between routes and that no cross-subsidization of operating synergies takes place across markets. Thus, we hypothesize that the airfare changes on routes in subsample Hub/Overlap will be most affected by efficiency gains and market power, and airfares in subsample Neither will be the least affected.

Table 4 reports the mean relative fare changes, the mean relative concentration changes, and the ordinary-least-squares results using the regression specification in equation (2) for each of the four subsamples.[34] As would be expected, the changes in concentration are larger for overlapping routes than for nonoverlapping routes,[35] and also larger during the completion period than during the announcement period.

The results reveal important differences for normal-firm mergers in pricing behavior across subsamples. During the announcement period, both the relative fare changes and the regression coefficients on Normal × Lhhichg are significantly positive for all subsamples except for the subsample Hub Only: for this subsample, neither the fare change nor the coefficient is significantly different from zero. Evidently, firms exercise greater market power during merger discussion on most routes, except on routes where they only share a common hub.

For the completion period, normal-firm mergers exhibit significantly negative regression coefficients for all subsamples that have either common hubs or overlapping routes; in contrast, the same coefficient for subsample Neither is significantly positive. This is consistent with our hypothesis that mergers generate direct operating synergies on routes with common hubs or overlapping routes. Clearly, these efficiency gains dominate any residual market power obtained during this period. For subsample Neither, such efficiency gains are neither expected nor observed.

The results for the two subperiods are aggregated in the full period.[36] For the three subsamples with common-hub routes or overlapping routes, the price effect during the completion period appears to offset (and sometimes dominate) the effect during the announcement period; namely, the efficiency gains seem to play at least as important a role as market power. For the subsample Neither, on the other hand, the exercise of increased market power during the completion period reinforces the price effect during the announcement period. Indeed, these results reveal that the positive relation between fare changes and concentration changes for normal-firm mergers reported in Table 3 is driven by subsample Neither, which represents 76 percent of the sample. Apparently, it is only when there are no obvious sources of direct operating synergies, as is the case for subsample Neither, that increased market power leads to

[33]Subsample Neither may result in an increase in market power indirectly through multimarket contact. We will discuss this issue later.

[34]We run both ordinary least squares and weighted least squares for each of the two regression models, (2) and (3). All of the four regression results are qualitatively similar. Hence we report only the ordinary-least-squares results for regression model (2), because the variable Ldist does not facilitate distinction between the market-power and efficiency effects. The coefficient of Ldist is positive and significant at the 1-percent level in nine out of 12 ordinary-least-squares regressions, insignificantly different from zero for one, and significantly negative for two at the 1-percent level.

[35]The HHI's in the two subsamples with no overlapping routes may still change because the relative power of merging firms can increase due to common hubs or multimarket contact. Common hubs and multimarket contact can increase control/availability of routes for travelers and can increase control over rival firms through the threat of retaliation. Such increases in power may lead to an increase in market share. Also, because we measure the concentration changes relative to the control group, the relative concentration ratios can change if there is a change in the concentration for the control group.

[36]Notice that the full period contains a larger set of routes than the announcement and completion periods, as mentioned in footnote 25. For this reason, the results in the announcement period and the completion period may not add up exactly to those in the full period.

TABLE 4—ORDINARY-LEAST-SQUARES REGRESSIONS FOR SUBSAMPLES
$\text{Lfarchg}_i = \alpha + \beta_1 \text{Normal}_i \times \text{Lhhichg}_i + \beta_2 \text{Fail}_i \times \text{Lhhichg}_i + \varepsilon_i$

Period and subsample	Mean Lfarchg, percentage [sample size]		Mean Lhhichg, percentage [sample size]		Regression coefficient (t statistic)			
	Merger between normal firms	Merger with a failing firm	Merger between normal firms	Merger with a failing firm	Constant	Normal × Lhhichg	Fail × Lhhichg	R^2_{adj}
A. *Merging Firms:*								
Full period								
Hub/Overlap	−0.33 [193]	48.91** [180]	36.35** [193]	20.13** [180]	0.3174 (9.00)	−0.4891 (−6.69)	0.0920 (1.00)	0.101
Hub Only	−11.01** [291]	40.23** [331]	1.89 [291]	5.81** [331]	0.1604 (6.99)	−0.0461 (−0.45)	0.0837 (0.72)	−0.002
Overlap Only	3.92** [1,205]	40.12** [566]	22.49** [1,205]	19.92** [566]	0.1535 (11.89)	−0.1370 (−4.56)	0.3512 (5.28)	0.044
Neither	3.84** [6,822]	18.28** [2,041]	0.84** [6,822]	4.02** [2,041]	0.0690 (16.59)	0.1945 (12.12)	0.1548 (3.38)	0.016
Announcement period								
Hub/Overlap	7.18** [186]	−13.63** [101]	2.74[a] [186]	−0.69 [101]	−0.0110 (0.61)	0.5359 (4.16)	−0.0329 (−0.31)	0.080
Hub Only	1.15 [278]	−14.96** [147]	−1.67 [278]	−2.30 [147]	−0.0435 (−2.81)	0.0258 (0.21)	0.0507 (0.52)	−0.004
Overlap Only	12.09** [1,106]	−21.88** [311]	3.00** [1,106]	5.30** [311]	0.0430 (4.40)	0.1780 (3.48)	−0.0716 (−0.70)	0.009
Neither	11.96** [4,262]	−19.03** [823]	2.24** [4,262]	−0.47 [823]	0.0649 (13.92)	0.2468 (10.37)	0.0622 (0.87)	0.027
Completion period								
Hub/Overlap	−5.69** [190]	56.52** [110]	31.45** [190]	17.04** [110]	0.2395 (6.17)	−0.4590 (−6.09)	0.3689 (2.42)	0.139
Hub Only	−10.23** [283]	34.92** [144]	3.68* [283]	2.74 [144]	0.0549 (2.71)	−0.1550 (−2.24)	−0.1276 (−0.64)	0.004
Overlap Only	−7.47** [1,143]	55.71** [357]	18.30** [1,143]	15.88** [357]	0.0846 (6.06)	−0.2052 (−7.95)	0.5213 (4.53)	0.071
Neither	−9.45** [4,524]	31.88** [806]	−1.41** [4,524]	6.13** [806]	−0.0346 (−7.94)	0.0374 (2.45)	0.3330 (3.96)	0.015
B. *Rival Firms:*								
Full period								
Hub/Overlap	4.29 [135]	44.10** [160]	33.06** [135]	18.65** [160]	0.2837 (7.77)	−0.3316 (−3.59)	0.2499 (2.38)	0.062
Hub Only	−6.17[a] [157]	44.33** [260]	5.20* [157]	6.36** [260]	0.2469 (9.15)	−0.0009 (−0.01)	0.1570 (1.36)	0.001
Overlap Only	2.49* [790]	37.36** [528]	14.74** [790]	18.12** [528]	0.1533 (10.42)	−0.0613 (−1.43)	0.2299 (3.36)	0.014
Neither	7.02** [4,496]	17.21** [1,583]	2.97** [4,496]	5.20** [1,583]	0.0897 (17.50)	0.2118 (9.55)	0.1742 (4.05)	0.020
Announcement period								
Hub/Overlap	11.48** [134]	−21.79** [95]	4.54* [134]	−0.86 [95]	−0.0445 (−1.79)	0.8197 (5.31)	0.1394 (0.92)	0.135

TABLE 4—*Continued.*

Period and subsample	Mean Lfarchg, percentage [sample size]		Mean Lhhichg, percentage [sample size]		Regression coefficient (t statistic)			
	Merger between normal firms	Merger with a failing firm	Merger between normal firms	Merger with a failing firm	Constant	Normal × Lhhichg	Fail × Lhhichg	R^2_{adj}
Hub Only	−0.97 [150]	−17.47** [126]	−0.02 [150]	−1.70 [126]	−0.0831 (−4.10)	0.4019 (2.63)	0.2415 (2.76)	0.043
Overlap Only	12.65** [699]	−23.29** [297]	5.79** [699]	5.29** [297]	0.0049 (0.39)	0.3828 (5.64)	−0.0737 (−0.68)	0.033
Neither	13.44** [2,747]	−17.41** [643]	4.78** [2,747]	0.10 [643]	0.0637 (10.19)	0.3155 (10.16)	0.0414 (0.53)	0.040
Completion period								
Hub/Overlap	−6.25** [131]	62.37** [103]	28.27** [131]	17.03** [103]	0.3091 (6.72)	−0.6046 (−5.86)	0.3483 (2.22)	0.155
Hub Only	−6.11** [169]	43.97** [120]	6.39** [169]	3.32 [120]	0.1522 (5.42)	−0.1151 (−1.47)	−0.0698 (−0.32)	−0.004
Overlap Only	−6.07** [705]	56.99** [343]	8.23** [705]	14.83** [343]	0.1320 (7.85)	−0.1394 (−3.53)	0.4415 (3.69)	0.035
Neither	−5.12** [3,100]	36.51** [633]	−1.18** [3,100]	6.70** [633]	0.0160 (3.07)	0.0176 (0.31)	0.3143 (3.63)	0.015

Notes: Lfarchg (Lhhichg) is the difference between the sample and control routes in the logs of the ratio of fares (concentrations) at the end to the beginning of each period. The mean Lfarchg and Lhhichg reported are the unweighted means. The Fail (Normal) dummy is 1 (0) for failing mergers and 0 (1) otherwise. Sample sizes are given in brackets below the mean Lfarchg and mean Lhhichg; t statistics are given in parentheses under the coefficients.

[a]Statistically significant at the 10-percent level.

*Statistically significant at the 5-percent level.

**Statistically significant at the 1-percent level.

higher prices. We explain how market power can increase in mergers with no overlapping routes or common hubs within the context of multimarket contact in the next section.

For the failing-firm mergers, the change in concentration has no significant impact for any of the subsamples during the announcement period, although the decreases in relative fares are large and significant for all subsamples. Apparently, the failing firms are more interested in cutting prices than in exercising market power until the merger is consummated. During the completion period, the concentration coefficient becomes significantly positive in three out of four subsamples. Thus, even in mergers involving failing airlines, the market power seems to play an important role once the financially troubled firm is successfully merged with a presumably more solvent acquirer.[37]

Finally, the results for rival firms reported in panel B of Tables 3 and 4 are generally consistent with those for merging firms. This again confirms our claim that the joint effect of market power and efficiency gains

[37]The only exception to the above generalization is again the subsample Hub Only; its concentration coefficient is not significantly different from zero during the completion period. Like normal-firm mergers during the announcement period, subsample Hub Only does not show evidence of increased market power when all other subsamples do. Thus, when routes affected by a merger have only common hubs, the market-power effect does not dominate efficiency gains. This is true regardless of the financial situation of the acquired firm.

has similar pricing implications for both merging and rival firms.

F. *Multimarket Contact*

In the preceding subsection we documented that airfares increase with increases in concentration for subsample Neither, which consists of nonoverlapping routes with no common hubs. This is surprising because, unless the merging firms serve the same route or have indirect control of a route through a common hub, a merger should leave the level of competition and prices in that market unaffected.

A possible explanation for this apparent puzzle can be found in the literature on multimarket contact.[38] Alfred E. Kahn (1950) and Corwin D. Edwards (1955) advance the notion that when firms face each other in a web of markets, they compete less vigorously by allowing each other more or less exclusive spheres of influence. More recently, John T. Scott (1982) suggests that multimarket contact can increase the recognition of mutual dependence and make oligopolistic consensus more likely, and B. Douglas Bernheim and Michael D. Whinston (1990) show that increased multimarket contact relaxes the incentive constraints that limit the extent of collusion, increasing the probability of tacit collusion under most circumstances.[39] The influence of multimarket contact on pricing behavior can also be applied to airline mergers. When airlines face each other in several markets they may compete less vigorously due to the fear of retaliation. Acquisition of a competitor has the effect of extending and creating alliances on routes where either of the merging firms was operating previously. Thus, multimarket contact will increase market power even on routes where the merging firms do not have direct contact.

To illustrate, consider three separate routes, AB, CD, and EF, and three airlines X, Y, and Z. Assume that X and Y operate on route AB with 80 percent and 20 percent shares, respectively. They also operate on CD with 20 percent and 80 percent shares, respectively. On route EF, airlines Y and Z operate with 20 percent and 80 percent shares, respectively. First consider routes AB and CD. Assume that Y, which has a small presence in AB, can increase its market share by reducing the fare. However, X may retaliate, not by reducing fares in AB, but by reducing fares on CD, where Y is dominant. The threat of such retaliation may prevent X and Y from competing vigorously on routes AB and CD; but there is nothing to restrain Y from cutting fares on route EF, because there is no retaliatory threat from Z. Therefore the fares on route EF will be more competitive than the fares on routes AB and CD. However, a merger between X and Z will put X in a position to retaliate if Y reduces fares on EF. This may restrain the competitive intentions of Y and raise the price on route EF even though X and Z have no direct contact on route EF.

The case of Northwest and Midway is illustrative. In 1989, Midway Airlines cut its prices in Milwaukee, an important market for Northwest. Northwest retaliated, not by matching fare cuts in Milwaukee, but by slashing fares at Midway's Chicago hub, where the fare cuts would hurt Midway the

[38]There are other possible explanations. First, creation of a larger firm due to a merger may result in a frequent-flyer program that is greater than the sum of frequent-flyer tickets issued by the two premerger firms. Because we exclude frequent flyers from our analysis, the fare changes could be overstated. However, frequent-flyer tickets constitute only about 1 percent of the tickets written in our data base.

A second and more plausible explanation is that, even for routes in subsample Neither, a merger can reduce the number of airlines with gates on either side of the route, if the merging airlines operate from the same airport. To the extent that airlines with gates on either side of the route pose a greater threat of new entry than others, a merger reduces the threat of potential competition due to new entry. This explanation is not mutually exclusive with multimarket contact.

[39]Scott (1982) uses data for manufacturing firms and John E. Martinez (1990) uses data for banking firms to show that the firms which have grown interdependent in several markets compete less vigorously. Scott (1989, 1991) also provides evidence of how multimarket contact reduces rivalry among firms through *conglomerate* mergers.

most. The retaliation prompted Midway to end its Milwaukee fare cut earlier than planned. Passengers sued Northwest for denying them lower fares. Northwest settled the suit in 1991 without admitting wrongdoing.[40] In addition to this anecdotal evidence, William N. Evans and Ioannis N. Kessides (1991) show that fares in airline markets are positively correlated with the level of multimarket contact.

G. *Other Considerations*

Although we attribute documented price increases to a greater exercise of market power, at least two competing explanations exist. One explanation is that an excess supply of air transportation service existed prior to (or during) the sample period, and mergers provided a means by which the industry could restore a competitive price equilibrium by reducing the supply. However, there is no evidence of a reduction in supply for the industry as a whole over the sample period. According to *Aerospace Facts and Figures 1989/1990*, the available seat-miles (number of seats in a plane multiplied by the distance traveled) for all certificated carriers show a steady increase from 1984 through 1988.[41] There was also a steady increase in demand over the same years.[42] A study by the U.S. Department of Transportation (1990), which is based on the same data base as ours, reports an increase in daily revenue passenger-miles from 183 million for the year ending December 1984 to 243 million for the year ending September 1988. If the mergers during the sample period were merely correcting an oversupply, we should not have observed such an increase in both the supply of and demand for air transportation.

The other possible explanation is that the price increases may reflect an improvement in quality. Although quality is difficult to measure, the quantifiable measures of quality include number of customer complaints, frequency of direct flights,[43] and time required to fly from origin to destination. As noted earlier, out of the 41 mergers that could be identified following the 1978 Airline Deregulation Act until 1988, nearly two-thirds took place during 1985–1988. Moreover, most of the major airlines were involved in a merger during this period.[44] Thus, if mergers result in quality improvements, we should detect a quality enhancement as measured in these dimensions during our sample period. On the contrary, the number of complaints filed with the governing agency increased almost threefold, from 1.49 per 100,000 passengers in 1984 to 4.43 per 100,000 passengers in 1988.[45]

Furthermore, mergers do not appear to have helped passengers in flying directly to their destinations. The study by the U.S. Department of Transportation (1990) shows a small decline in the number of direct markets (routes served by airlines without a change of plane), from 5,412 in July 1984 to 5,314 in July 1988. Also, in 1984, 71.5 percent of the passengers flew on direct flights, whereas by September 1988 this proportion had declined to 65.6 percent. In terms of revenue passenger-miles, the figures are 60.7 percent and 54.1 percent.

[40]For more details, see the *Wall Street Journal* (17 May 1991). In addition, according to the *Wall Street Journal* (9 October 1990, p. B1), an internal pricing policy memo of Northwest states, "Attempts to use price to improve market share will be countered immediately and rendered ineffective."

[41]The available seat-miles were 516 billion in 1984, 548 billion in 1985, 607 billion in 1986, 649 billion in 1987, and 677 billion in 1988.

[42]The number of revenue passenger-miles (number of passengers multiplied by the number of miles traveled) were 305 billion in 1984, 337 billion in 1985, 366 billion in 1986, 405 billion in 1987, and 423 billion in 1988. Comparison of these revenue passenger-miles with available seat-miles, reported in footnote 41, indicates that capacity utilization improved from 59.1 percent in 1984 to 62.5 percent in 1988.

[43]Direct flights refer to flights which do not involve a change of plane. They include both nonstop and stopping flights. The data base does not distinguish between the two types of direct flights.

[44]The only notable exceptions are Pan Am and United Airlines.

[45]The data are compiled based on statistics reported in *Air Transport World*. The consumer complaints peaked to 8.59 per 100,000 passengers in 1987 when the Airline Passenger Protection Bill was passed by the Congress.

Finally, on the time required to fly from origin to destination, Stephen A. Morrison and Clifford Winston (1986) report that the average time for air travel on similar routes increased by 5.4 percent from 1977 to 1983, which they attribute to the "hub-and-spoke" operations and the concomitant increase in airport congestion.[46] Mergers may lead to larger hub-and-spoke operations at the common hubs of the merging airlines (see Jan K. Brueckner et al., 1990). Thus, in terms of the three quantifiable measures of quality, there is no evidence of quality improvement in the service provided by airlines during the sample period.

IV. Summary and Conclusions

Our examination of price changes associated with airline mergers reveals evidence of the exercise of increased market power. In general, routes affected by mergers show significant increases in airfares relative to the control group. These price increases are positively correlated with changes in concentration and do not appear to be the result of an improvement in quality or of an industry-wide contraction of air services to rectify a supply–demand imbalance. The fare changes are also positively related to the distance of routes, suggesting that airlines exploit greater market power on longer routes for which substitution by other modes of transport is less likely.

We observe distinctly different pricing effects between mergers that involve financially distressed firms and those that do not. When mergers involve only "normal" firms, most of the effect of increased market power takes place during merger discussion. Efficiency gains start to kick in after merger completion, mainly for routes with potential sources of direct operating synergies, such as routes on which the merging firms have common hubs or provide overlapping service. For these routes, efficiency gains offset much of the impact of increased market power.

For routes on which the merging firms have neither common hubs nor overlapping service, we observe no such offsetting effect of efficiency gains. We only observe a persistent exercise of market power throughout merger discussion and merger completion. While the absence of efficiency gains is expected, the presence of market power is surprising. One might expect that, unless the merging firms serve the same route or have indirect control of a route through a common hub, a merger should leave the level of competition and prices in that market unaffected. We explain this apparent puzzle in the context of multimarket contact. Airlines face each other in several markets and hence may compete less vigorously in one market due to the fear of retaliation in another. Acquisition of a competitor, even when it has no direct contact with the acquirer, has the effect of strengthening existing alliances or creating new ones on routes where the merging firms are operating.

For mergers in which the acquired firm was in financial distress, we observe airfares well below the industry level prior to merger discussions, with further reductions throughout merger talks until merger completion. Upon merger completion, the merged firm raises fares drastically, though the increased fares still remain below the industry level. This pricing pattern is closely matched by the rival firms. Presumably, the exit of a noncooperative firm enables greater collusion among the remaining airlines.

The parallel pricing behavior between merging and rival firms is evident for all mergers for all periods under all regression specifications. Apparently, the joint effect of market power and efficiency gains due to mergers has similar pricing implications for both merging and rival firms. The parallel movement in prices raises the possibility that tacit cooperation exists among airlines in setting prices.

Finally, the results of this study have important policy implications. They show that relaxation of the antitrust policy for airline mergers during the sample period did per-

[46]A hub-and-spoke operation is a system in which flights from numerous points (spokes) arrive at and then depart from a common point (hub) to their ultimate destinations. In this manner, feed traffic from spoke points is collected at hubs and then consolidated. The earlier system was a linear system in which a carrier provides crisscrossing flights between cities serviced by it.

mit greater exercise of market power. On the whole, market power dominated efficiency gains, making the consumer worse off. In addition, the results demonstrate that the market power derived from multimarket contact deserves attention from the regulators. While market power derived from an increase in concentration is moderated by efficiency gains, the exercise of market power due to multimarket contact has no redeeming features.

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