Predatory Practices in the U.S. Airline Industry

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I. Executive Summary

This report examines the potential for predatory practices, or unfair methods of competition, in the U.S. domestic airline industry. Two main conclusions emerge from this analysis. The first is that predatory practices may have occurred in the past and are a recurring possibility in the U.S. domestic airline industry. For such predatory practices to be a rational business strategy, there must be some expectation that any losses or reduced profits incurred while driving a rival from the market can be recouped through higher prices once the rival has left the market. This study concludes that there is sufficient market power in the airline industry, as shown by the persistence of hub premiums at many airports, to allow recoupment of losses incurred in driving a competitor from a market.

The second conclusion is that the antitrust laws, as they have been applied in other industries, may not be sufficient to identify some types of predatory practices in the airline industry. Competition policy must recognize the diverse nature of airline competition, taking into account pricing, capacity, service, and related activities and constraints that affect airline travelers.

II. Overview

Section III of this paper describes entry and competition in the U.S. airline industry. The section starts with a brief historical background of how competition has evolved in the industry since deregulation. Particular emphasis is placed on the increasingly important role that low-fare and new-entrant carriers have played in bringing the benefits of competition to consumers. The paper next turns to some examples of incumbent airline responses to competitive entry by low-fare new-entrant carriers. These examples illustrate the kinds of concerns that have been growing regarding competition policy. The paper discusses whether the competitive response to low-fare new entrants is similar to the competitive response to entry by other network airlines or by Southwest Airlines. We find that responses by the major network airlines to low-fare new entrants were much stronger and more vigorous than responses to other new entry. The section also discusses network airlines' creation of low-fare subsidiary airlines such as Metrojet, Shuttle by United, and Delta Express.

Section IV turns to an economic analysis of predatory conduct. The section begins with a brief discussion of the cost/price test proposed by Areeda and Turner and how it has been applied in some lawsuits involving predatory pricing in other industries. The paper then raises potential problems with a narrowly-defined application of the Areeda-Turner standard. Some of these criticisms may be particularly relevant in attempting to apply Areeda-Turner standards to the airline industry. The paper then turns to other approaches that have been proposed to address predatory practices and unfair methods of competition. Two approaches that might have relevance for the particular problems posed by the airline industry are a two-part test proposed by Joskow and Klevorick and an output test proposed by Williamson. We think these approaches, or variants of them, warrant consideration as an aspect of competition policy for the airline industry.

Section V discusses issues in applying these concepts and approaches to predatory behavior in the airline industry. The section begins with a discussion of the applicability and issues involved in trying to apply a narrowly defined cost/price test to the airline industry. Specifically, we believe that the case-specific competitive responses must be considered in determining how cost-price tests might be constructed and evaluated for predatory practices. For example, since aircraft costs are likely to be variable in terms of what routes they are flown, cost definitions that include lease or rental costs of capital may be particularly appropriate in cases where entry responses include capacity or frequency additions. However, we also believe that even a broadly-defined cost/price standard may not reach all aspects of potentially predatory behavior in the airline industry. We also address concerns that policies directed at predatory practices and unfair methods of competition might limit airlines in engaging in legitimate competitive responses to entry.

The section next turns to a description of the multiple competitive tools that airlines have at their disposal, including a discussion of the effects of yield management systems on capacity planning across fare categories. The section next discusses flight frequency, capacity, scheduling, frequent flier programs, travel agent commission overrides, and the competitive use of route networks. The role of signaling and the airlines' past use of signaling is also discussed. Section V next discusses the very large effect on fares that can result from the presence of a low-fare carrier in a market.

Market power as evidenced by the persistence of hub premiums is discussed next. Without sufficient market power, airlines would not be able to recoup the economic losses incurred in attempting to drive a low-fare new entrant from a market. We believe that there is strong evidence that the airlines possess persistent market power in some city-pair routes principally involving their hub airports. The evidence also indicates that the participation of a low-fare carrier in markets at a network hub airport reduces the market power (and the corresponding hub premiums) of the major network airlines. The paper concludes in Section VI with a summary of the challenges posed in developing a competition policy for the airline industry.

III. Entry and Competition in the U.S. Airline Industry

This section begins with some historical background. It then turns to two examples of recent airline competitive behavior that raises questions and concerns about the competitive practices used by the major airlines. The section then provides evidence about the changing nature of competition and entry in the airline industry.[1]

The section then discusses when predatory practices might be a rational strategy for an airline. This issue hinges on the extent to which the major network carriers have market power in routes to and from their hub airports. Empirical evidence on market power at hub airports is presented. Additional topics addressed are the extent to which the major airlines' competitive actions can influence new entrants' access to capital markets and how a major carrier's actions in one market or a small set of markets acts as a signal to other prospective entrants.

Historical Background

The underlying premise of airline deregulation was that competition among airlines would replace government regulation in determining fare and service offerings. For the most part in the past 20 years, where there has been effective competition, fares have been low and service has been responsive to consumer needs.[2] The early years of airline deregulation were characterized by periods of intense competition among the major established airlines as well as by competition from new-entrant carriers and from carriers formerly confined to intrastate markets.[3] In the mid to late-1980s, however, there was considerable industry consolidation as a

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[1] Throughout this paper, a distinction is made between Southwest Airlines and other low-fare carriers on the one hand and major network full-service carriers on the other. Some clarification of this terminology is needed. Majors are defined by the Department of Transportation as those airlines with annual operating revenues of over $1,000,000,000. For the purposes of this paper, however, we use the term major airline to mean those passenger airlines with 1996 operating revenues of over $3 billion whose operations are dominated by hub-and-spoke route networks and who offer both first class and coach service. These carriers are American, Continental, Delta, Northwest, Trans World, United, and USAirways. Southwest Airlines meets the $3 billion revenue criterion and operates some routes as a hub-and-spoke system, but focuses on low fare service. When the term "major network airline" is used in this paper, it refers to the major carriers excluding Southwest.

[2] See Elizabeth E. Bailey, David R. Graham, and Daniel P. Kaplan, *Deregulating the Airlines* (Cambridge: The MIT Press, 1985), John R. Meyer and Clinton V. Oster, Jr. with John S. Strong, Jose A. Gomez-Ibanez, Don H. Pickrell, Marni Clippinger, and Ivor P. Morgan, *Deregulation and the Future of Intercity Passenger Travel* (Cambridge, The MIT Press, 1987), and Steven A. Morrison and Clifford Winston, *The Evolution of the Airline Industry* (Washington, The Brookings Institution, 1995).

[3] For accounts of competition during the early years of deregulation and of the initial wave of new-entrant airlines, see John R. Meyer and Clinton V. Oster, Jr., Editors, *Airline Deregulation: The Early Experience* (Boston,

wave of mergers struck the industry. Table 1 lists the mergers that took place between 1985 and 1987. While some of these mergers involved the acquisition of very small carriers, others involved the acquisition of larger carriers such as Frontier, Republic, Eastern, Ozark, Western, and Piedmont. Still other mergers involved the acquisition of carriers who had been pursuing a low-fare strategy similar to Southwest's, such as People Express, Air Cal, and Pacific Southwest. Some research has found that the industry consolidation that occurred through these mergers contributed to higher fares and an increase in market power.[4]

In the years between the onset of airline deregulation in 1978 and the wave of mergers beginning in 1985, most of deregulation's benefits to consumers came in the form of improved service and lower fares created by competition from new entrants and from the major network carriers themselves.[5] The ability to serve new and growing markets, to fashion more extensive route networks, and to charge low fares had been severely constrained by regulation. These reconfigured services could be implemented in no small degree due to innovations in technology that enabled the development of sophisticated yield management systems. Such systems allow airlines to offer and to quickly change the mix of high and low-fare seat capacity on a given flight, as well as manage both origin and destination and flow traffic over the entire network.

As the constraints on airline operations were lifted by deregulation and the airlines quickly exercised their new route and fare freedoms, consumers in many markets reaped substantial benefits. Following the late-1980s mergers, however, the source of deregulation's benefits began to change. The benefits gradually became less attributable to the actions of the major network airlines and more attributable to the actions of a small number of low-fare carriers. By the late 1990s, the major airlines' domestic route networks had become fairly stable and were built around hub airports typically dominated by a single carrier. These hub-based networks established geographic areas in which each major network airline has substantial presence and market power, especially in short-haul, smaller markets. As a result, the benefits of deregulation have increasingly come from competition among major network carriers in long-haul markets and from lower fares in short-haul markets served by low-fare carriers such as Southwest. Southwest's role in bringing the benefits of deregulation to travelers has become increasingly important. Other low-fare carriers might serve a similar function, but to date, none has achieved the size or impact of Southwest. In many of the markets not served by low-fare carriers, the benefits of deregulation may well be eroding. To be sure, entry by a low-fare carrier either into the industry or into a new market is not easy. New business ventures in all industries have a high failure rate, and new airlines are no exception. However, it is important that new airlines (or established airlines entering new markets) have an opportunity to compete for business on the basis of the product or services they offer, rather than be forced to contend with predatory practices by the incumbent carriers.

Massachusetts: Auburn House, 1981) and John R. Meyer and Clinton V. Oster, Jr., with Marni Clippinger, Andrew McKey, Don H. Pickrell, John Strong, and C. Kurt Zorn, *Deregulation and the New Airline Entrepreneurs* (Cambridge, Massachusetts: The MIT Press, 1984).

[4] E. Han Kim and Vijay Singal, "Mergers and Market Power: Evidence from the Airline Industry," *American Economic Review*, Vol. 83, No. 3, June 1993, pages 549-569.

[5] Steven Morrison and Clifford Winston, *The Economic Effects of Airline Deregulation* (Washington: The Brookings Institution, 1986).

Table 1: Airline Mergers in the 1985-87 Period

Acquiring Airline	Passengers (thousands)	Acquired Airline	Passengers (thousands)	Final Bid
Southwest	10,698	Muse	1,980	March 11, 1985
Piedmont	14,274	Empire	1,084	October 3, 1985
People	9,100	Frontier	7,068	October 9, 1985
Northwest	14,539	Republic	17,465	January 24, 1986
Texas	19,640	Eastern	41,662	February 24, 1986
TWA	20,876	Ozark	5,541	February 28, 1986
Alaska	3,132	Jet America	774	September 8, 1986
Delta	39,804	Western	9,062	September 10, 1986
Texas	19,640	People	11,907	September 16, 1986
American	41,165	Air Cal	4,451	November 18, 1986
Alaska	3,132	Horizon	942	November 20, 1986
USAir	19,278	Pacific Southwest	9,049	December 9, 1986
USAir	21,725	Piedmont	22,800	March 6, 1987
Braniff	2,557	Florida Express	1,415	December 15, 1987

Source: U.S. Department of Transportation, Air Carrier Traffic Statistics

Some Examples that Raise Concern

In recent years, some of the incumbent network carriers' responses to entry by low-fare carriers have given rise to concerns about the use of what might be termed predatory practices or unfair methods of competition. Two examples of recent airline competitive behavior illustrate these concerns. The first, involving the Reno-Minneapolis market, raises questions because a major network carrier added new "mini-hub" service overlaid on the entrant's network, and then pulled back after exit of the new carrier. The second example, involving the Detroit-Philadelphia market, raises questions about the ability of incumbents to "dump" large quantities of low-fare seat capacity in response to entry, even though the network carrier did not make major changes in the number of flights or in total seats available. Together, they raise potential issues for competition policy.

Reno – Minneapolis. The first example involved Reno Air's attempt to launch nonstop service between Reno, Nevada and Minneapolis, Minnesota in 1993. Northwest had previously served that market, but had withdrawn during the third quarter of 1991. Reno Air had begun operations from Reno on July 1, 1992. On February 10, 1993, Reno Air announced that it would initiate three daily nonstops between Reno and Minneapolis on April 1.

The next day, February 11, Northwest announced that it would also begin three daily nonstops between Reno and Minneapolis on April 1. The following day, February 12, Northwest announced it would also begin daily nonstops from Reno to Los Angeles, Seattle, and San Diego on April 1. These were all markets served by Reno Air and not previously served by Northwest. Northwest also announced that it would begin a second daily trip from Reno to Seattle on May 1. Finally, Northwest also announced that it would offer bonus frequent flier miles for Reno residents on these routes and that it would offer special travel agent commission overrides on

flights to or from Reno.[6]

Two days later, on February 14, Northwest announced fares to match Reno Air's fares on the Reno to Minneapolis routes. Northwest initially announced fares that would be lower than Reno Air's fares. Northwest also announced that fares for its nonstop flights between Minneapolis and Los Angeles, San Francisco, San Diego, Seattle, Ontario (California) and Portland would be the same as those for Reno Air's connecting service via Reno. Reno Air began Reno to Minneapolis service on April 1 as originally intended, but by May 20 losses forced it to reduce its service to one flight a day. On June 1, 1993, Reno Air exited the Reno to Minneapolis market.

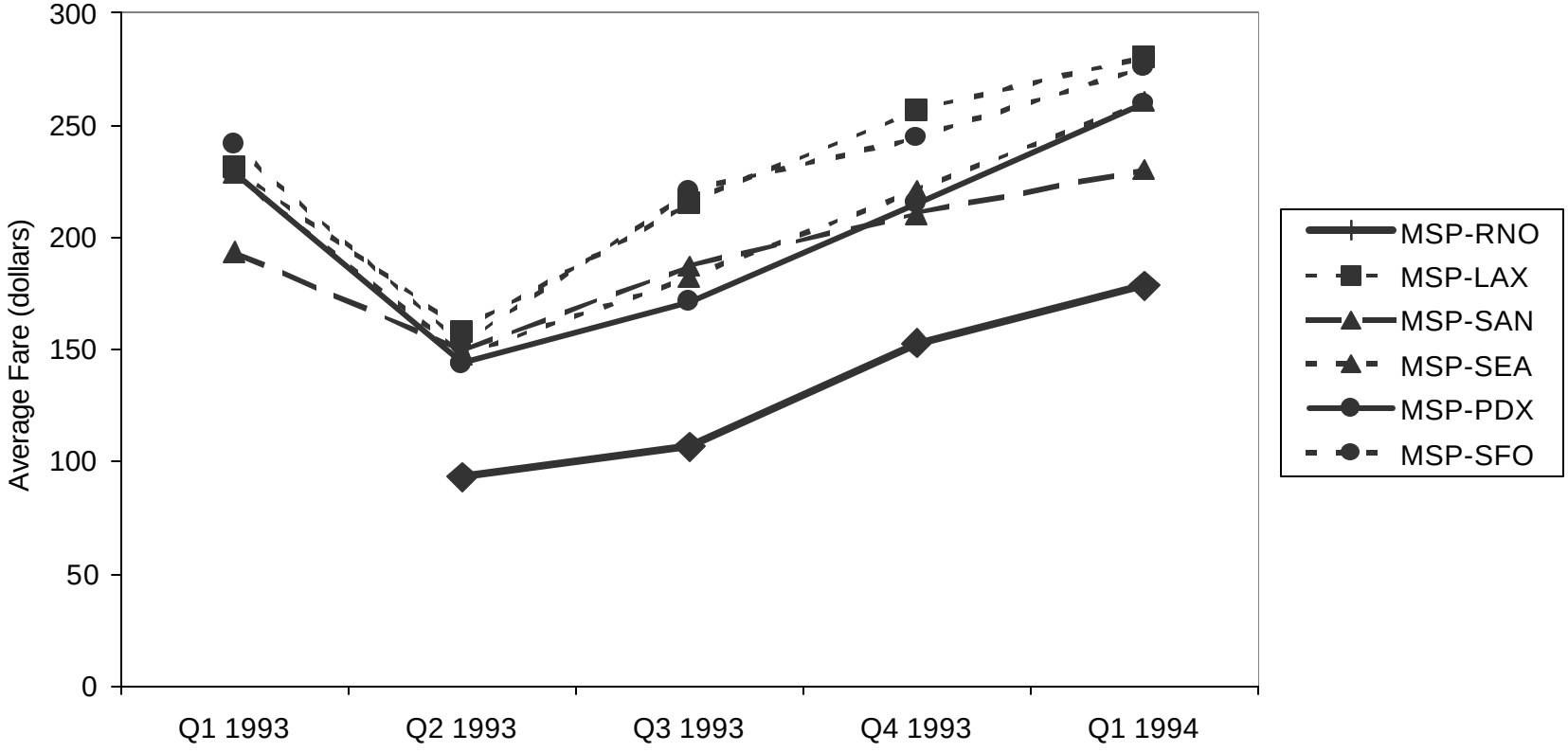
Northwest's fares between Minneapolis and Los Angeles, San Francisco, Seattle, Portland, and San Diego all dropped sharply in response to Reno's entry into the Reno to Minneapolis market. Following Reno's exit from the Reno to Minneapolis market, these fares increased quickly and steadily, as shown in Figure 1. In the spring of 1999, Northwest remained in the Reno to Minneapolis market with two nonstops a day. Northwest's round trip fares for this service ranged from $345 to $668 for capacity-controlled seats with advance purchase, minimum stay, and maximum stay requirements. Northwest also offered a $948 round trip fare with advance purchase and minimum stay requirements, but no maximum stay requirement. The lowest unrestricted round trip Northwest fare was $1,476. Other airlines offered only connecting service through their respective hubs. For this connecting service, none of these airlines offered a capacity-controlled restricted fare of less than $345.

Detroit – Philadelphia. A second example involves competition in the Detroit - Philadelphia market. Spirit Airlines entered this market on December 15, 1995 with a single DC-9 daily round trip with one-way fares ranging from $49 to $139. In the first quarter of 1996, Spirit carried 11,770 passengers at fares between $50 and $75.[7] During that quarter, Northwest Airlines carried almost 32,000 passengers but only 1,220 of these passengers were at fares between $50 and $75. The second quarter of 1996 Spirit introduced a second round-trip, enabling travelers to travel outbound in the morning and return in the evening of the same day. Spirit's traffic increased 57 percent to 18,749. Northwest's traffic also increased 36 percent to 43,520 during the second quarter, but its traffic in the $50 to $75 fare class increased only 11 percent to 1,360. During the second quarter of 1996, Spirit also entered the Detroit - Boston market, a market also served by Northwest, with one-way fares ranging from $69 to $159.

[6] Travel Agent Commission Overrides, or TACOs as they are sometimes known, are special bonus commissions paid by an airline to travel agents as a reward for booking a targeted proportion or number of passengers on that airline. Such overrides, which travelers are typically not aware of, provide incentives to travel agents to steer some travelers from one airline to another. These overrides can also serve as a barrier to entry.

[7] An advertised $49 fare falls into the $50-$75 fare category once applicable taxes and fees are added.

Figure 1: Northwest Response to Reno



Source: U.S. Department of Transportation based on Data Bank 1a.

In the third quarter, Northwest responded in the Detroit – Philadelphia market by selling 49,760 seats in the $50 to $75 fare category (matching Spirit's $49 fare), an increase of 48,400 seats. Thus, Northwest sold over 35 times as many low-fare seats as it had in the previous quarter. As a result of this enormous increase in low-fare seats, Northwest's revenue, which had increased 22 percent between the first and second quarters, dropped 37 percent. Spirit's load factor dropped from 86 percent in the second quarter to 39 percent in the third quarter. Spirit exited the market on September 30, 1996 after this third quarter response. Following Spirit's exit, Northwest then dropped the number of low fare seats to 27,100 in the fourth quarter and dropped them again to only 910 in the first quarter of 1997. Northwest's revenues during these periods following Spirit's exit were substantially higher than in the earlier quarters when Spirit was in the market.

The point of these examples is not to present definitive cases of predatory practices. Rather it is to show the kind of conduct that has given rise to concerns that predatory practices may exist in the airline industry and to show situations that probably warrant a closer look.[8] For example, one would want to assess the history of traffic in the markets including any seasonality or special events that might have influenced the amount of travel. One would also want to examine general macroeconomic conditions and compare traffic and the conduct of the airlines in the markets under review with traffic and the conduct of the airlines in other similar markets. Similarly, one would want to examine the extent to which a range of competitive tools available to the airlines was used in these markets. Finally, there would need to be a detailed review of the timing, nature, and consequences of the response to entry.[9]

Other Examples of Potential Anti-competitive Behavior in Response to Entry

Table 2 summarizes responses to entry in 12 selected markets, all of which involve a short- to medium-haul flight and involve a major network carrier hub at one or both ends.[10] These markets are the kinds that typically have been dominated by a network carrier with hub-and-spoke operations, and that have had less effective competition. The route and hub dominance is important because it indicates both the opportunity for low-fare entry as well as the incentives and potential ability of major incumbents to recoup the short-run costs of predatory

[8] The Department of Transportation received 32 informal complaints about unfair competitive practices between 1993 and 1999. Half of these complaints involved allegations of unfair pricing and capacity responses - the dumping of low-fare capacity in the city-pair market, and in some cases the adding of flights. Others involved allegedly unfair uses of marketing and airport handling relationships, such as higher travel agent commissions.

[9] In response to DOT's initial concerns about apparent anti-competitive responses to entry, Dresner and Windle examined the period from the third quarter of 1991 through the second quarter of 1997 and found "little or no evidence of practices by major incumbent carriers against new entrants that can be deemed predatory, rather than normal competitive behavior." ("Assessing Competitive Behavior By U.S. Air Carriers," by Martin Dresner and Robert Windle, Submission to Docket OST-98-3713, July 24, 1998) Unfortunately, the data used in their study do not allow an examination of either the capacity response or the fare response in sufficient detail. For example, these data do not indicate how much capacity either the entering carrier or the incumbents offered, nor do they indicate how many seats were sold in each of the fare categories. A second drawback results from the limited number of markets, in this case only the top 500 city-pair markets, that were included. Much of the new entry by start up low-cost carriers is in markets not included in this study. For example, the Reno – Minneapolis market discussed above is excluded. Thus, the kinds of competitive responses which raise concern about predatory practices would be very difficult to detect using these data and their methods.

[10] This section draws from Transportation Research Board, *Entry and Competition in the U.S. Airline Industry*, Special Report 255, (Washington: National Academy Press, 1999), pp. 87-93.

Table 2
Entry Patterns into Hub Airports

			Quarter Before Entry					Second Quarter After Entry					Eighth Quarter After Entry					
Entry Year-Quarter	City-Pair	Carrier	Avg Fare	Seats Available	Flights	Avg Load Factor	Revenue	Avg Fare	Seats Available	Flights	Avg Load Factor	Revenue	Avg Fare	Seats Available	Flights	Avg Load Factor	Revenue	Status of New Entrant
96-2	DTW-BOS	Incumbent	$257	227,400	648	57%	$215,860,632	$99	306,700	832	82%	$207,150,578	$232	273,800	675	71%	$304,427,268	
		New Entrant	-	-	-	-		$70	12,400	71	27%		-	-	-	-		exited
96-1	ATL-MOB	Incumbent	$186	202,900	700	73%	$192,848,334	$112	207,000	725	70%	$117,658,800	$88	209,800	712	70%	$92,016,602	
		New Entrant	-	-	-	-		$42	17,000	75	51%	$273,105	$54	45,000	205	34%	$1,693,710	competing
95-4	DTW-PHL	Incumbent 1	$165	150,100	523	67%	$86,784,293	$221	133,400	491	57%	$82,509,594	$189	153,700	516	52%	$77,945,082	
		Incumbent 2	$179	48,800	242	56%	$11,837,943	$233	42,200	210	46%	$9,498,292	$206	81,500	394	53%	$35,058,790	
		New Entrant	-	-	-	-		$55	15,100	76	71%	$448,138	-	-	-	-		exited
95-3	PIT-BOS	Incumbent	$130	209,400	856	72%	$167,774,630	$135	228,400	788	69%	$167,650,625	$177	202,800	824	74%	$218,877,011	
		New Entrant	-	-	-	-		$84	NA	NA	NA		-	-	-	-		exited
95-2	MSP-MCI	Incumbent	$201	92,800	407	52%	$39,476,786	$69	141,700	603	70%	$41,269,983	$78	150,300	676	75%	$59,437,638	
		New Entrant	-	-	-	-		$43	11,300	30	NA		$60	43,000	160	55%	$2,270,400	competing
95-2	DFW-ICT	Incumbent 1	$111	27,300	430	46%	$5,993,933	$65	47,900	820	58%	$14,807,806	$89	54,200	673	68%	$22,075,638	
		Incumbent 2	$126	22,100	482	32%	$4,294,967	$126	18,200	510	41%	$4,795,081	$100	15,700	525	66%	$5,440,050	
		New Entrant	-	-	-	-		$44	24,300	189	60%	$1,212,473	-	-	-	-		exited
94-4	DFW-MCI	Incumbent 1	$111	99,500	732	70%	$56,592,018	$91	99,500	779	79%	$55,722,298	$88	139,400	1087	79%	$105,342,127	
		Incumbent 2	$114	60,200	537	57%	$21,006,345	$68	20,000	176	53%	$1,268,608	-	-	-	-		
		New Entrant	-	-	-	-		$50	18,300	146	58%	$774,822	$63	21,700	173	70%	$1,655,558	competing
97-2	ATL-CLT	Incumbent 1	$205	192,800	686	56%	$151,835,398	$227	203,800	717	70%	$232,191,989	$162	228,600	805	68%	$202,719,737	
		Incumbent 2	$190	136,200	574	54%	$80,211,449	$57	129,000	592	67%	$29,164,939	$153	126,300	572	56%	$61,898,316	

Table 2

Entry Patterns into Hub Airports

			Quarter Before Entry					Second Quarter After Entry					Eighth Quarter After Entry					
Entry Year-Quarter	City-Pair	Carrier	Avg Fare	Seats Available	Flights	Avg Load Factor	Revenue	Avg Fare	Seats Available	Flights	Avg Load Factor	Revenue	Avg Fare	Seats Available	Flights	Avg Load Factor	Revenue	Status of New Entrant
		New Entrant	-	-	-	-		$55	50,800	221	37%	$2,284,654	-	-	-	-		exited
96-4	ATL-MCI	Incumbent	$119	183,700	639	80%	$111,749,854	$111	175,200	626	81%	$98,608,972	$141	186,300	642	78%	$131,541,139	
		New Entrant	-	-	-	-		$79	39,700	155	43%	$2,090,344	$129	65,000	269	82%	$18,495,633	competing
96-1	ATL-PIT	Incumbent 1	$168	153,600	538	59%	$81,909,596	$93	147,000	544	77%	$57,265,085	$217	144,100	530	58%	$96,123,058	
		Incumbent 2	$161	90,300	434	59%	$37,226,771	$86	121,100	520	61%	$33,035,111	$203	87,800	395	58%	$40,833,409	
		New Entrant	-	-	-	-		$79	40,900	181	50%	$2,924,146	-	-	-	-		exited
95-1	ATL-DTW	Incumbent 1	$184	165,600	493	67%	$100,646,778	$108	204,209	515	64%	$72,691,869	$111	238,400	630	75%	$125,034,840	
		Incumbent 2	$177	131,900	527	57%	$70,129,951	$93	172,600	694	68%	$75,751,655	$95	173,900	697	71%	$81,754,998	
		New Entrant	-	-	-	-		$86	53,000	237	50%	$5,401,230	$99	31,100	143	55%	$2,421,555	competing
94-3	ATL-DFW	Incumbent 1	$185	213,000	779	59%	$181,109,321	$104	188,400	799	78%	$122,111,234	$100	346,800	1283	64%	$284,764,416	
		Incumbent 2	$217	425,000	1100	68%	$689,843,000	$158	471,500	1166	65%	$564,612,763	$115	545,500	1491	72%	$673,445,934	
		New Entrant	-	-	-	-		$86	74,400	329	64%	$13,472,471	97	77,000	333	44%	$10,943,579	competing

Source: Transportation Research Board, *Entry and Competition in the U.S. Airline Industry*, Special Report 255, (Washington: National Academy Press, 1999), pp. 90-91.

practices.

In 10 of the 12 cases in Table 2, the new entrant's fare was at least 50 percent lower than the average fare of the incumbent(s) during the quarter preceding entry. In three-fourths of the cases, within two quarters the average fare of the incumbent fell by 1/3 or more, and in four cases total incumbent passenger traffic rose by more than 1/3. (Due to the lack of fare data by category, the table is unable to shown the extent to which large "buckets" of low-fare seats were made available by either the incumbent or the new entrant.)

Within eight quarters after entry, the new entrant had exited in half the cases, while in two additional markets load factors were so low that survival was uncertain. In three of the six cases where the entrant exited, average fares then rose to above pre-entry levels, while in the other three markets average fares rose above the level of the entry period. In contrast, fares remained lower in all but one of the markets in which entry was sustained.

The revenue behavior for the incumbent carriers in these twelve cases is of prime importance in evaluating the incentives and viability of predation. In four of the six cases in which the new entrant remained in the market, revenues of the incumbent carrier eight quarters after entry were lower than they had been in the quarter before entry. But in 5 of the 6 cases in which the new entrant exited the route, total incumbent revenues eight quarters later not only were higher, but also had increased sufficiently to offset any revenue losses that came from additional low-fare traffic during the period that the new entrant was in the market. This indicates that predatory practices may be a rational strategy in the airline industry, in that short-run revenue losses may be recouped in the longer term.

There is no doubt that it may be difficult to predict predation, or to define "bright-line" rules for when it has occurred. The entry events in Table 2 are not necessarily meant to indicate examples of predatory practices. However, they do suggest that low-fare entry is feasible in some network markets. In six of the twelve markets, the new entrant was still providing service in the eighth quarter after entry. For incumbent carriers, short-run revenue losses might be recouped within a short period if the new entrant is forced to leave the market. Responses by major network incumbents to new entry may drive entrants from specific routes and provide a signal to other prospective entrants that despite high fares being charged in some markets, any new entry will be met with a response that renders the entrant's operations unprofitable.

Trends in Entry Activity

In a paper commissioned for the TRB study *Entry and Competition in the U.S. Airline Industry*, Dresner and Windle examined patterns of entry and exit for the period 1989-1998.[11] The rate of route entries by the major network carriers declined throughout the decade, indicative of an airline market characterized by dominant hubs with respective "hinterlands" (catchment areas). They found that the rate of carriers beginning service on nonstop routes was relatively stable in the early 1990s. However, beginning in 1996, route level entry began to decline, even among new-entrant airlines. Since 1996, new entrants tended to exit more routes than they

[11] Transportation Research Board, *Entry and Competition in the U.S. Airline Industry*, Special Report 255, (Washington: National Academy Press, 1999), pp. 40-44.

entered. While there are several plausible explanations for these trends, the slowdown in route entry may be due to the nature of responses by the major network carriers. This raises the question of whether the major airlines respond to entry in the same way, or if responses depend on what type of carrier is entering.

Differences in Responses by Type of Entry

How does the response of the major network airlines to entry by a new-entrant low-fare airline compare to their response to entry by Southwest or to entry by another major network airline?[12] We examined the service patterns for American, Northwest, Southwest, and United for the period beginning with the first quarter of 1995 and ending with the third quarter of 1999. We identified cases of entry by an airline into a city it had not previously served during this time period and where the service by one or more of the incumbents was with predominantly single-plane or nonstop service.[13]

The cases we found where a major network airline entered a market served by another network carrier were all markets where the entering carrier initiated direct service and the incumbent offered connecting service. In no case did the incumbent appear to respond to this entry by initiating its own direct service and in most of the cases the incumbent's average fare increased.[14] When the incumbent's average fare did decline following entry, the decline was very small and left the incumbent's average fare well above that of the entering carrier.

In most cases of entry by Southwest, Southwest entered with nonstop service into markets that the incumbent carrier served with only connecting service. In these situations, the incumbents typically did not respond with lower fares, added capacity, or new nonstop single-plane service. A typical result was that Southwest quickly gained the largest market share.

We did find a few cases where Southwest entered a market where the incumbent was a major network carrier offering mostly single-plane or nonstop service. Two of those cases are discussed in Appendix A. In these cases, the response of the incumbents appeared to be very mild compared to the responses to Reno Air and Spirit discussed earlier. While the incumbent responded by lowering its fare, the incumbent's average fare was consistently higher than Southwest's average fare, with no evidence of dramatic increases in capacity by the incumbent.

A related issue is how Southwest responds to competitive entry by another carrier. We found one such case during this time period. In the second quarter of 1998, Dallas/Love Field to

[12] Southwest Airlines poses a much different sort of threat to the established network majors than do the other new entrants. Southwest is large and has been consistently profitable in the post-deregulation era, so that its pockets are deep. It is not easily persuaded to leave markets it has entered. Indeed, since it began operations in 1971, it has only withdrawn from three cities that it has entered: Denver, Beaumont, Texas, and Detroit City Airport. Finally, it has significantly lower operating costs than any other major carrier in the United States.

[13] The source of information for the analyses in this section was the Department of Transportation's Database 1a (10% ticket sample). This database does not allow an analyst to distinguish with certainty between nonstop service and one-stop service in which the passenger does not change planes.

[14] Airlines sell tickets at many different fares for the same flight. Each fare category is known as a "bucket". The average fare is determined by how many seats are sold in each bucket. When the average fare is observed to increase, it could be the result of raising some or all of the fares, but it could also be because more tickets were sold in the higher fare buckets and/or fewer were sold in the lower fare buckets.

Austin was a market dominated by Southwest at a fare of $69. In the third quarter, American entered that market with a fare of $53. Southwest did not appear to respond, maintaining an average fare of $68 through the third quarter of 1999. By this time American had raised its fare to $65. During this period Southwest saw its traffic decline by 17 percent, but still carried about two and a half times the number of passengers carried by American.

In sum, when major network airlines were subject to entry either by Southwest or by another major network airline, the response was typically either a very slight fare reduction with no significant increase in capacity or a fare increase. We did not find any cases where the response was as aggressive as when a new-entrant low-fare carrier entered a market.

Responding to Entry through Low-Fare Subsidiaries

Another form of response to Southwest and other low-fare airlines by three of the major airlines has been to establish a low-cost subsidiary airline and then deploy this subsidiary airline selectively to compete with Southwest. United Airlines was the first to try this strategy when it organized Shuttle by United (often called United Shuttle) in October 1994.[15] Initially, United Shuttle competed with Southwest in ten markets, all involving a California city on at least one end.[16] United Shuttle subsequently withdrew from all three of its competing markets involving Oakland, as well as from the Sacramento-San Diego market. It retained service in six markets, all involving either San Francisco or Los Angeles on one end.

Shuttle by United's strategy has evolved. In addition to competing with Southwest, the carrier also increasingly provides feeder service to its three western hubs: Denver, San Francisco, and the newly established hub at Los Angeles. United Shuttle uses all B-737s and keeps its costs down through higher labor productivity achieved through flying point-to-point turnaround operations and through work rule provisions that create more flexibility in assigning and completing operational tasks such as ground handling, check-in, boarding, etc.

Delta adopted a different strategy when it established Delta Express in October 1996. Delta Express flies point-to-point between Florida and the Northeast, offering nonstop service to passengers who might otherwise have connected in Atlanta. (Delta Express does not serve any markets to or from Atlanta.) These city-pair markets tend to be those in which Delta's service was most vulnerable to competition from Southwest, AirTran, and other low-fare carriers. Delta Express flies all-coach B737-200s with higher aircraft utilization and lower labor costs than Delta's usual service.

US Airways started the third of the subsidiary airlines, Metrojet, in June 1998 with five aircraft. One year later, Metrojet operated 37 aircraft and it anticipated further expansion to 54 aircraft by the end of 1999. The goal of Metrojet has been to help US Airways compete against Southwest, which had entered many US Airways markets on the East Coast. Like Delta Express, Metrojet offers all-coach service with a fleet of B737-200s with higher fleet utilization and lower labor costs. By 1999, it was estimated that Metrojet would account for about 10% of US

[15] Continental Airlines had tried establishing a low-cost unit, Continental Lite, earlier, but it did not have a focused strategy and was ultimately unsuccessful.

[16] That United Shuttle was developed to compete with Southwest was quickly clear when it purchased the phone number 1-800-SOUTHWEST from a private party and used it, for a brief period, as its reservations number.

Airways block hours. Through 1999, Metrojet was limited to 25% of US Airways total block hours by the pilot union contract. In much the same way that Delta Express does not serve Atlanta, Metrojet does not serve either Pittsburgh or Charlotte. Metrojet has also been used to counter threats by Delta Express and even in response to the buildup of a United Airlines hub at Washington Dulles airport.

Delta Express and Metrojet appear to be a defensive response carefully targeted to the threat of Southwest and other low-cost, low-fare airlines. These two airlines fly primarily hub overflight routes to predominately lower-yield, leisure markets in Florida. These are also the markets that are particularly vulnerable to entry by low-cost carriers like Southwest. Serving such markets with subsidiary airlines, either in response to actual or potential entry, reduces the profit potential of such markets for low-cost, low-fare new-entrant airlines. By avoiding service to the dominant hubs such as Pittsburgh, Charlotte, and Atlanta, the strategies of both Delta Express and Metrojet seems designed to contain the threat while having minimal impact on Delta's and US Airways' ability to use their market power in these hubs. Given the lower cost structure of these subsidiaries, though, the assessment of potential predatory behavior is made more difficult. One key issue is the extent to which these low-fare subsidiaries continue such operations. To the extent that they become an established part of the industry, they provide additional beneficial low-fare competition for travelers.

Effects on Applications of New Airlines to Begin Service

Table 3 provides a summary of applications to U.S. Department of Transportation of new carriers to begin jet service from 1989-mid 2000. The table shows that entry applications had slowed in the wake of the 1989-1991 Gulf War and recession, but then increased substantially through early 1996. At that point, the pattern changes markedly, with fewer applications filed and no new entrants beginning service in 1997 or 1998. There are several potential explanations for the decline, including changes in certification reviews by DOT and issues in the wake of the ValuJet crash in 1996. However, the decline in entry applications, and in the number of carriers moving from authorized to operating status, may in part be due to the perceptions of both investors and prospective new entrants about the nature of likely entry responses from the incumbent carriers. It is noteworthy that the applications appear to resume in 1999, following the announcement that DOT was in the process of reviewing competitive practices in the industry and the filing of an antitrust suit by DOJ against a network carrier's alleged predatory conduct.

Table 3
U.S. CERTIFICATED JET AIR CARRIERS
Authorized to Operate
1989-2000 (through 7/7/00)

Year Action Taken	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	**Total**
SCHEDULED PASSENGER CARRIERS													
Currently Operating	***2***	***0***	***1***	***1***	***4***	***3***	***0***	***2***	***1***	***2***	*2*	*0*	***18***
Operated & Ceased (including revoked)	2	1	1	7	4	5	3	1	0	0	0	0	**24**
Authorized but not yet operating	0	0	0	0	0	0	0	0	1	0	1	1	**3**
Authorized but never operated (revoked)	1	0	1	1	0	4	0	3	1	0	0	0	**11**
Total Authorized (current & revoked)	**5**	**1**	**3**	**9**	**8**	**12**	**3**	**6**	**3**	**2**	**3**	**1**	**56**
Applications Dismissed/Denied	3	0	1	3	1	6	2	7	2	0	4	1	30
Applications Pending												1	1
Total Applications (granted or not)	**8**	**1**	**4**	**12**	**9**	**18**	**5**	**13**	**5**	**2**	**7**	**3**	**87**

Year Action Taken	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	**Total**
CHARTER & CARGO CARRIERS													
Currently Operating	***3***	***0***	***1***	***2***	***2***	***3***	***3***	***6***	***0***	***3***	***1***	*0*	***24***
Operated & Ceased (including revoked)	1	0	1	5	1	2	1	4	1	0	0	0	**16**
Authorized but not yet operating	0	0	0	0	0	0	0	0	0	1	0	1	**2**
Authorized but never operated (revoked)	2	0	1	0	1	1	1	1	2	0	0	0	**9**
Total Authorized (current & revoked)	**6**	**0**	**3**	**7**	**4**	**6**	**5**	**11**	**3**	**4**	**1**	**1**	**51**
Applications Dismissed/Denied	0	1	0	2	0	1	4	3	1	0	1	1	14
Applications Pending												1	1
Total Applications (granted or not)	**6**	**1**	**3**	**9**	**4**	**7**	**9**	**14**	**4**	**4**	**2**	**3**	**66**

Total Authorized for Scheduled Passenger	**5**	**1**	**3**	**9**	**8**	**12**	**3**	**6**	**3**	**2**	**3**	**1**	**56**
Total Currently Operating	***2***	***0***	***1***	***1***	***4***	***3***	***0***	***2***	***1***	***2***	*2*	*0*	***18***

Total Authorized for Charter or Cargo	**6**	**0**	**3**	**7**	**4**	**6**	**5**	**11**	**3**	**4**	**1**	**1**	**51**
Total Currently Operating	***3***	***0***	***1***	***2***	***2***	***3***	***3***	***6***	***0***	***3***	***1***	*0*	***24***

Source: U.S. Department of Transportation, Office of Aviation and International Economics.

IV. Economic Analysis of Predatory Conduct

Predatory pricing

Analysis of predatory practices has generally focused on predatory pricing – usually defined as a company pricing its product below an appropriate measure of cost with the intent of driving a financially weaker competitor out of business and establishing or re-establishing monopoly power.[17]

Within the context of antitrust law, predatory pricing has typically been a very limited concept narrowly circumscribed by the courts.[18] Areeda and Turner have proposed a standard that requires a "cost/price test". Since short-run profit maximization requires a firm to cover variable costs[19], the Areeda-Turner standard would hold that prices below average variable cost would be considered as predatory.[20] This rule has been cited in many court cases, but has been criticized by economists almost from its introduction.[21] Charles McCall has summed up the criticisms most succinctly:

> "Scherer has demonstrated that the Areeda-Turner rule would not promote long-run economic welfare, would not ensure an efficient allocation of resources, and would encourage firms to maintain excess capacity. Greer has shown that the Areeda-Turner rule relying on either an average variable or marginal cost floor would be overly lenient in that it would allow the destruction of equally (or more) efficient rivals. Dirlam has also rejected cost-based rules, noting that they are too rigid and would require difficult and ambiguous short-run cost measurements. Finally, Beckenstein and Gabel have argued that succinct per se rules are unable to deal with some anticompetitive practices and other subtle forms of business behavior like predatory investment, economies of scope, vertical integration, and experience curve learning."[22]

There is widespread agreement among prominent economists that predatory pricing involves dynamic behavior. William Baumol states, "The problem clearly involves intertemporal behavior patterns that cannot be addressed adequately by the comparison of prices

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[17] See, for example, Phillip Areeda and Donald F. Turner, "Predatory Pricing and Related Practices under Section 2 of the Sherman Act," 88 *Harvard Law Review* 697-733 (1975), Klevorick, Alan B, "The Current State of the Law and Economics of Predatory Pricing," *American Economic Review*, Vol. 83, No. 2, May 1993, pp. 162-167, and Jonathan B. Baker, "Predatory Pricing After Brooke Group: An Economic Perspective," *Antitrust Law Journal*, Volume 62, Issue 3, Spring 1994.

[18] See Daniel J Gifford, "Predatory Pricing Analysis in the Supreme Court," *Antitrust Bulletin*, v39 n2, Summer 1994, pp. 431-83.

[19] If some of a firm's costs are fixed in the short run, profit maximization requires covering variable costs, with any surplus contributing to covering the fixed costs. (This will maximize profits or minimize losses.) In the long run, the firm must cover all costs to be profitable. An accounting approach will typically attempt to allocate all costs, and thus is more appropriate for the long run rather than the short run.

[20] Phillip Areeda and Donald F. Turner, "Predatory Pricing and Related Practices under Section 2 of the Sherman Act," 88 *Harvard Law Review* 697-733 (1975). Areeda and Turner argue that ideally marginal cost should be used but because of the potential difficulties in measuring marginal cost, average variable cost might be used as a proxy.

[21] In some courts, predation has been found with prices above average variable costs when other evidence of predation was available.

[22] McCall, Charles W., "Predatory Pricing: An Economic and Legal Analysis," *Antitrust Bulletin*; v32 n1 Spring 1987, pp. 1-59.

and costs at any single moment."[23] Oliver Williamson makes essentially the same point when he says, "… predatory pricing involves strategic behavior in which intertemporal considerations are central. Static economic models that fail to capture these attributes miss crucial features of the predatory pricing issue."[24] Paul Joskow and Alan Klevorick are even more direct when they say, "…the central problem in formulating a policy to cope with such behavior is the difficult task of inferring unobservable long-run market outcomes from observable short-run market conditions. … This task, however, is unavoidable: to dismiss entirely an assessment of long-run effects, as for example Areeda and Turner seem to do, is to dismiss the essence of the predatory pricing problem."[25]

A second line of criticism is that using a very narrow definition of cost is overly lenient. A critical issue is the extent to which costs are fixed or variable in the short run. Even capital costs may be treated as variable in nature, since aircraft can be quickly moved in and out of individual markets. Indeed, it is the notion of opportunity cost that determines when a company is sacrificing short-term profits. As Comanor points out, "In this setting, the predator need not actually incur losses in any standard accounting sense. His investment is rather the lower profits earned due to his conduct as compared with those that could otherwise be earned. He bears economic losses but not necessarily accounting losses."[26]

Market Power And A Two-Part Test

An approach proposed by Paul Joskow and Alan Klevorick has the dual virtues of guarding against discouraging legitimate competitive pricing behavior and of providing clear guidance both to participants in the industry and to those charged with implementing policy.[27] Rather than use a single test in all situations to determine whether pricing behavior is predatory, they propose a two-step approach. Their research concludes that no single rule is best for all market situations and that a rule that is developed for one market situation may not be effective in another. They argue that "…the most effective way to guard against discouraging pricing behavior that is truly competitive is to screen out those market situations in which truly predatory pricing is unlikely."[28]

The first step in their test is to consider only those market situations where there is sufficient market power that predatory pricing is likely to give a firm long-run market power and thus the ability to charge supracompetitive prices. The underlying principle is that the more

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[23] Baumol, William J., "Quasi-permanence of Price Reductions: A Policy for Prevention of Predatory Pricing," in Scherer, F. M., ed.. Monopoly and competition policy. Volume 2.. Elgar Reference Collection. International Library of Critical Writings in Economics, vol. 30. Aldershot, U.K.: Elgar; distributed in the U.S. by Ashgate, Brookfield, Vt., 1993, pp. 328-53.

[24] Williamson, Oliver E., "Predatory Pricing: A Strategic and Welfare Analysis," Williamson, Oliver.. Antitrust economics: Mergers, contracting, and strategic behavior. Oxford and New York: Blackwell 1987, pp. 225-81.

[25] Paul L. Joskow and Alvin K. Klevorick, "A Framework for Analyzing Predatory Pricing Policy," *Yale Law Journal*, Volume 89, Number 2, December 1979.

[26] Comanor, William S.; Frech, H. E., III, "Predatory Pricing and the Meaning of Intent," *Antitrust Bulletin*; v38 n2 Summer 1993, pp. 293-308.

[27] Paul L. Joskow and Alvin K. Klevorick, "A Framework for Analyzing Predatory Pricing Policy," *The Yale Law Journal*, Volume 89, Number 2, December 1979.

[28] Paul L. Joskow and Alvin K. Klevorick, "A Framework for Analyzing Predatory Pricing Policy," *The Yale Law Journal*, Volume 89, Number 2, December 1979.

market power a firm has, the greater will be its ability to raise prices, and increase profits, if it can eliminate the threat of entry. Market power can also provide the ability to recoup any losses or expenses incurred in driving the competitor from the market. So in their analysis, "[t]he critical question is whether or not the dominant firm can use that monopoly power to maintain prices above the competitive level for some significant period of time, and this depends on the conditions of entry into the market."[29] They further argue that, "[o]nly in dominant firm or collusive oligopoly industries do firms have a clear incentive to exclude or eliminate rivals."[30]

Only those situations where there is sufficient market power that predatory pricing might be a rational strategy warrant further examination to see if such pricing behavior actually has occurred. For this second stage of analysis, Joskow and Klevorick propose a more rigorous test. They argue that a price cut below average variable cost is both a necessary and sufficient condition for showing predation. But they further argue that pricing between average variable and average total cost could also indicate predation. They would place the burden of proof on the dominant firm to show that prices in this range were not predatory. They would also place a burden of proof on the dominant firm to show that any subsequent price increases were justified by independent increases in costs of production or changes in demand and were not the result of a competitor's withdrawal from the market.

A two-part test that starts with an assessment of market power allows a focus on those market situations where unfair methods of competition might well result in one carrier driving another from the market, thereby maintaining or increasing its market power.[31] One possible type of market would be where small, new-entrant airlines attempted to compete with larger established major carriers. The underlying criterion of the first stage of the test, however, is the extent of market power, not the specific identity of the airlines in the market.

V. Predatory Practices in the Airline Industry

Challenges in Applying Cost/Price Tests to the Airline Industry

Trying to apply an Areeda-Turner type of test to the airline industry, even with its other critical limitations, could present difficult measurement problems with both price and cost. Perhaps the biggest problems are with measuring costs. Marginal cost can be an elusive concept

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[29] Paul L. Joskow and Alvin K. Klevorick, "A Framework for Analyzing Predatory Pricing Policy," *The Yale Law Journal*, Volume 89, Number 2, December 1979.

[30] The advantage of first assessing the extent of market power before proceeding with any further analysis of predation is that it allows avoiding investigation of competitive situations involving roughly equal competitors. As Oliver Williamson points out, "A firm will be less inclined to engage in a policy of predatory pricing if potential entrants exist that are equal in size, diversification, and borrowing capacity." See O. Williamson, "Predatory Pricing: A Strategic and Welfare Analysis," Williamson, Oliver.. *Antitrust Economics: Mergers, Contracting, and Strategic Behavior*. Oxford and New York: Blackwell 1987, pp. 225-81. The Joskow-Klevorick approach avoids even considering those situations and thereby also avoids putting any chilling effect on the competition that might occur there. In the assessment of market power, Joskow and Klevorick point out that, "The current market power provides a lower bound to the power that would follow upon the execution of a successful predatory price cut." See Paul L. Joskow and Alvin K. Klevorick, "A Framework for Analyzing Predatory Pricing Policy," *The Yale Law Journal*, Volume 89, Number 2, December 1979.

[31] Evidence of the ability to charge fares substantially above those found in similar markets elsewhere may be one indication of market power.

in the airline industry. One normally thinks of marginal cost as the additional cost to produce one additional unit of output. Even in the most simple situation of a nonstop flight from one point to another, marginal cost can be thought of at either the seat level or at the aircraft level`. To the extent that those airlines add capacity in response to new entry, then the marginal cost must be thought of not at the seat level, but at the aircraft level and must reflect the costs of making that aircraft and crew available for that flight. At a minimum, the marginal cost must reflect the opportunity cost of using the aircraft in the city-pair market in question rather than in another city-pair market. In the same way that the marginal cost must include the cost of the new aircraft deployed in the market, so must the average variable cost account for these same cost factors.

Measuring the marginal or average variable cost is further complicated by the practice of paying travel agent commission overrides to try to retain traffic in markets subject to new entry. The structure of these override agreements is not public information so little can be said with certainty about their impact on marginal or average variable costs. However, anecdotal information suggests that some of these arrangements are structured so that the additional payments to travel agents are related to an airline's market share or increments to market share in specific markets. Such arrangements, which may include a nonlinear relationship between the override commission paid and the change in market share, don't easily translate into an increment to the marginal cost of serving a passenger. Moreover, there is no easy way for an airline that has to compete against these overrides to know their magnitude or their structure.

Defining the appropriate price to compare with the marginal or average variable cost also is difficult. Airlines, of course, charge multiple prices for the seats on a single flight. Some differences in price are due to markedly different service, such as first class, business class, and coach class. Other differences reflect discount fares and their various restrictions. The most common restrictions require an advance purchase and a Saturday night stayover. For the most part, these restrictions reflect attempts at price discrimination by airlines to maximize the revenue from a particular flight by segmenting passengers according to their demand elasticity and charging those with less elastic demand higher fares.

In addition to the fare paid, there are other economic considerations in airline demand. For example, the passenger may receive benefits in the form of frequent flier award miles. This benefit can also vary if the incumbent airline offers bonus frequent flier award miles targeted at those markets subject to competitive entry. The value of this rebate to the passenger and the cost to the airline depends on how and when the rebate will be claimed in the form of free travel, upgrades, or other services.

The main impact of these complications on measuring both cost and price is that a narrow definition of a cost/price test might well understate the costs and overstate the price used by an airline suspected of predatory practices.

Predatory Practices versus Predatory Pricing

Any pro-competitive policy must recognize the complex nature of airline rivalry. Two essential differences between airline competition and competition in many other industries are

that airlines compete using multiple competitive tools and that airlines compete over networks.[32] These differences play critical roles in the assessing the effects of market behavior in the airline industry.

Because airlines have the potential to compete with multiple tools, of which the ticket price is only one, a narrowly defined predatory pricing standard is almost certainly inadequate. Were public policy to focus only on the ticket price, airlines would have ample ways to engage in what are clearly predatory practices without violating a narrow predatory pricing standard. Similarly, because airlines compete over networks rather than just in single city-pair markets, focusing only on a single city-pair market without considering potential network effects is also likely to be inadequate. Conceptually, an airline could even engage in predatory practices by making use of its network - without changing its behavior in any way in the specific city-pair market entered by the new carrier.

Multiple Competitive Tools. While the fare a passenger pays is an important element of competition, airlines don't compete solely on the basis of the price of the ticket. Instead, they compete over multiple dimensions including: the ticket price; the number of flights a day and the timing of those flights; the characteristics of the flight itinerary such as whether the flight is nonstop, continuing single-plane service, or connecting service; rebates to the traveler in the form of frequent flier programs or corporate discounts; in-flight amenities including food service and how closely the seats are spaced together; ground amenities including club lounges; and so forth. Airlines can also compete by paying travel agent commission overrides (TACOs), to encourage travel agents to book passengers on their flights rather than those of a competitor. To focus only a single dimension may miss the full range of the ways in which airlines can compete with one another, particularly if price and cost are narrowly defined.

Pricing. Airlines may also charge different travelers different prices depending on their demand characteristics, charging higher prices for those with more inelastic demand and lower prices for those with more elastic demand. The airlines' ability to price discriminate depends on having market power.[33] Prices based on demand characteristics rather than on the cost of providing the product is characteristic of a market in which the seller has a degree of market power.[34] In a competitive market, if an airline tried to charge some travelers higher prices simply because they had more inelastic demand (and did not have higher costs of service), then the higher profits earned carrying those passengers might be expected to attract entry by other airlines.

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[32] The implication of competition over networks in the airline industry is different from industries such as telecommunications or the Internet. In telecommunications and information technology, for example, the primary network effects are increasing returns to scale from large fixed costs coupled with extremely low variable costs and externalities increasing benefits to each user when a new user is added. With airlines, the principal effects of network competition are the ability to manage flow traffic and compete over alternative routings and the market power that often comes with dominant hubs in route networks.

[33] See James R. McGuigan, R. Charles Moyer, and Frederick H. deB. Harris, *Managerial Economics: Applications, Strategy, and Tactics, Eighth Edition* (Cincinnati: South-Western College Publishing, 1999) page 615, note 3. See also W. Kip Viscusi, John M. Vernon, and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust*, Second edition, (Cambridge: MIT Press, 1995), pp. 290-295.

[34] See Thomas T. Nagle, *The Strategy And Tactics Of Pricing: A Guide To Profitable Decision Making* (Englewood Cliffs, NJ : Prentice-Hall, 1987) and Robert J. Dolan, "How Do You Know When The Price Is Right?" *Harvard Business Review*, Sep/Oct 95, Vol. 73 Issue 5, pages 174-181.

Airlines can offer different fares on a given flight, attaching restrictions or conditions of travel to some fares and, most importantly, offering only a limited number of seats in some fare categories. Table 4 provides an example of the coach/economy class fares with associated types of restrictions offered by United Airlines for its flight 1956 from Denver to Miami for travel in January 2001. For this travel, United offered 6 different coach fares ranging from the lowest fare of $483 to the highest fare of $1,045.

These multiple fares give an airline considerable flexibility in how to price seats on its flights. The airline could, for example, offer service at low average fares by simply making a large number of seats available in the lower fare categories, as Northwest did in the third quarter of 1996 in the Detroit to Philadelphia market. Conversely, if there is sufficient demand and no meaningful competition, the airline can offer most of its service at high average fares by making few or no seats available in the lower fare categories.

Essentially an airline would like to sell as many high fare seats as possible, selling the low fare seats only to fill seats that otherwise would have been empty. Virtually all travelers, those traveling on business as well as those going on vacation, would rather pay a low fare than a high fare. From the perspective of the airline, the question is what they are willing to pay. If the airline can charge close to the maximum that each individual passenger is willing to pay, it will make higher profits than if all passengers must be charged the same fare. The goal behind modern yield management is to offer seats at multiple prices with varying conditions and then manage the number of seats in each of these price categories so as to charge each individual passenger as close as possible to the maximum they would be willing to pay.

Table 4: Multiple Fares in the Denver to Miami Market

Coach/Economy Fares on United Airlines Flight 1956, January/February 2001

One Way Fare	Advanced Purchase	Minimum Stay	Maximum Stay	Change Fee	Fare Code
$ 1,045.00	No	No	No	None	BUA
$ 945.00	Yes (3 days)	No	No	None	BA3
$ 940.50	No	No	No	None	BUA/SD10
$ 850.50	Yes (3 days)	No	No	None	BA3/SD10
$ 567.00	Yes (14 days)	Sunday	30 Days	$ 75.00	QE14NR
$ 483.29	Yes (14 days)	Sunday	30 Days	$ 75.00	QE14NR/SD10

Fare information found on Expedia, January 2, 2001

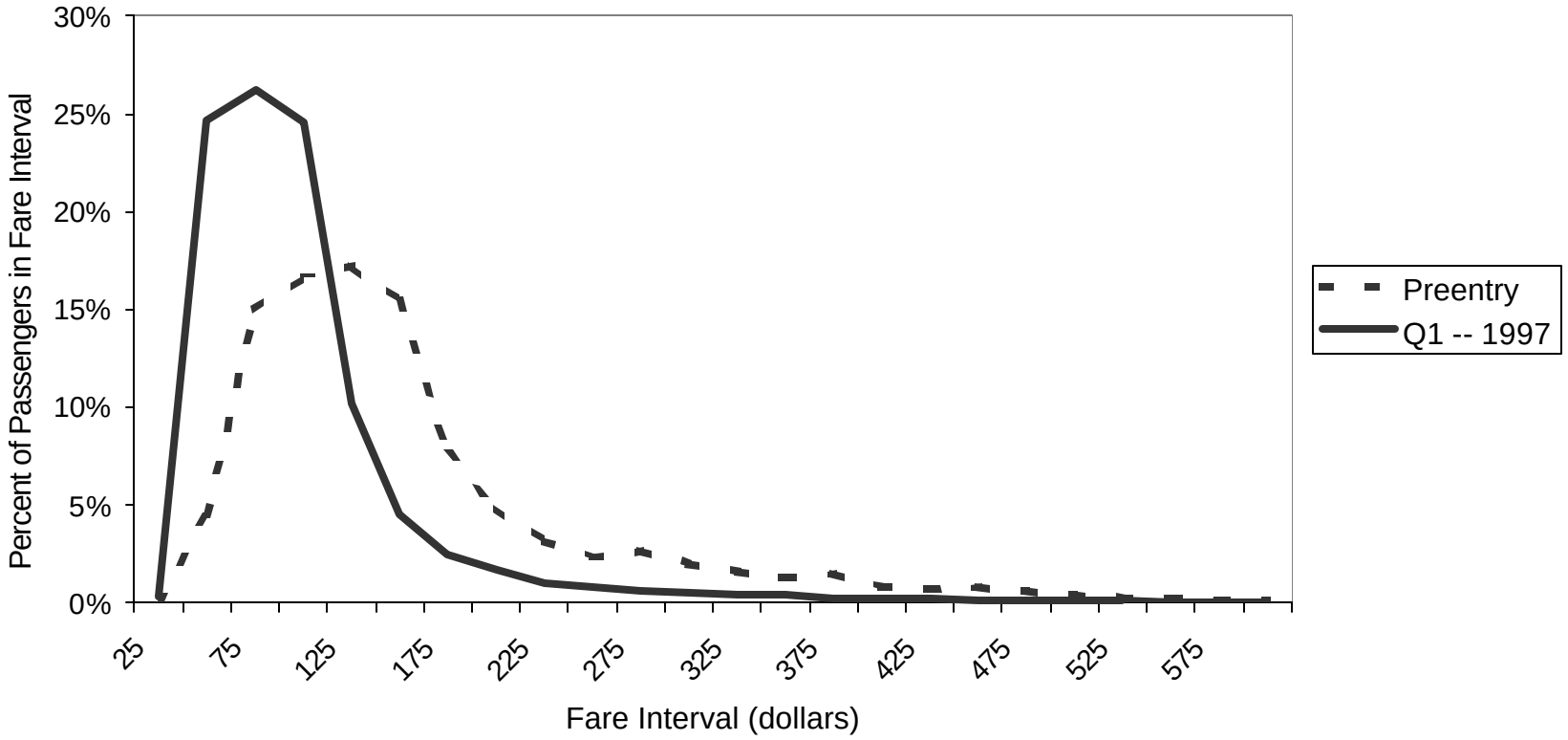
However, the presence of a low-fare carrier such as Southwest reduces an airline's ability to extract high fares from travelers. Figure 2 shows the distribution of fares both before and after entry of a low-fare carrier. The figure compares the distribution of fares in 150 markets two quarters before the entry of a low-fare carrier (the dashed line) with the distribution of fares in these same markets in the first quarter of 1997 (the solid line), with the low fare carrier still in the market. As can be seen in the figure, the entry of a low-fare carrier dramatically shifts the distribution of fares away from the higher fare classes toward the lower fare classes. The result is that the average fare fell from about $173 to about $115. Some high fares still remain after low-fare entry, but a much smaller proportion of travelers pay them. There are still tickets sold in all of the fare categories after low-fare entry, as was the case before entry, but the proportion of tickets sold in each of these categories has changed dramatically. It should also be noted that in these 150 markets, the number of passengers traveling increased dramatically in response to the larger number of seats offered at low fares.

The example in Figure 2 also illustrates how an airline can effectively change its fare offerings by changing the number of seats offered in each fare category without ever changing any of its posted prices. In response to new entry by a low fare carrier, for example, the airline could match fares by simply offering a large number of seats in an existing or new fare category that matched the new entrant's fare offering. Such matching need not be across all seats on all flights. Instead, such matching would more likely be targeted at those flights that most closely matched the new entrant's offering.

Flight Frequency, Capacity, and Scheduling. A second competitive tool is flight frequency, capacity, and scheduling. Depending on the trip, different departure and arrival times are more convenient than others. Business travelers attending a meeting in another city may wish to leave their homes early in the morning and return in the early evening so that the trip can be made in a single day. Capacity and scheduling changes also might be used to counter the threat of a new entrant, potentially in ways that might be considered unfairly anti-competitive. The incumbent could dramatically expand the offerings of seats in low-fare "buckets," either on existing flights or on new flights. Schedules could be changed so that incumbent flights "overlay" those of the new entrant.[35] A traveler is thus much more likely to find the incumbent's flights more convenient than the new entrant's flights. In extreme cases, the increased low-fare capacity could "swamp" the new entrant, thereby preventing the new entrant from garnering enough passengers to operate profitably.

[35] One such example is the "schedule sandwich" in which an incumbent carrier offers two flights timed to depart shortly before AND shortly after the flight of the new entrant. This service frequency creates incentives for higher yield business travelers to fly on the incumbent carrier, leaving only lower-yield discretionary traffic for the new entrant. This makes profitability even more difficult to achieve.

Figure 2: Low-Fare Entry and the Distribution of Fares



Source: U.S. Department of Transportation, Office of Aviation and International Economics.

Frequent Flier Programs. Frequent flier programs are essentially rebates on ticket purchases that are structured to build brand loyalty to a particular airline. Most programs are structured so that increased benefits accrue to those who concentrate travel on a specific carrier. These benefits include such highly-valued benefits as upgrades, specially-designated check-in, and fewer restrictions on the use of frequent flyer awards. In short, they focus on increasing customer loyalty by persuading travelers to concentrate air travel on a single carrier. Frequent flier programs can be inherently difficult for a new-entrant airline to compete with. The concern, from the standpoint of competition policy, is not that frequent flier programs exist, but rather that they can also be used as a carefully targeted competitive tool against a low-fare new entrant. For example, mileage bonuses can be awarded on those routes contested by a new entrant. The effect is that the net price paid by the passenger to fly on the airline offering the targeted frequent flier programs is lower than the published fare. In the extreme, very large bonuses could be offered, thereby making the effective price to travelers extremely low. Such bonuses might then be withdrawn once the threat posed by the new entrant was eliminated.

Travel Agent Commission Overrides (TACOs). Travel agent commission overrides are extra commissions paid to travel agents to encourage them to book passengers on the offering airline's flights. Such overrides, which are often based on the volume of tickets sold on a particular airline or the share of tickets sold on that airline, have the clear potential to discourage entry and can make it far more difficult for a new entrant to compete in a market. Overrides can be particularly objectionable from a consumer standpoint because they are not revealed to the consumer and they create the incentive for travel agents to withhold information about some of the flight alternatives.

According to a U.S. Government Accounting Office study, Southwest Airlines' decision to exit the Indianapolis-Detroit market, one of the few markets Southwest has ever exited, was strongly influenced by the effect of overrides offered by an incumbent on travel agents' booking patterns.[36] Similarly Midwest Express, another successful new-entrant carrier, stated that overrides in large part caused it to exit the Milwaukee-Detroit market in 1991 and caused it to exit other Midwest-to-East Coast markets in 1995. GAO also found that 9 of the 10 largest travel agencies in the United States confirmed the importance of overrides in influencing booking patterns. (The tenth agency declined to discuss overrides with GAO investigators.)

Networks. Airlines also compete over networks. Consider, for example, a small airline with a small hub that initiates service where none had existed before from that hub to the large hub of a major carrier. Figure 3 represents such a case. The small airline would expect to carry not only nonstop passengers between the two hubs (the dashed line), but also connecting traffic through its hub to beyond destinations (the dotted lines). The only new service in this case would be the flights between the two hubs, but the entering airline would gain new passengers on several of its existing flights from its hub to other destinations. If the incumbent major airline wanted to stop this loss of passengers, it might respond by offering large numbers of flights and extremely low fares from its hub to the beyond destinations (the solid lines). That way, it could make sure that the only passengers the new airline carried were passengers whose final destination was the new airline's hub. If the only way that profitable service could be sustained

[36] Government Accounting Office, Airline Deregulation: Barriers to Entry Continue to Limit Competition in Several Key Domestic Markets, GAO/RECD-97-4, October 1996, page 16.

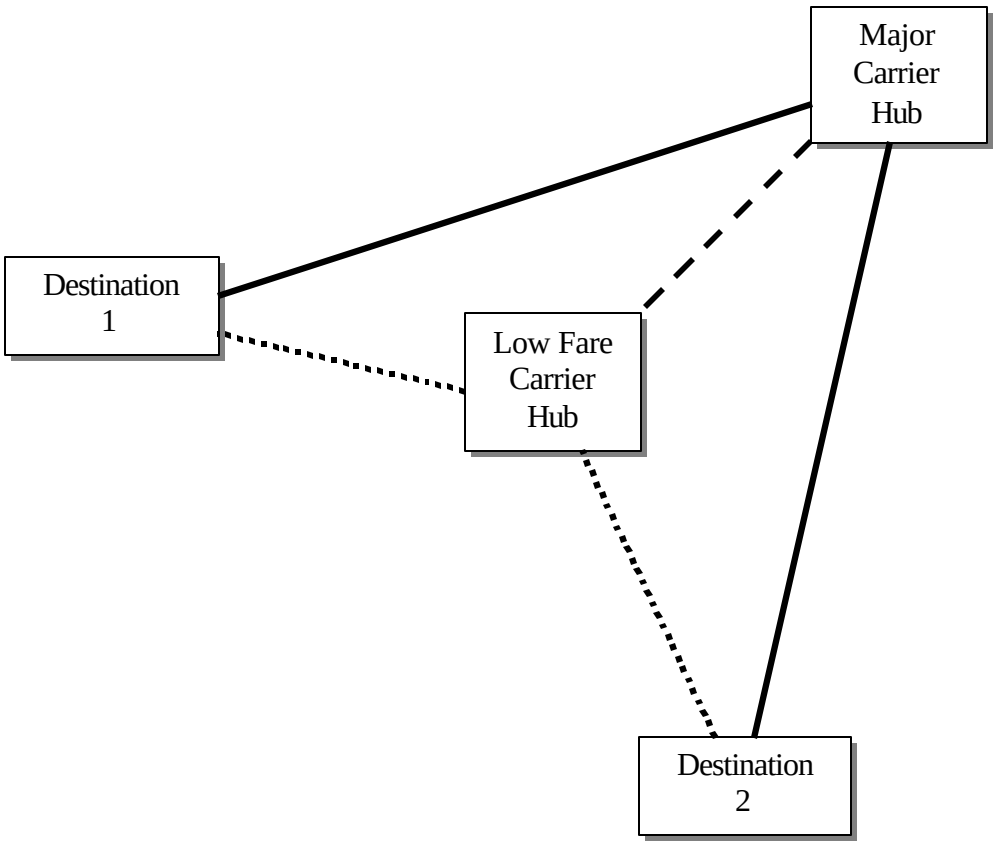


Figure 3: Competition Over Networks

between the two hubs was with a combination of hub-to-hub traffic and connecting beyond traffic, then the new airline would likely have to withdraw from the hub-to-hub market. Once the new airline had withdrawn, the major airline could suspend the low fares and reduce the number of flights to the beyond destinations. Thus, because of the network characteristics of airline service, the incumbent could force a new carrier to withdraw from the incumbent's hub without even offering competing service in the specific city-pair market the new airline had entered.

Additional Considerations Regarding Predatory Conduct in the Airline Industry

The airline industry also has special characteristics that make predation both a rational and an attractive business strategy. The key point is that information about entry and pricing is widely and quickly available.[37] The widespread use of yield management systems not only allows airlines to offer a variety of fares through price discrimination, but also provide significant and timely information about actions by actual and potential competitors. Computer reservation systems make available on almost a real-time basis much more precise information on other airlines' actions, supply, and even (to a more limited extent) availability – all of which reduce the cost of predation. The most obvious means through which this occurs is that a new entrant's services are clearly seen in advance, because of schedule and fare filings. Thus, the nature and extent of entry can be quickly sized up. Yield management systems allow a response to such entry in a targeted way so that other carriers will not view the action as the beginning of a general price war (which would lead to fare reductions on other routes and thus increase the costs of the predatory response). Other revenue side economies, such as frequent flyer programs, brand recognition, and travel agent overrides allow a carefully targeted assault on the entering carrier – without triggering responses from the other major carriers in the industry. In short, the information and market structure of the industry, especially related to revenue economies of scale, make predation a viable and in many cases an attractive strategy.

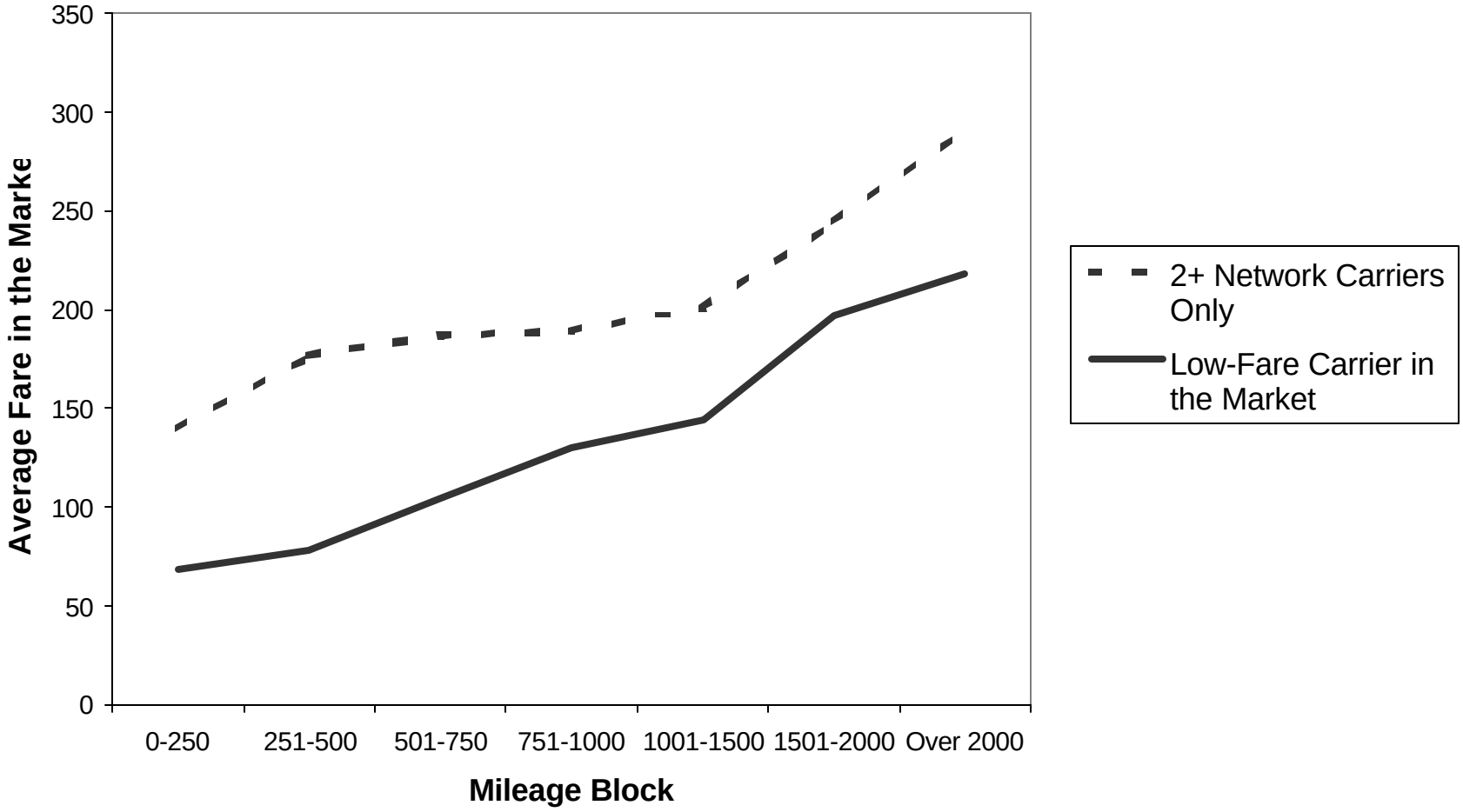
When Might Predatory Practices be Rational for an Airline?

Examining under what conditions it might be rational for an airline to engage in predatory practices or unfair methods of competition involves addressing the degree and nature of market power in the airline industry.

Competition Among the Major Network Carriers. One issue raised by those who argue that the airlines do not engage in such conduct is that there is more competition today than ever before in the industry. The evidence provided to justify such a claim is the increase in markets served by two or more carriers and the low number of markets served by only one carrier. Figure 4 shows the impact of the number of carriers serving a market on the average fare by mileage block as calculated by DOT.

[37] This section draws on communication from Todd Homan, US Department of Transportation.

Figure 4: The Impact of Low-Fare Competition on Fares



Source: U.S. Department of Transportation, Office of Aviation and International Economics

The main point to be seen in Figure 4 is that when a low-fare carrier shares a market with one or more major carriers, there is a dramatic impact on fares in that market. As the solid line in the figure indicates, average fares are markedly lower when a low-fare carrier is present. For markets of less than 1000 miles, average fares when a low-fare carrier is in the market are only 53 percent of the fares that prevail when a major network carrier has a monopoly in that market. In markets of over 1000 miles, the presence of a low-fare carrier reduces average fares by about one-third compared to major network carrier monopoly markets. Notice that the solid line represents the average fares for all carriers in the market, not just the fares charged by the low-fare carrier. Clearly consumers are substantially better off because of the lower fares a low-fare carrier brings to the market.

Table 5 shows the fare offerings of the airlines providing service in the Minneapolis to Miami market. The most striking aspect is the degree of similarity in the fares offered by these major carriers, particularly in the low-fare range. While each airline uses different fare codes, the corresponding fares are remarkably similar. In this market, American offers several fares that do not seem to have a counterpart with the other airlines, as does Delta to a lesser extent. Also, US Airways does not seem to offer the very highest first class fares. A similar pattern prevailed in other markets that were examined.

How can the airlines achieve such uniformity in their fare offerings? The answer would appear to lie with the computer reservations systems that allow competitors' prices to be observed. These fares are posted on the reservations systems well in advance of any bookings made for these flights. The time lag between posting the fares and booking any substantial number of passengers gives each airline an opportunity to see what the other airlines are charging and make any needed adjustments.[38]

The tables also suggest that while the airlines seem to match one another's fares offerings, their service offerings are quite different. Only one carrier, Northwest, offers nonstop service between Minneapolis and Miami. The other airlines offer only connecting service over their respective hubs. Thus the services offered by the other major airlines are substantially inferior to that offered by Northwest, yet the structure of the fares they offer is virtually identical to Northwest's. Without knowing how many seats are offered in each fare class by each airline, it is not possible to determine the extent to which the airlines offering only connecting service are offering that service at a lower average fare than Northwest's nonstop service. However, the nearly identical fare structures are consistent with Northwest having a sphere of influence where flights from its Minneapolis hub are not challenged.

[38] The major airlines were charged with price fixing in the early 1990s in a lawsuit that also involved the Airline Tariff Publishing Company (ATP). (See James Ott, "Air Transport Carries to Contest Price-Fixing Charges," *Aviation Week and Space Technology*, Vol. 138, No 1, January 4, 1993.) The suit charged that the airlines were able to reach agreement on fares by announcing through the ATP system a future date ("first ticket date") when tickets would be available at a certain price. Through this mechanism, it was charged, the airlines were able to discuss and agree on fares before they were offered to the public. It was further charged that the airlines also used the posted expiration date of fares ("last ticket date") to agree on elimination of discount fares. The accused airlines denied price-fixing, but settled the case in 1994 with an agreement that prohibited the use of first ticket date and also placed restrictions on the use of last ticket date. See "Justice Department, US Carriers Settle Price-Fixing Suit," *Aviation Daily*, March 18, 1994.

Table 5: Fares from Minneapolis to Miami

Minneapolis to Miami												Travel Date: June 16, 1999	
Northwest		American		Continental		Delta		TWA		United		US Airways	
Fare	Code	Fare	Code	Fare	Code	Fare	Code	Fare	Code	Fare	Code	Fare	Code
		$ 226	MEO14FN										
$ 345	*	$ 345	*	$ 345	*	$ 345	*	$ 345	*	$ 345	*	$ 345	*
$ 444	MEL21NR	$ 444	VE21SNR	$ 444	BSE21IP	$ 444	KES21NN	$ 444	VES21N	$ 444	HOE21NQ	$ 444	MLE21NN
$ 483	ME21NR	$ 483	V21ENR	$ 483	BE21IP	$ 483	QE21NN	$ 483	VE21N	$ 483	HE21NQ	$ 483	ME21NN
		$ 526	KOE14FN										
$ 634	BEL14NR	$ 634	QE14SNR	$ 634	KSE14IP	$ 634	HES14NN	$ 634	KES14N	$ 634	MOE14NQ	$ 634	MEL14NN
		$ 669	QE7NR			$ 689	HE7NR						
$ 692	BE14NR	$ 692	Q14ENR	$ 692	KE14IP	$ 692	HE14NN	$ 692	KE14N	$ 692	ME14NQ	$ 692	BE14NN
		$ 785	HE21NR			$ 785	ME21NR						
$ 973	YE7NR	$ 973	HE7NR	$ 973	HE7IP	$ 973	ME7NR	$ 973	KE7N	$ 973	ME7NFQ	$ 973	BE7NR
						$ 1,350	Y06						
$ 1,430	YUPCNX	$ 1,430	Y26	$ 1,430	*			$ 1,430	*	$ 1,430	BUA	$ 1,430	*
$ 1,432	B26												
		$ 2,064	C26			$ 2,064	*			$ 1,708	YUA	$ 1,734	F8
$ 2,144	F26	$ 2,144	F26	$ 2,144	A8	$ 2,142	*	$ 2,144	F25	$ 2,144	FUA		
$ 2,206	Y			$ 2,206	Y			$ 2,206	Y	$ 2,206	Y		
		$ 2,516	P26			$ 2,570	C						
$ 3,340	F			$ 3,340	F	$ 3,124	F	$ 3,340	F	$ 3,218	F		

* -- multiple codes with the same fare

Source: Easy Sabre, April 2, 1999.

Market Power and Hub Premiums

Some observers say there is no benefit from predatory behavior because the airlines do not have the market power necessary to recoup the losses incurred while driving a competitor out of the market. The evidence clearly suggests that there is market power at some of the major carriers' large hubs. One type of evidence of such market power is the persistence of fare premiums at these hubs. Hub premiums represent the extent to which fares to and from hub cities are higher than average fares on similar routes throughout the domestic route system. Table 6 shows hub premiums for seven airlines in 16 hub airports over the period from 1984 through 1997.[39] For example, in 1984, Delta had fares into and out of Atlanta that were 35 percent higher than the average fares on a similar set of routes throughout the system. On average, the hub premiums have been increasing for this set of hubs since the mid-1980s, although as the table indicates, there is considerable variation across hubs. We return to the source of this variation below.

In calculating hub premiums, the main analytical question is what adjustments are required to allow comparisons of fares across different routes. One obvious adjustment that should be made is for the distance of the routes. As could be seen in Figure 4 earlier, the average fare on a route increases with distance. The hub premiums shown in Table 6 are adjusted for distance so that the fare on a route to and from a hub is compared with the average fare on routes of the same distance throughout the system.

A second adjustment that is often made is for market density – the number of passengers traveling in that market. All else being equal, it is often cheaper to serve a route with more passengers on it than a route with fewer passengers. The main reason is that with a larger number of passengers it is easier to get better utilization of equipment than in a market with fewer passengers. In addition, a market with more passengers permits the use of larger aircraft, which typically have a lower cost per seat-mile than smaller aircraft. Table 7 shows the hub premiums adjusted for both distance and density for ten hub airports at three points in time.[40] As can be seen by comparing the two tables, adding an adjustment for density causes some hub premiums to increase and others to decrease. Overall, however, the results in the two tables are quite similar - hub premiums exist and have been persistent.

[39] Appendix B describes the methodology with which these numbers were calculated.
[40] Appendix C describes the methodology with which these numbers were calculated. Hub premiums calculated with this methodology for the other six airports found in Table 7 were not available.

Table 6: Changes in Hub Premiums Over Time

	Carrier	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Atlanta	Delta	0.35	0.39	0.39	0.26	0.33	0.33	0.40	0.34	0.32	0.33	0.28	0.41	0.21	0.21
Baltimore	US Airways	0.04	0.01	-0.02	0.02	0.08	0.12	0.15	0.14	0.21	0.11	-0.07	0.04	0.05	-0.01
Charlotte	US Airways	0.26	0.07	0.13	0.14	0.20	0.26	0.24	0.28	0.36	0.36	0.25	0.59	0.69	0.62
Chicago O'Hare	American	0.22	0.22	0.29	0.29	0.23	0.21	0.17	0.09	0.11	0.23	0.15	0.15	0.19	0.20
Chicago O'Hare	United	0.25	0.20	0.24	0.24	0.18	0.15	0.18	0.11	0.15	0.18	0.12	0.14	0.22	0.25
Cincinnati	Delta	0.24	0.19	0.25	0.33	0.30	0.28	0.37	0.28	0.30	0.37	0.42	0.64	0.60	0.51
Dallas-Ft. Worth	American	0.13	0.23	0.16	0.19	0.27	0.29	0.30	0.22	0.16	0.29	0.38	0.31	0.35	0.35
Denver	United	-0.09	-0.12	-0.19	0.02	0.05	0.07	0.13	0.09	0.08	0.09	0.07	0.12	0.19	0.07
Detroit	Northwest	0.08	0.14	0.15	0.10	0.05	0.05	0.09	0.10	0.18	0.22	0.34	0.25	0.29	0.22
Houston (IAH)	Continental	-0.12	-0.13	-0.10	0.01	0.14	0.19	0.19	0.16	0.15	0.15	0.13	0.13	0.21	0.18
Memphis	Northwest	0.37	0.35	0.39	0.32	0.26	0.18	0.27	0.24	0.23	0.26	0.38	0.29	0.39	0.39
Minneapolis	Northwest	0.10	0.11	0.10	0.17	0.13	0.13	0.33	0.26	0.25	0.21	0.42	0.34	0.44	0.41
Philadelphia	US Airways	0.20	0.20	0.20	0.10	0.10	0.08	0.07	0.21	0.32	0.33	0.27	0.26	0.30	0.29
Pittsburgh	US Airways	0.28	0.29	0.22	0.08	0.06	0.16	0.20	0.27	0.40	0.39	0.45	0.45	0.49	0.51
Salt Lake City	Delta	0.14	0.09	0.09	0.14	0.24	0.15	0.21	0.21	0.19	-0.06	-0.04	-0.02	-0.19	-0.15
St. Louis	TWA	0.12	0.12	0.10	0.18	0.10	0.06	0.06	0.03	-0.04	-0.04	0.01	-0.02	0.14	0.09
Washington (IAD)	United	0.01	0.17	0.17	0.17	0.12	0.11	0.15	0.16	0.16	0.17	0.21	0.2	0.32	0.37

Data taken from table 2 of Severin Borenstein's January 21, 1999 presentation to the TRB Study Committee on Airline Competition

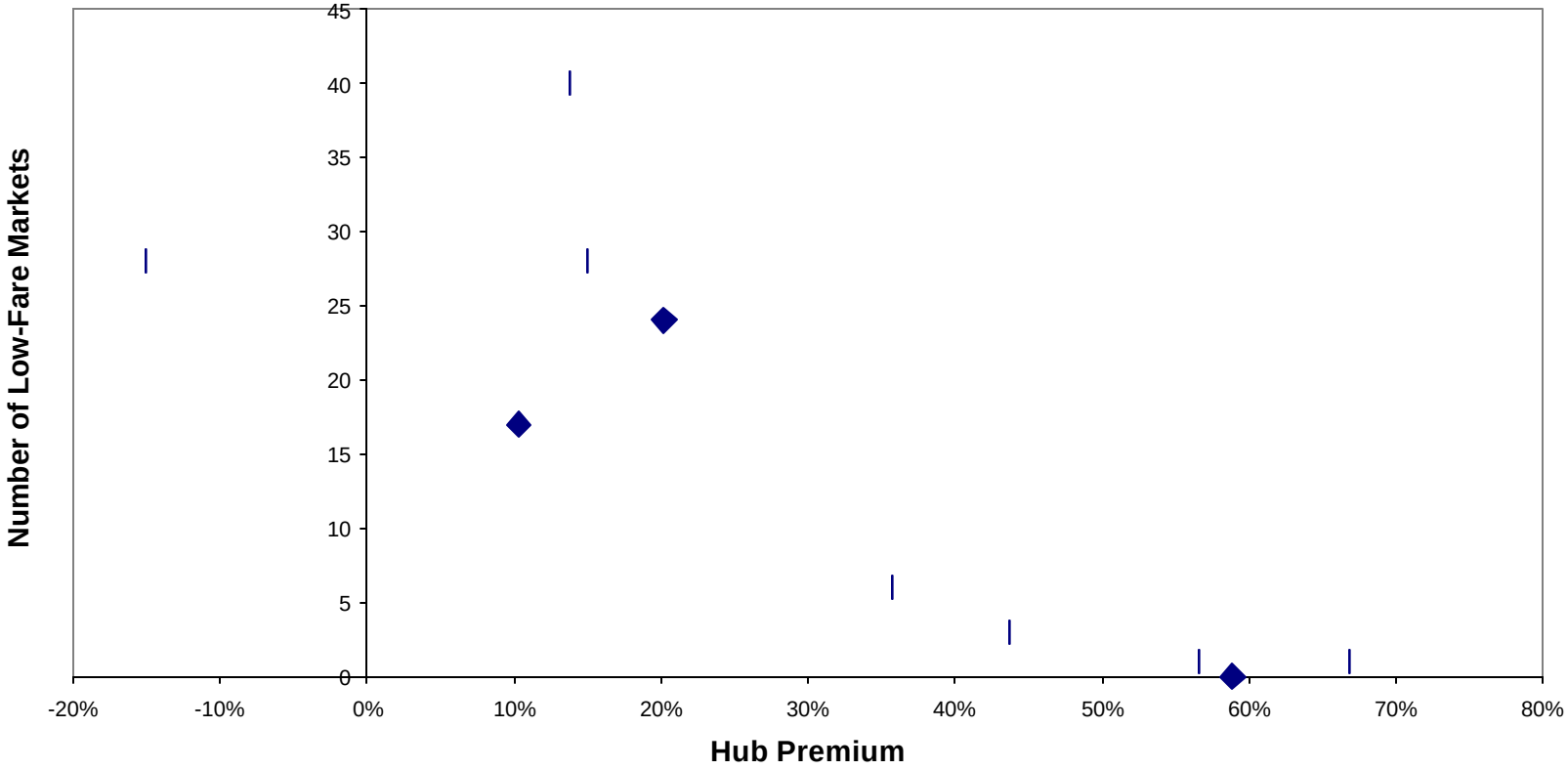
Table 7: Changing Hub Premiums Over Time

Hub City	Carrier	Hub Premium			1997 Low-Fare Markets
		1988	1995	1997	
Atlanta	Delta	47%	38%	20%	24
Charlotte	US Airways	34%	51%	59%	0
Cincinnati	Delta	45%	64%	67%	1
Denver	United	-4%	13%	10%	17
Detroit	Northwest	2%	21%	15%	28
Memphis	Northwest	33%	36%	36%	6
Minneapolis	Northwest	23%	41%	44%	3
Pittsburgh	US Airways	12%	46%	57%	1
Salt Lake City	Delta	21%	-11%	-15%	28
St. Louis	TWA	24%	3%	14%	40

Source: U.S. Department of Transportation
1988 and 1997 are for the Calendar Year
1995 is for the Third Quarter

In Table 7, the rightmost column shows the number of markets involving the hub as an origin or destination with a low-fare carrier in 1997. Where there are very few low-fare markets, the hub premiums are high and have been increasing. The relationship between the number of low-fare markets and the 1997 hub premiums is shown in Figure 5. Where low-fare carriers have routes into the hub, hub premiums are less. Furthermore, the greater the presence of a low-fare carrier at the hub, the lower the hub premium. What the figure doesn't reveal is that the large majority of low-fare routes represented in the data are served by Southwest Airlines. In the absence of Southwest, it seems likely that some of these hubs would have little or no low-fare carrier presence, with the result that the hub premiums would be noticeably higher.

Figure 5: Hub Premiums and Low Fare Competition -- 1997



Source: Derived from Table 7.

The above findings largely have been corroborated by the TRB study *Entry and Competition in the U.S. Airline Industry*.[41] That study finds that concentrated hubs have had consistently higher fares over time. The 12 concentrated hub airports were involved in 54 of the 75 highest fare markets in the country in 1997. Fares declined at only three of these twelve hubs, two of which (Salt Lake City and Atlanta) had significant entry by low-fare carriers. At the city-pair route level, average fares at hub airports were found to be consistently higher for short-, medium-, and long-haul markets.

In sum, it seems clear that the major airlines have been able to exercise market power for extended periods at their hub airports. Sustained entry of low-fare carriers might threaten this market power. In these circumstances, taking steps that forgo economic profits in the short run in order to preserve market power in the longer run might well be rational, profit-maximizing behavior.

Signaling. Beyond the evidence of market power, there are other reasons why predatory practices might be particularly attractive in the airline industry. An airline's behavior in one market can be viewed as a signal of how it would behave in other markets. Thus, the benefits from predatory practices are likely to extend beyond just the markets where they occur.

Indeed, for network airlines, these signaling benefits can be considerable. As Milgrom and Roberts point out, "The more such markets there are to protect – the greater are the incentives to build and maintain a reputation that deters challenge…[P]reying keeps alive the possibility that future entrants will also meet an aggressive response and, if this possibility is sufficiently unattractive to these entrants, they may be deterred."[42] One such example may have occurred in Cincinnati, where Trans World, with less than 1 percent of the market, introduced a new fare structure to boost connecting traffic from Cincinnati over TWA's hub in St. Louis. Delta responded by retaliating with lower fares on twenty markets not connected to Cincinnati but which were core routes for TWA profitability. This response is indicative of the ability in the airline industry to respond through network actions, even though no direct response occurred in the original market in which entry or increased competition occurred.

Once an effective and consistent signal has been sent, the carrier may have established a reputation for an aggressive response to new entry. With such a reputation, it may not be necessary to actually engage in predatory practices very often. As Comanor and Frech point out, "If the prey believes that the threat or promise will be carried out, there is no need for actual predation. Thus, like collusion, the most successful use of predatory threats or promises is difficult for outsiders to observe."[43]

If unfair methods of competition are rarely observed, this may not be because these practices don't exist in the airline industry, but because the relatively few signals that are sent are

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[41] Transportation Research Board, *Entry and Competition in the U.S. Airline Industry*, Special Report 255, (Washington: National Academy Press, 1999), pp. 74-81.

[42] Milgrom, Paul; Roberts, John, "New Theories of Predatory Pricing," in Bonanno, Giacomo; Brandolini, Dario, eds.. *Industrial structure in the new industrial economics*. Oxford; New York; Toronto and Melbourne: Oxford University Press, Clarendon Press 1990, pp. 112-37.

[43] Comanor, William S.; Frech, H. E., III, "Predatory Pricing and the Meaning of Intent." *Antitrust Bulletin*; Vol. 38 No. 2, Summer 1993, pp. 293-308.

very effective in persuading new entrants to avoid markets where they would have to compete with the predatory practices of an established major carrier. The ability to use industry information on services, fares, etc., also allows an incumbent carrier to monitor and launch a targeted assault on a new entrant. This ability to target entry responses enables the predator to reduce the costs of predation and to limit the extent of potentially damaging spillover to other markets.

As Roberts concludes, "The entrant, looking forward, will foresee the predatory pricing that will arise if it enters. Even though this pricing does not induce extra exit or lower second-period prices, it does reduce the entrant's first-period profits. Thus entry may be deterred by the credible threat of predation aimed at inducing exit or reducing output, even though this predation will not actually influence the exit or output decisions!"[44]

Acquisition as a Substitute for Predation. Predatory behavior is not the only threat to competition from low-fare airlines. An alternative to predation might be to acquire the new carrier. Telser argues, "Suppose that a firm or group of firms acting in concert seeks monopoly returns in a market which is presently competitive. To achieve this goal it is necessary to eliminate the existing competition and to deter future entry. … The would-be monopolist can choose between offering to acquire the competing firms at some price or selling the product at predatory prices so as to ruin them."[45] Indeed, in the predatory pricing literature, some economists have argued that it is likely to be cheaper to acquire the competitor than to drive it from the market using predatory pricing. Of course, antitrust authorities often take a dim view of acquisitions intended to establish or increase market power. However, if the acquisitions can be made while the acquired companies are still small and haven't yet reduced the market power of the major airlines in a significant way, then the acquisitions may be permitted.

Access to Capital Markets. Another issue in assessing whether predatory behavior might be effective is whether the new carriers have equal access to capital markets. In the predatory pricing literature, it has been argued that if all participants in the market have equal access to capital, then predatory pricing is unlikely to be effective. With equal access to capital, it is argued, the so-called "long purse" approach to predatory pricing where one company is able to force another out of business by simply being able to sustain losses longer wouldn't work. The assumption implicit in the argument that all companies have equal access to capital simply doesn't hold in practice. New-entrant airlines typically don't have the same access to capital as the established major carriers. Furthermore, a willingness to engage in predatory practices on the part of the major airlines may have the effect of reducing the new entrants' access to capital.

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[44] Roberts, John, "A Signaling Model of Predatory Pricing," in Morris, D. J., et al., ed.. *Strategic behaviour and industrial competition*. (Oxford; New York; Toronto and Melbourne: Oxford University Press, Clarendon Press 1986), pp. 75-93.

[45] Telser, L.G., "Cutthroat Competition and the Long Purse," Scherer, F. M., ed.. *Monopoly and competition policy*. Volume 2.. Elgar Reference Collection. International Library of Critical Writings in Economics, vol. 30. Aldershot, U.K.: Elgar; distributed in the U.S. by Ashgate, Brookfield, Vt., 1993, pp. 235-246.

VI. Summary

The characteristics of the airline industry, and in particular the persistence of market power at hub airports, make predatory practices a recurring possibility in the domestic airline industry. As such, they are a legitimate concern for competition policy. Because the presence of low-fare carrier service has such a dramatic effect on hub premiums, predatory practices are especially likely to be targeted at low-fare new entrants, although such practices need not be confined to these situations. Since many of the continuing gains from airline deregulation come from the presence of low-fare carriers, an industry characterized by vigorous opportunities for entry is essential for continuing consumer gains.

Appendix A: Responses to Competitive Entry

Entry by Southwest:

New Orleans – Tampa. In the third and fourth quarter of 1995, Continental and Delta primarily served this market, with a few other carriers carrying a small number of passengers in connecting service. Both Continental and Delta were offering predominantly single-plane service. During these quarters, Continental charged a lower fare than Delta and also carried more passengers. In the first quarter of 1996, Southwest entered the market with nonstop service with an average fare about half that charged by either Continental or Delta. In response, Continental cut its average fare slightly, but that fare was still 66% higher than Southwest's. Continental also went from predominantly single plane service to almost entirely connecting service and its traffic dropped by over 80 percent. Delta responded by retaining mostly single plane service and cutting its average fare more, but it was still 32 percent above Southwest's. Delta's traffic increased over the prior quarter, and was about the same as Southwest's traffic. Over the next six quarters, Delta continued with the same mix of mostly single plane service and continued to gradually lower its average fare, although at no point was that fare as low as Southwest's. Delta's traffic held at about the same level, but Southwest's grew to about 2.5 times Delta's traffic.

Baltimore-Washington (BWI) – Providence. In the second and third quarters of 1996, US Airways, offering single plane service at an average fare of approximately $170, dominated this market. In the fourth quarter, Southwest entered the market with nonstop service at a fare of $40. US Airways responded by cutting its average fare to $67 and its traffic increased by over 75 percent. However, at the lower fare, Southwest carried nearly two and a half times the traffic as US Airways. Over the next six quarters, Southwest's average fare gradually increased from $40 to $48, while US Airways average fare decreased from $67 to $53. US Airways did not have a lower average fare in any of these quarters. By the second quarter of 1998, Southwest was still carrying two and a half times the number of passengers as US Airways, but both carriers saw their traffic continue to increase. Indeed, by the second quarter of 1998, total traffic in the market was ten times the level it had been in the quarters immediately prior to Southwest's entry while average fares had fallen by more than two thirds.

Entry by American:

Dallas/Fort Worth – Montgomery, Alabama. In the third quarter of 1998, the Dallas/Fort Worth – Montgomery, Alabama market was served primarily by Delta with connecting service at an average fare of $256. American entered in the fourth quarter of 1998 with nonstop service and a fare of $106. Delta responded by cutting its average fare slightly to $227. By the third quarter of 1999, American had raised its fare to $165 and Delta had reduced its fare to $179, but still offered only connecting service. In response to American's lower fare and direct service, the overall market doubled in size, but Delta carried only about half of the passengers it had carried prior to American's entry.

Chicago O'Hare – Montgomery. In the third quarter of 1998, the Chicago O'Hare – Montgomery market was also primarily a Delta market with connecting service at an average fare of $124. American entered with direct service in the fourth quarter with a fare of $102. Delta continued to offer connecting service, but raised its average fare to $144 and saw its traffic decline by about half. The next quarter, both American and Delta raised their average fares and both saw their traffic decline. By the third quarter of 1999, American switched to connecting service at an average fare of $211 and carried very few passengers. Delta continued with connecting service at an average fare of $128 and saw its traffic return to levels nearly as high as before American's entry..

Chicago O'Hare – Duluth. Prior to American's entry in the fourth quarter of 1998, this market was served by Northwest with connecting service and an average fare of $225. American entered with direct service in the fourth quarter with a fare of $112. Northwest responded with a fare of $184, but continued with connecting service and lost two thirds of its prior traffic. By the third quarter of 1999, American increased its average fare to $186 with Northwest charging an average fare of $210 for connecting service. Not surprisingly, American carried 80 percent of the traffic.

Entry by Northwest

Greensboro/High Point – Detroit. In the first quarter of 1996, US Airways carried 75 percent of the traffic in this market with connecting service at an average fare of $168. In the second quarter, Northwest entered with direct service at an average fare of $201. US Airways responded by raising its average fare slightly to $171 and saw its traffic decline by about one third to a level below that carried by Northwest. The next quarter, US Airways again raised its average fare and again saw its traffic decline. Northwest also raised its fare for direct service, but saw its traffic continue to increase. By the end of 1997, traffic had stabilized at about this level with Northwest charging an average fare of $202 for its direct service and US Airways charging an average fare of $182 for connecting service.

Entry by United

Chicago O'Hare – Chattanooga . In the first quarters of 1998, Delta carried two thirds of the traffic in this market with connecting service at an average fare of a little over $140. United entered in the third quarter with nonstop service at an average fare of $120 and carried more traffic in their first quarter of service than the total market had in the previous quarters of connecting service only. Delta responded by increasing its fare to $147 and its traffic fell by two thirds. From that point through the third quarter of 1999, Delta and United both increased their fares with United usually keeping its fare about $25 lower. United continued to offer direct service while Delta continued to offer connecting service and United usually carried about three quarters of the traffic.

Appendix B - Hub Premiums

The data presented in Table 6 were constructed by Severin Borenstein for the Transportation Research Board's Special Study 255, *Entry and Competition in the U.S. Airline Industry*. Borenstein also provided this description of their construction.

These data were constructed from the U.S. Department of Transportation's Databank 1A, which is a 10% random sample of all tickets collected by U.S. airlines during a quarter. The data used cover every quarter from 1984:1 to 1997:4. The DOT's Databank 1A is the primary source of information on actual prices of tickets sold. It is used by government, academic, and industry analysts.

From each quarter of the Databank 1A, the following tickets are eliminated from the analysis of prices:

1. Any ticket that includes a destination or change-of-plane point outside the U.S.

2. Any ticket that is not either a one-way or round-trip itinerary, e.g., open jaw or circle trip tickets.

3. Any ticket that includes more than four coupons (each time a passenger changes flights, a coupon is collected).

4. Any ticket that includes more than two coupons for an origin to destination trip, i.e., any itinerary in which the passenger changes planes more than once as part of traveling from an origin to a destination.

5. Any ticket that requires changing airlines (interlining), as well as flights, as part of an origin to destination trip.

6. Any ticket with a fare of less than $10. These are usually "non-revenue" passengers, including both frequent-flyer bonus tickets and employee (and family) free travel. Unfortunately, all airlines do not treat and report these tickets the same way.

7. Any ticket with a fare greater than four times the DOT's Standard Industry Fare Level (SIFL) for the origin-to-destination distance of travel. These are assumed to be keypunch errors.

After eliminating these tickets, the remaining round-trip tickets are treated as two directional trips, one in each direction, with each directional trip costing half the ticket price. Using all of these "split" round-trip tickets and all remaining one-way domestic tickets, the average fare in every 50-mile distance category is calculated. For instance, the average fare in the 551-600 mile category is calculated by counting the total number of origin-to-destination passenger trips in this category and adding up the total revenue collected for these trips. The average price in the 551-600 mile category is then the total revenue divided by the total number of passenger trips. This is done for every 50-mile category.

To calculate the price premium at a given airport, all passenger trips to or from the airport are collected and the price for each trip is compared to the average price for trips in the same distance category. The calculation of the price premium for a given airline at a given airport is done in a similar way.

Appendix C: US Department of Transportation Hub Premium Analysis

The data presented in Table 7 were constructed by the U.S. Department of Transportation using the following methodology. Start with true O&D traffic in markets with more than twenty passengers per day.[46] Data should be divided into two groups: the data for the specific hub, city, or group of cities for which the premium is being calculated, and the "base" to which you are comparing that city's data. Henceforth these two sets are referred to as "hub data" and "base data" respectively.

For both sets of data, do the following:

a. Parse the data by distance and density:

Distance: 0 to 250 miles; 251 to 500 miles; 501 to 750 miles; 751 to 1000 miles; 1001 to 1500 miles, 1501 to 2000 miles, and over 2,000 miles.

Density: 21 to 50 passengers per day; 51 to 100 passengers per day; 101 to 200 passengers per day; 201 to 500 passengers per day; and over 500 passengers per day.

b. For each density and distance category, calculate the average fare (revenue/total passengers), yield (fare/average trip stage length), and market size (total passengers/count of markets)

Create Hub Passenger Weighting Matrix

For each distance/density block in the hub matrix, calculate the passenger weight by dividing the number of passengers in that block by the hub total.

Create Hub Premium Matrix

For each distance/density block, multiply the Hub yield by the Base average trip distance. Subtract Base average fare.

Weighted Fare Premium Matrix

Multiply Passenger Weighting Matrix by Hub Premium Matrix.

Add up the Weighted Fare Premium Matrix to get the dollar figure fare premium (or discount). Divide dollar fare premium by hub average fare to calculate percentage fare premium.

[46] This analysis is limited to the 10 cities (not airports) in which a single hubbing network carrier enplaned more than 65 percent of passenger traffic. This approach excludes some heavily concentrated network hub airports in multiple airport cities such as Dallas/Fort Worth, New York, and Houston that also experience significant fare premiums.