AIRFARES TO SMALL AND MEDIUM SIZED COMMUNITIES

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INTRODUCTION

By most accounts, U.S. Airline Deregulation has been successful in delivering lower prices and improved service to customers. Despite the recent increase in government involvement in the airline industry aimed at ensuring financial viability and improving safety, there has not been a return to the types of government intervention that existed before 1978 (Bailey, 2002).

While real airfares have declined since deregulation, there continue to be concerns over higher fares paid by travelers from rural and small communities compared to those paid by travelers from large metropolitan areas. For example, a 1998 report by the U.S. Department of Transportation found evidence that travelers going to and from small communities paid higher airfares than those traveling between large hub airports.[1] Moreover, a recent study by the U.S. General Accounting Office (GAO, 1999) found evidence of barriers to entry and higher fares at some airports, with particular concerns at airports in small communities. The study found passengers flying to or from small-and medium-sized communities paid 12 percent more than the national average airfare in 1998 and that 13 of the 42 airports serving small communities that they examined had real airfare increases between 1994 and 1998.[2]

These concerns have not been isolated to any individual region of the United States, as state interests have voiced concerns over higher fares to communities in the Midwest, the South, and the East. For example, in testimony to the U.S. House of Representatives, the Consumer Protection Board Chairwoman for New York stated: "Deregulation has produced more uneven results in smaller markets such as those served by New York's upstate regional airports. Many smaller regional airports have effectively been divided among the major carriers and their subsidiaries, decreasing competition and relaxing the drive to lower prices."[3] Similarly, airport officials attending the 16th annual Texas Aviation Conference discussed "costly airline prices that cause some travelers to drive to the nearest large city for lower fares," as a problem facing small communities.[4]

The potentially higher prices realized for air travel for many small communities combined with reductions in service to many small communities since the terrorist attacks of September 2001 suggest potential access and mobility problems for rural residents and businesses. The Regional Airline Association (RAA) reported that since August of 2001, 19 airports in the 48 contiguous states have lost air service completely, 20 more have been reduced to service by one airline, and another 86 have been reduced to three or fewer flights per day.[5] The access and mobility provided to rural residents and businesses from low-cost, high-quality air travel is especially important given their remote locations. As stated by the National Association of Development Organizations in its statement of Transportation Policy for the 21st Century:

> *The national transportation network functions properly when it helps form vital social and economic connections. This is especially true in small metropolitan and rural America where distance and a scattered population make these connections even more important. Transportation is essential not only for linking people to jobs, health care and*

[1] U.S. Department of Transportation, News Release, "DOT Submits Report to Congress on Rural Airfares," 4/21/98. Available at http:/www.dot.gov/affairs/1998/dot8198.htm.
[2] General Accounting Office, "Airline Deregulation: Changes in Airfares, Service Quality, and Barriers to Entry," Report to Congressional Requesters, March 1999.
[3] Testimony of Debra Martinez, Chairwoman and Executive Director of the New York State Consumer Protection Board, before the U.S. House of Representatives Aviation Subcommittee, September 20, 1999.
[4] Tinsley, Anna M. "Officials Form Group to Work on Solutions to Airline Problems in Smaller Communities," *Abiliene Reporter-News*, June 5, 1998.
[5] Larsen, Tulinda, "Crisis in Small Community Air Service," RAA Convention News, May 21, 2003.

family in a way that enhances their quality of life, but also for contributing to regional economic growth and development by linking business to customers, goods to markets, and tourists to destinations.

This study examines one component of the air service provided to rural and small communities – the fares paid for airline travel. Specifically, this report examines differences in airfares paid by travelers to and from rural and small communities in comparison to those paid by travelers to and from large metropolitan areas. The study:

(1) examines trends in airfares to various-sized communities by reviewing U.S. General Accounting Office studies that have highlighted these trends,

(2) examines airfare differences in the year prior to the Sept. 11, 2001, Terrorist Attacks, highlighting fare differences among community of different sizes,

(3) examines potential reasons for such fare differences, such as cost differences and market power differences,

(4) examines differences in cost characteristics, demand characteristics, and market power characteristics between rural/small communities and large communities,

(5) estimates an empirical model of airfares to show the impacts of variables influencing costs, demand, and market power on fares,

(6) highlights various fare differences attributable to such factors, and

(7) discusses findings and implications.

The next section of the report examines trends in airfares to various-sized communities by reviewing the findings of various studies performed by the U.S. General Accounting Office (U.S. GAO).

TRENDS IN AIRFARES

A series of studies by the U.S. General Accounting Office (U.S. GAO) examined changes in airfares and service since deregulation of the airline industry.[6] In general, each of these studies has extended the methodology used in the previous study to make assessments of changes in airfares at airports serving various-sized communities. The studies defined small communities as those with Metropolitan Statistical Area (MSA) populations of 300,000 or less, medium-sized communities as those with MSA populations between 300,001 and 600,000, medium-large communities as those with populations between 600,001 and 1.5 million, and large communities as those with populations of more than 1.5 million.

All three of these studies found that real airfares declined overall on average for the period studied. Moreover, they found average airfares declined for airports serving each of the four community sizes studied. For example, in 1996 GAO found that in studying airfare changes between 1979 and 1994 at 112 of the nation's largest airports:

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[6] *Airline Deregulation: Trends in Airfares at Airports in Small and Medium-Sized Communities* (GAO/RCED-91-13, Nov. 1990), *Airline Deregulation: Changes in Airfares, Service, and Safety at Small, Medium-Sized, and Large Communities* (GAO/RCED-96-79, April 1996), and *Airline Deregulation: Changes in Airfares, Service Quality, and Barriers to Entry* (GAO/RCED-99-92, March 1999)

- real airfares dropped by 8.5 percent at airports serving small communities
- real airfares dropped by 10.9 percent at airports serving medium-sized communities
- real airfares dropped by 8.3 percent at airports serving large communities

Further, in examining airfare changes between 1990 and the second quarter of 1998 for 171 airports, GAO (1999) found:

- real airfares dropped by an average of 19.5 percent at airports serving small communities
- real airfares dropped by an average of 22 percent at airports serving medium communities
- real airfares dropped an average of 22.2 percent at airports serving medium-large communities
- real airfares dropped an average of 21 percent at airports serving large communities

However, the studies also found that the changes in airfares over time varied greatly for routes of different distances and varied greatly among airports serving similarly sized communities. For example, the 1996 study found that fares decreased between 1979 and 1994 for 73 of the 112 airports studied, but that airfares increased at 13 of the 49 small airports studied, 19 of the 38 medium airports studied, and 7 of the 25 large airports studied. GAO (1996) found the fare reductions tended to occur at airports that realized increased competition, particularly low-cost carrier competition. Similarly, GAO's 1999 study found that from 1994 to 1998, average fares decreased at 132 of the 171 airports studied, while they increased at 13 airports serving small communities, 4 airports serving medium communities, 9 airports serving medium-large communities, and 13 serving large communities. In making an assessment of why these communities may have realized fare increases, GAO noted that 12 of the 13 small community airports, 3 of the 4 medium community airports, and 7 of the 9 medium-large community airports where fare increases occurred were served by an airline that had at least a 40 percent share of the airport's passengers. Moreover, for the 13 large community airports where fare increases occurred, 7 were hubs for major airlines. Finally, none of the small and medium community airports where fare increases occurred were served by low-cost air carriers. Low cost air carriers had small market shares at most of the medium-large and large airports where fare increases occurred. These findings suggest that competitive conditions, not just community size, have played an important role in airfare changes.

In addition to finding differences in fare changes over time, the GAO studies also highlighted major fare differences at any point in time. These fare differences existed among airports serving different-sized communities, and among airports serving similarly sized communities. GAO (1999) showed that although the fare changes for various-sized communities have been very similar over time, in 1998 passengers flying to or from small communities paid 12 percent more than the national average fare, while those flying to or from large communities paid 8 percent more than the national average fare. In highlighting how airfares for different communities of similar size can also vary widely at one point in time, GAO showed that the average fare for passengers flying to or from Las Vegas, NV was 9 cents per passenger mile compared to an average fare for passengers flying to or from Charlotte, NC of 28 cents per passenger mile in 1998.

Because several time-series glimpses of airfare changes already exist, and because of a lack of understanding of airfare differences at one point in time, this study focuses on current airfare differences in an attempt to explain how cost factors, demand factors, and market power factors explain rate differences among cities. As our directive was to focus on small communities, we will pay special attention to fare differences between small and large communities and reasons why they may exist. The following section examines airfare differences among different sized communities.

CURRENT FARE DIFFERENCES

This section of the report uses the DB1B Databank of the U.S. DOT's *Origin and Destination Survey* to examine fare differences nationwide in the year prior to the Sept. 11, 2001, terrorist attacks (third quarter 2000 through second quarter 2001). The DB1B Databank is a 10 percent sample of all airline passenger tickets sold in the United States.

Specific fare differences examined in this section include differences by size of community served, region served, and flight distance. In this study, we define two different community sizes: (1) small – MSA populations of 300,000 or less, and (2) large – those above 300,000. We do not break the group of communities with populations of more than 300,000 into smaller groups because our focus is on fare differences between small communities and other communities.

Figure 1 shows average fare per passenger mile for flights originating in, terminating in, and serving small and large communities.[7] As the figure shows, the average fare for flights serving small communities is 11 percent higher than for flights serving large communities. Moreover, a paired T-test of significant differences in means shows that the average fares between two communities are significantly different.[8]

[7] Flights serving small-and large-sized communities are those that either originate or terminate in a small or large community. Thus, some flights that serve small communities are also counted as flights serving large communities.
[8] Weighted averages are not used for fares because a large number of fares obtained from the sample data do not have corresponding information on the number of passengers flying from various cities.

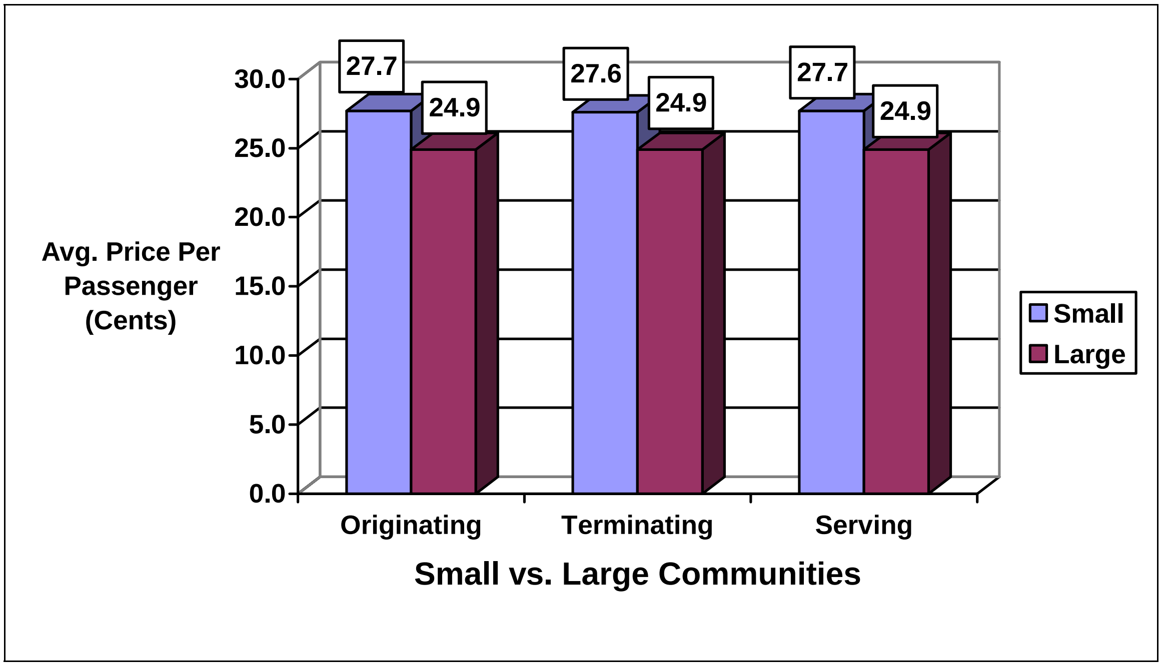

Figure 1. Average Price per Passenger for Flights Serving Small and Large Communities (3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B).
T-test of equal means (small vs. large; originating) = t-value: -51.18, p-value <.0001
T-test of equal means (small vs. large; terminating) = t-value: -54.13, p-value <.0001
T-test of equal means (small vs. large; serving) = t-value: -74.46, p-value <.0001

In order to obtain additional insight into fare differences, we break down the average fares by distance.[9] Figure 2 shows fare differences by distance traveled for flights originating in small and large communities. Figures 3 and 4 show the same fare information for flights terminating in and serving various-sized cities, respectively. As the figures show, the average fares are higher for flights serving small communities than large communities for short and medium distance flights, while they are lower for long distance flights.

[9] The General Accounting Office (GAO) defines short-haul trips as equal to or less than 750 miles, medium-haul trips as between 751 and 2,000 miles, and long-haul trips as 2,001 miles or greater. This study uses these definitions.

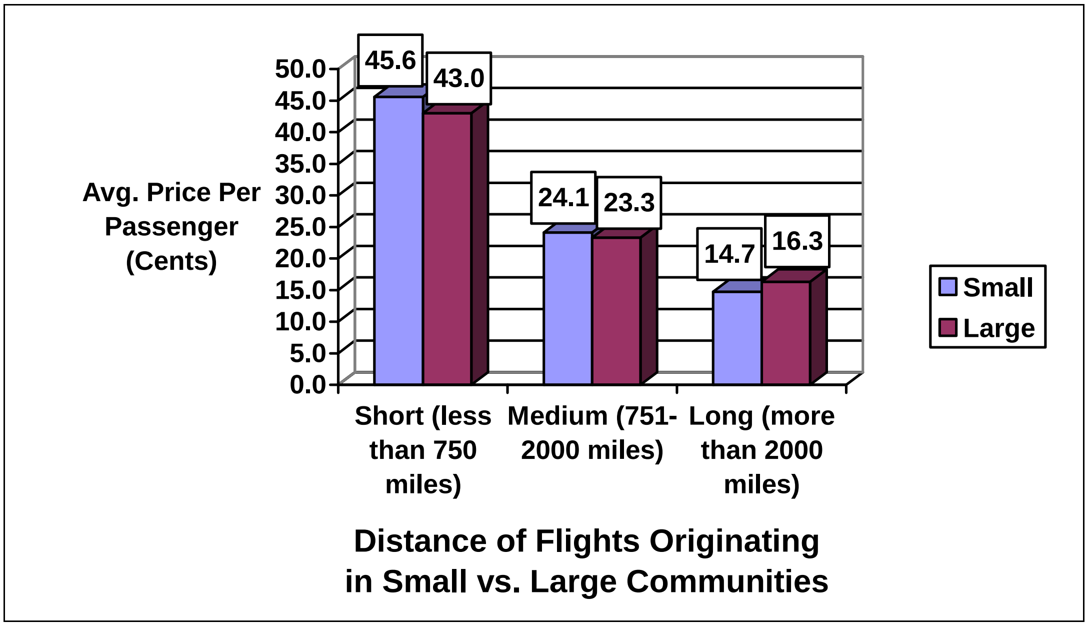

Figure 2. Average Price per Passenger by Flight Distance Originating in Small and Large Communities (3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B).
T-test of equal means (small vs. large; short distance) = t-value: -19.52, p-value<.0001
T-test of equal means (small vs. large; medium distance) = t-value: -13.01, p-value<.0001
T-test of equal means (small vs. large; long distance) = t-value: 26.25, p-value<.0001

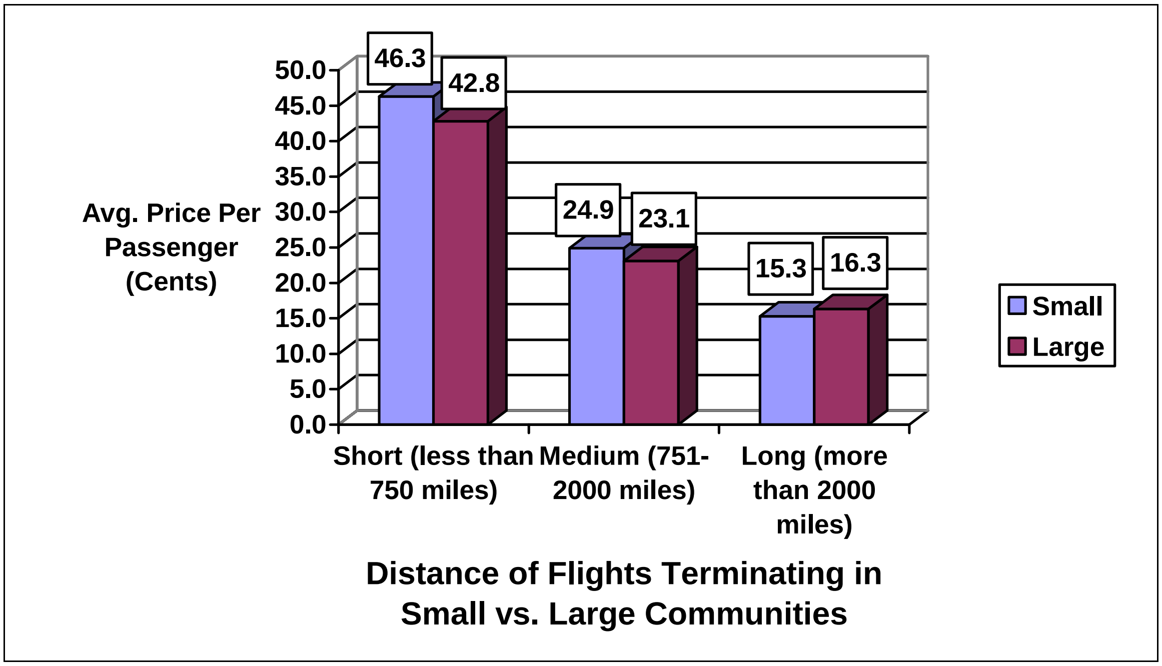

Figure 3. Average Price per Passenger by Flight Distance Terminating in Small and Large Communities (3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B).

T-test of equal means (small vs. large; short distance) = t-value: -24.90, p-value<.0001

T-test of equal means (small vs. large; medium distance) = t-value: -32.35, p-value<.0001

T-test of equal means (small vs. large; long distance) = t-value: 17.17, p-value<.0001

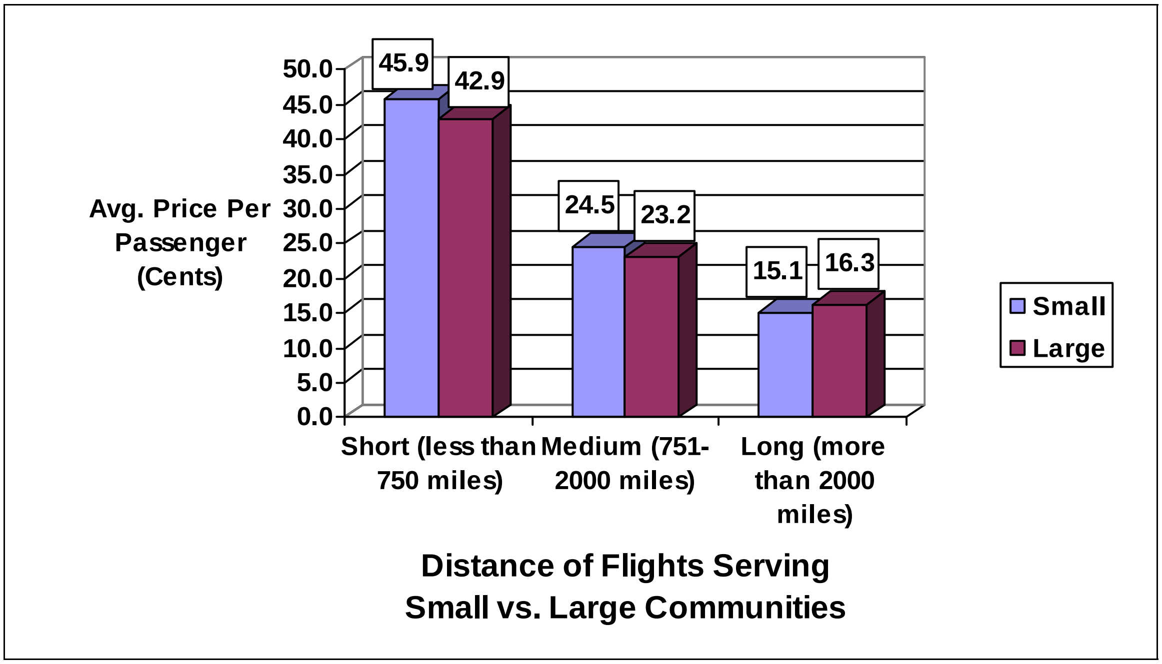

Figure 4. Average Price per Passenger by Flight Distance Serving Small and Large Communities (3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B)
T-test of equal means (small vs. large; short distance) = t-value: -31.44, p-value<.0001
T-test of equal means (small vs. large; medium distance) = t-value: -32.46, p-value<.0001
T-test of equal means (small vs. large; long distance) = t-value: 29.92, p-value<.0001

Tables 1 through 4 compare average fares per passenger mile at airports serving small and large communities by state. As the tables show, there are large fare variations among states and within states. In examining airfare differences between small and large communities within states, Table 1 shows that 30 of the 36 states that have airports serving small and large communities show higher average fares for small community airports than large community airports. Table 2 shows fare differences by flight distance, originating community size, and state. The table shows that small community airfares are higher for 18 out of the 36 states having airports that serve large and small communities on long distance flights, while they are higher for small communities in 19 of the states for medium and short distance flights. Table 3 shows larger proportions of small community flights showing higher fares for terminating flights: higher fares for small communities in 25 and 24 out of 36 states for long and medium flights, respectively, and higher fares for small communities in 31 out of 36 states for short flights.

Table 1. Average Fare per Passenger Mile by State.						
	Average Fare per Passenger Mile (Cents)					
	Originating		Terminating		Serving	
Size of Communities	Large	Small	Large	Small	Large	Small
Alabama	29.6	31.0	29.9	32.5	29.8	31.8
Alaska		19.7		20.1		19.9
Arizona	18.2	20.4	17.8	20.3	18.0	20.4
Arkansas	26.9	28.1	28.3	30.7	27.6	29.5
California	18.1	18.9	17.9	20.0	18.0	19.4
Colorado	25.1	27.1	24.3	24.7	24.7	25.6
Connecticut	23.8		25.0		24.4	
District of Columbia	28.0		28.3		28.2	
Florida	19.6	27.4	18.6	24.9	19.1	26.0
Georgia	30.2	29.0	28.0	28.1	29.2	28.5
Hawaii	11.4	16.4	10.4	13.2	10.9	14.0
Idaho	19.1	23.1	19.0	23.2	19.0	23.2
Illinois	28.3	30.4	29.0	34.0	28.7	32.2
Indiana	29.1	31.9	30.5	34.2	29.8	33.1
Iowa	29.5	28.0	31.7	30.2	30.6	29.1
Kansas	27.1	23.1	29.1	27.5	28.0	25.9
Kentucky	29.5	32.7	30.5	35.4	30.0	34.2
Louisiana	23.5	27.6	23.0	29.4	23.2	28.5
Maine		26.4		24.9		25.6
Maryland	22.7		23.0		22.8	
Massachusetts	26.1	37.7	26.5	33.8	26.3	34.9
Michigan	30.2	29.5	32.1	31.0	31.1	30.3
Minnesota	27.8	30.0	28.8	31.6	28.3	30.8
Mississippi	25.6	31.2	25.4	32.4	25.5	31.8
Missouri	26.7	33.4	26.6	36.4	26.6	35.0
Montana		21.3		20.0		20.6
Nebraska	22.9	24.7	24.3	26.7	23.6	25.7
Nevada	17.2	22.2	15.2	19.5	16.1	20.4
New Hampshire	22.6		23.2		22.9	
New Jersey	37.1		37.1		37.1	
New Mexico	19.4	30.1	18.7	35.8	19.1	34.1
New York	27.1	36.3	28.2	38.3	27.6	37.2
North Carolina	30.5	36.1	31.0	35.0	30.7	35.5
North Dakota		26.4		28.3		27.3
Ohio	30.4		31.6		31.0	
Oklahoma	23.1	24.5	24.0	22.8	23.5	23.6
Oregon	17.4	19.9	17.6	21.9	17.5	20.8
Pennsylvania	32.0	37.2	32.9	40.0	32.4	38.5
Rhode Island	22.9		23.2		23.0	
South Carolina	33.9	29.5	33.0	27.8	33.5	28.6
South Dakota		25.5		26.6		26.1
Tennessee	31.0	36.5	31.8	34.6	31.4	35.4
Texas	23.9	25.0	23.6	25.9	23.8	25.4
Utah	18.7	19.3	18.1	20.5	18.4	19.9

Table 1. Average Fare per Passenger Mile by State (Continued).						
Vermont		26.6		27.0		26.8
Virginia	30.4	38.1	30.8	39.4	30.6	38.8
Washington	16.7	20.8	16.4	22.3	16.6	21.5
West Virginia	40.5	39.0	43.8	42.3	42.1	40.6
Wisconsin	31.1	32.2	32.8	34.2	31.9	33.2
Wyoming		27.1		25.4		26.0

Source: 3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B.

Table 2. Average Fare per Passenger Mile for Flights Originating by Distance and State.						
	Average Fare per Passenger Mile for Flights Originating (Cents)					
	Long Distance		Medium Distance		Short Distance	
Size of Communities	Large	Small	Large	Small	Large	Small
Alabama	14.5	16.7	26.1	25.5	44.6	47.2
Alaska		12.4		26.1		47.8
Arizona	17.0	14.8	18.2	19.7	23.8	32.0
Arkansas	16.0	14.2	24.2	23.8	36.4	45.8
California	16.6	14.1	18.9	18.9	27.0	30.5
Colorado	21.4	19.2	24.5	24.8	43.5	44.4
Connecticut	14.9		23.3		46.3	
District of Columbia	19.1		26.7		45.3	
Florida	14.4	15.3	19.7	24.3	37.5	43.7
Georgia	18.6	15.9	30.0	25.6	43.9	41.5
Hawaii	9.9	12.3	10.3	14.3	42.2	31.5
Idaho	16.1	16.7	18.9	22.0	26.8	32.7
Illinois	20.3	14.7	25.6	23.0	43.4	45.9
Indiana	14.4	14.4	23.1	24.2	46.2	47.7
Iowa	16.3	15.5	25.4	23.0	47.9	47.2
Kansas	14.8	15.5	24.9	22.2	42.8	42.8
Kentucky	14.5	14.9	22.7	24.7	44.1	46.4
Louisiana	16.2	15.9	21.7	24.1	36.0	42.6
Maine		15.0		24.8		50.6
Maryland	13.9		22.2		41.2	
Massachusetts	18.4	24.7	26.2	25.0	50.4	50.6
Michigan	16.1	14.3	23.5	23.4	47.5	45.4
Minnesota	18.9	16.9	25.7	24.5	48.1	51.0
Mississippi	14.6	15.5	22.4	26.1	37.4	46.2
Missouri	17.4	15.6	23.9	25.2	39.5	46.3
Montana		15.0		22.1		38.0
Nebraska	15.3	17.1	20.7	21.7	37.9	39.0
Nevada	14.9	19.3	17.9	23.9	24.3	21.3
New Hampshire	11.9		22.0		45.9	
New Jersey	17.3		20.4		58.6	
New Mexico	15.9	18.8	19.1	27.6	27.6	46.1
New York	17.7	18.7	25.4	27.2	48.7	54.9
North Carolina	16.2	16.5	27.6	29.4	44.4	47.1
North Dakota		16.0		23.9		45.6
Ohio	15.2		24.8		46.6	

Table 2. Average Fare per Passenger Mile for Flights Originating by Distance and State (Continued).						
Oklahoma	16.1	13.9	22.2	21.2	30.1	36.1
Oregon	14.8	13.1	18.0	19.0	33.6	34.8
Pennsylvania	17.9	15.9	28.3	25.8	52.6	54.9
Rhode Island	12.5		22.4		47.4	
South Carolina	16.8	17.0	30.4	23.8	47.8	39.0
South Dakota		14.5		22.9		43.6
Tennessee	16.2	17.3	27.0	24.9	44.7	47.8
Texas	20.1	17.0	23.2	22.6	32.7	32.9
Utah	15.8	20.0	19.2	17.0	26.1	30.5
Vermont		16.4		24.3		46.0
Virginia	15.4	17.9	26.4	30.1	48.4	53.8
Washington	14.8	14.4	17.4	18.6	31.5	39.1
West Virginia	16.0	14.8	29.5	27.1	56.7	56.8
Wisconsin	15.2	16.4	25.5	26.3	48.7	51.5
Wyoming		19.4		25.5		45.6

Source: 3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B.

Table 3. Average Fare per Passenger Mile for Flights Terminating by Distance and State.						
	Average Airfare per Passenger for Flights Terminating (Cents)					
	Long Distance		Medium Distance		Short Distance	
Size of Communities	Large	Small	Large	Small	Large	Small
Alabama	15.8	16.8	26.9	27.8	44.0	50.3
Alaska		13.6		26.4		47.2
Arizona	16.4	14.9	17.7	21.0	24.4	33.8
Arkansas	18.5	23.7	26.1	26.5	36.9	46.3
California	16.5	15.0	18.3	19.9	26.7	31.3
Colorado	21.2	18.9	23.7	23.3	41.9	45.8
Connecticut	15.9		23.8		46.5	
District of Columbia	19.3		26.0		45.2	
Florida	14.2	16.4	18.3	22.0	36.2	43.0
Georgia	17.5	16.6	27.5	24.5	40.5	41.1
Hawaii	9.8	11.1	3.8	13.1	35.6	34.4
Idaho	15.7	16.7	19.4	22.9	26.3	34.6
Illinois	19.8	18.7	25.9	27.0	42.6	49.0
Indiana	15.2	16.2	24.4	26.8	46.2	48.9
Iowa	18.7	18.9	27.6	25.2	49.9	49.5
Kansas	18.8	22.6	26.9	25.3	44.3	49.5
Kentucky	14.8	20.0	24.0	27.4	44.5	49.7
Louisiana	15.9	18.8	21.1	25.9	35.9	43.6
Maine		14.9		23.0		47.4
Maryland	13.8		22.3		40.7	
Massachusetts	19.0	19.9	25.4	22.5	49.4	50.7
Michigan	17.0	16.7	25.1	24.9	48.9	45.8
Minnesota	19.7	21.1	26.8	26.6	46.8	49.6
Mississippi	14.9	15.9	22.3	28.0	37.5	45.5
Missouri	17.4	24.3	24.2	30.2	38.1	47.0

Table 3. Average Fare per Passenger Mile for Flights Terminating by Distance and State (Continued).						
Montana		14.5		21.3		39.3
Nebraska	17.5	20.9	22.0	24.1	38.6	40.9
Nevada	13.1	23.9	15.8	20.0	22.7	16.7
New Hampshire	12.1		23.1		43.7	
New Jersey	13.3		23.6		53.4	
New Mexico	16.6	25.2	18.4	32.9	26.4	52.3
New York	18.3	19.3	26.0	30.0	48.0	55.6
North Carolina	16.7	18.0	27.6	29.6	45.1	46.4
North Dakota		20.0		25.8		47.6
Ohio	15.9		25.6		47.7	
Oklahoma	16.9	16.7	23.2	19.3	31.1	35.7
Oregon	15.1	14.9	18.2	20.7	32.5	37.5
Pennsylvania	18.5	16.4	28.8	28.9	53.4	57.4
Rhode Island	13.0		22.6		45.1	
South Carolina	16.3	18.4	29.9	22.8	46.8	37.2
South Dakota		17.1		23.8		47.2
Tennessee	16.9	16.4	27.4	23.9	45.2	45.9
Texas	20.0	21.7	22.8	23.6	32.1	33.1
Utah	15.0	18.4	18.6	17.5	26.0	36.6
Vermont		15.8		25.3		44.8
Virginia	16.0	19.7	26.4	32.3	48.1	54.0
Washington	14.7	15.7	17.4	19.6	29.6	41.6
West Virginia	18.4	16.1	35.4	31.6	58.5	58.7
Wisconsin	17.6	19.5	27.4	28.4	48.3	52.0
Wyoming		17.2		25.3		48.8

Source: 3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B.

Table 4. Average Fare per Passenger Mile for Flights Serving by Distance and State.						
	Average Airfare per Passenger for Flights Serving (Cents)					
	Long Distance		Medium Distance		Short Distance	
Size of Communities	Large	Small	Large	Small	Large	Small
Alabama	15.1	16.7	26.5	26.7	44.3	48.7
Alaska		13.0		26.3		47.5
Arizona	16.7	14.9	18.0	20.5	24.1	32.9
Arkansas	17.4	20.0	25.2	25.2	36.7	46.1
California	16.6	14.6	18.6	19.4	26.8	30.9
Colorado	21.3	19.0	24.1	23.9	42.8	45.2
Connecticut	15.4		23.5		46.4	
District of Columbia	19.2		26.4		45.2	
Florida	14.3	16.0	19.0	22.9	36.8	43.4
Georgia	18.1	16.3	28.8	25.0	42.3	41.2
Hawaii	9.9	11.4	9.2	13.5	40.0	33.1
Idaho	15.9	16.7	19.1	22.5	26.6	33.7
Illinois	20.1	16.8	25.7	25.0	43.0	47.5
Indiana	14.8	15.3	23.7	25.5	46.2	48.3
Iowa	17.5	17.4	26.5	24.1	48.9	48.3

Table 4. Average Fare per Passenger Mile for Flights Serving by Distance and State (Continued).						
Kansas	16.9	20.5	25.9	24.1	43.5	47.7
Kentucky	14.6	17.9	23.3	26.1	44.3	48.1
Louisiana	16.0	17.5	21.4	25.0	36.0	43.1
Maine		14.9		23.8		48.9
Maryland	13.8		22.2		41.0	
Massachusetts	18.7	20.9	25.8	23.2	49.9	50.7
Michigan	16.5	15.5	24.2	24.2	48.2	45.6
Minnesota	19.2	19.2	26.3	25.6	47.5	50.3
Mississippi	14.8	15.7	22.3	27.1	37.4	45.8
Missouri	17.4	20.4	24.0	27.9	38.8	46.6
Montana		14.7		21.7		38.6
Nebraska	16.4	19.1	21.3	22.9	38.2	39.9
Nevada	13.9	21.9	16.7	21.3	23.5	18.1
New Hampshire	12.0		22.5		44.7	
New Jersey	15.0		22.5		55.1	
New Mexico	16.3	23.4	18.7	31.2	27.0	50.5
New York	17.9	19.0	25.7	28.5	48.3	55.3
North Carolina	16.4	17.3	27.6	29.5	44.7	46.7
North Dakota		18.2		24.8		46.6
Ohio	15.5		25.1		47.2	
Oklahoma	16.5	15.6	22.7	20.2	30.6	35.9
Oregon	14.9	14.0	18.1	19.8	33.1	36.1
Pennsylvania	18.2	16.1	28.6	27.3	53.0	56.1
Rhode Island	12.7		22.5		46.2	
South Carolina	16.5	17.8	30.2	23.2	47.3	38.1
South Dakota		16.0		23.3		45.5
Tennessee	16.6	16.6	27.2	24.4	44.9	46.8
Texas	20.1	19.8	23.0	23.1	32.4	33.0
Utah	15.4	19.1	18.9	17.3	26.0	34.2
Vermont		16.1		24.8		45.4
Virginia	15.7	18.8	26.4	31.2	48.3	53.9
Washington	14.7	15.1	17.4	19.1	30.7	40.4
West Virginia	17.2	15.4	32.5	29.4	57.6	57.8
Wisconsin	16.4	18.1	26.4	27.3	48.5	51.8
Wyoming		17.9		25.4		47.3

Source: 3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B.

This section shows the large variations in airfares among community size and region. Moreover, the differences in airfares between small and large communities are consistent with previous findings by the GAO and others – findings of higher average fares for passengers traveling to and from airports serving small communities in comparison to the national average. The next section explains potential reasons why airfares are higher on average for airports serving small communities.

EXPLAINING AIRFARE DIFFERENCES BETWEEN SMALL AND LARGE COMMUNITIES

While it is apparent that the average airfares charged on flights originating in small-and medium-sized communities are higher than those on flights originating in large communities, there may be several reasons for the higher fares. Two obvious reasons might be: 1) smaller cities may be more costly to serve, due to a lower density of traffic, shorter average distances traveled, lower load factors, and smaller plane sizes, or 2) smaller cities are typically dominated by one or a few carriers, providing potential for the exertion of more market power.

Caves, Christensen, and Tretheway (1984) have shown that large economies of density exist in the airline industry. This suggests that carriers that have more traffic over a given network realize lower average costs than those with less traffic over the same-sized network. This suggests that airlines are likely to realize higher costs on routes serving smaller communities with lower traffic levels than on those where traffic levels are high. However, as noted by Keeler (1972), high traffic may also lead to higher costs because of congestion.

Keeler (1972) and others have shown an important role for stage length in determining the cost of providing flights. Stage length is the segment length for any portion of a flight where stops are made. Several airline costs vary less than proportionally with distance and are really more a function of the number of takeoffs and landings. These costs include maintenance costs, fueling costs, boarding costs, luggage loading costs, security costs, landing fees, and a variety of other costs. These costs decline as a portion of total costs with increases in stage length. Consequently, average unit costs decline with longer stage lengths. Because most airlines use a hub and spoke system to carry passengers throughout their networks, most passengers flying from small cities must travel to a larger hub city before going to their final destination. This leads to lower average stage lengths and the resulting higher average costs.

Several authors have also shown the cost savings associated with having flights that are more fully loaded (higher load factors). Many costs of operating flights do not vary proportionally with the number of passengers. For example, flight crew costs, maintenance costs, fuel costs, etc. do not increase in line with the number of passengers on a flight. Bailey, Graham, and Kaplan (1985) estimate that less than 22 percent of U.S. trunk carriers' domestic costs were passenger related. The large unit cost savings resulting from having higher load factors also suggest a lower cost of serving larger cities than smaller communities.

A fourth reason why it may be more costly to serve small cities in comparison to large cities is that small cities may not have the necessary traffic levels to support larger and more economical aircraft. Bailey, Graham, and Kaplan (1985) show that in most cases direct aircraft operating costs are lower per passenger mile for larger aircraft than for smaller aircraft.[10]

Finally, as highlighted by U.S. GAO (1999), much of the growth in flights from small communities since deregulation has been through the introduction of turbo-prop flights. It is generally cheaper to operate turbo props than jets (U.S. GAO, 1999). Thus, to the extent that a larger portion of flights serving small communities are using such turbo-prop aircraft, the costs of serving flights from small cities may be less expensive holding other factors constant.

[10] The exception is that at very low mileages, some of the larger aircraft are more costly to operate on a per passenger mile basis.

In addition to these important potential cost differences between small and large cities, there are also important potential differences in demand and in market power that may account for fare differences. In some cases, characteristics that affect the costs of flights may affect demand. For example, higher flight frequencies may result in an increase in demand due to more convenient schedules, more fully loaded flights might decrease demand due to a less comfortable environment, and an increased use of turbo-props might reduce demand because of less perceived comfort associated with turbo-props than jets.

In other cases, there are unique characteristics of different flights that may affect demand. For example, vacation travelers are likely to account for a higher portion of total travelers on flights traveling to tourist destinations than on other flights. Because the elasticity of demand for travel is likely to be higher for vacation travelers than for business travelers, airlines are likely to have more pricing power on business fares. Thus, flights leaving and going to vacation locations are likely to realize lower average fares. The lower percentage of small city locations that are tourist locations may also account for higher fares realized by small communities.

Market power differences between small and large cities might be realized due to differences in concentration realized at small city and large city airports, differences in market share of the largest carriers at small city and large city airports, and differences in the proportion of small and large city airports that are served by low-cost carriers.

A variety of studies have shown that the contestability hypothesis does not appear to hold for the airline industry. According to the perfect contestability hypothesis, the presence of actual competition is unimportant in fare determination, because carriers are unable to exercise market power due to potential competition. However, studies by Graham, Kaplan, and Sibley (1983), Call and Keeler (1985), and others show that airfares are higher in more concentrated markets than in less concentrated markets. Morrison and Winston (1987) show that while perfect contestability is not met for the airline industry, there is some role for potential competition. In essence, they show that potential competition (as measured by airlines serving one endpoint of a route, but not the other) has an impact on fares in addition to actual competition. These findings suggest that airline markets with less actual and potential competition are likely to have higher airfares. Thus, to the extent that there is less potential and actual airline competition at airports serving small communities than at airports serving large communities, we would expect to see higher fares at small community airports, all other factors constant.

Borenstein (1989) has shown that in addition to market concentration, there is the potential for individual carrier market share to give it increased market power that is not completely shared by other carriers on the same routes. In particular, he argues that carriers that carry a large share of passengers from a given airport are likely to realize increased pricing power due to advantages associated with frequent flier programs, travel agent commission overrides (TACOs), and biased computer reservations systems. With the dawn and expansion of internet travel reservations, the last two advantages of airport dominance that result from travel agent incentives and the reservations systems used by travel agents are not likely to be sources of individual carrier dominance anymore. However, the dominance of individual carriers attributable to frequent flier programs still applies.

As Borenstein explains, the frequent flier program can reduce incentives for airline passengers to seek the lowest airfare due to a principal-agent type problem. When travel is business-related, the buyer often does not bear the full cost of the ticket price. Although most airlines participate in these types of programs, the programs confer an advantage to the dominant airline in a market for two reasons. First, the frequent flier program gives passengers the incentive to concentrate their business with one airline. It is likely that the dominant airline in a market will serve the most routes from that market, allowing passengers to concentrate their business in this way. Second, the frequent flier program is more attractive when the benefit (free flights) is better (more destinations). To the extent that airports serving small communities rely more heavily on one or a few airlines for access to many other markets, fares may be higher in small city markets.

Finally, one of the important benefits of deregulation has been the entrance of low-cost carriers into several markets. The most important of such carriers has been Southwest Airlines (Bailey, 2002). In the markets where Southwest entered between 1990 and 1998, traffic has increased more than 174 percent and real fares have dropped by 54 percent (Bailey, 2002). Low-cost carriers, by concentrating on point-to-point service where high densities exist rather than on the hub-and-spoke network, are able to realize costs substantially lower than traditional hub-and-spoke carriers. Their entrance into markets can reduce fares in two ways. First, they are able to charge lower rates because of their lower cost structure. Second, their ability to charge lower fares reduces the pricing power of other carriers in such markets. Because airports serving small communities are not able to generate enough traffic in point-to-point service, many small community airports do not have a low-cost carrier. This is an additional reason price may be higher in small communities than in large communities. The following section of the report examines differences in the characteristics of flights serving small communities and those serving large communities.

DIFFERENCES IN COST CHARACTERISTICS, DEMAND CHARACTERISTICS, AND MARKET POWER CHARACTERISTICS BETWEEN LARGE AND SMALL COMMUNITIES

This section of the report examines differences in the characteristics of flights serving airports with MSA populations of less than 300,000 and those serving airports with MSA populations of 300,000 or more. Most data are not available at the market (origin-destination) level, but rather at the airport level. Primary data sources used include the DB1B 10 percent sample of airfares and the T-100 Domestic Segment Data.[11]

T-100 Domestic Segment data include the number of passengers traveling, the airplane size, and the type of airplane by originating/terminating airport for U.S. certificated air carriers.[12] Although T-100 Domestic Market Data exist, they only include passengers staying on the same airplane for an entire trip. Because our data are only available at the airport level, we examine characteristics at origin and destination airports. Further, our concentration indices and market share indices measure actual and potential competition because they are at the airport level rather than the market level.

As discussed in the previous section, airlines are likely to realize lower costs in serving high-density routes than lower-density routes. As Figure 5 shows, the average annual frequency of departures and arrivals is much higher for large community airports than it is for small community airports.[13] This suggests a lower cost structure for serving large communities. On the other hand, however, the high

[11] In the DB1B, we only include domestic trips where the destination is clearly defined. As in Borenstein (1989), we eliminated tickets that are not either one way or round trip. We also eliminated the highest and lowest 1 percent of fares per passenger mile.

[12] T-100 domestic segment data include all passengers carried by large air carriers, as well as passengers carried by many regional and commuter airlines. However, in 2001, reporting of the T-100 domestic segment data was voluntary for regional and commuter airlines. We find that 82.5 percent of airports serving large communities have T-100 domestic segment data associated with them, while 63.7 percent of airports serving small communities have T-100 domestic segment data in 2001.

[13] Total number of departures and arrivals from 3rd quarter of 2000 to 2nd quarter of 2001 was estimated (T-100 Domestic Segment Data).

frequency of service also means more frequent flights and more convenient flight schedules. This suggests that service quality may be higher for large communities, resulting in increased demand for service.

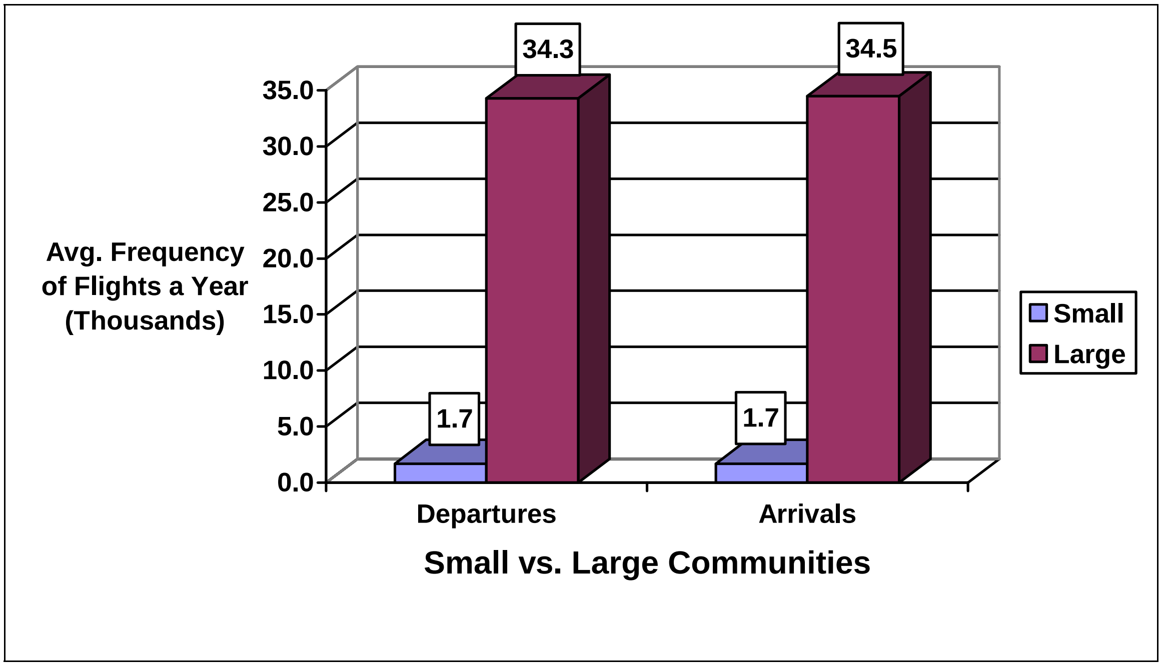

Figure 5. Average Frequency of Flights per Airport a Year Departing/Arriving in Small and Large Communities (3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).
T-test of equal means (small vs. large; departures) = t-value: 7.54, p-value<.0001
T-test of equal means (small vs. large; arrivals) = t-value: 10.65, p-value<.0001

The importance of stage length in determining flight costs per mile also was highlighted in the previous section. Figure 6 examines stage lengths for flights serving small and large communities. As the figure shows, the average stage length for flights serving large communities is significantly longer than that for flights serving small communities. This is largely reflective of the fact that most flights originating or terminating in small communities travel through an intermediate hub before traveling to or from their destination or origin. As a result of these longer stage lengths for large communities, the cost per passenger mile would be expected to be lower, all other things constant.

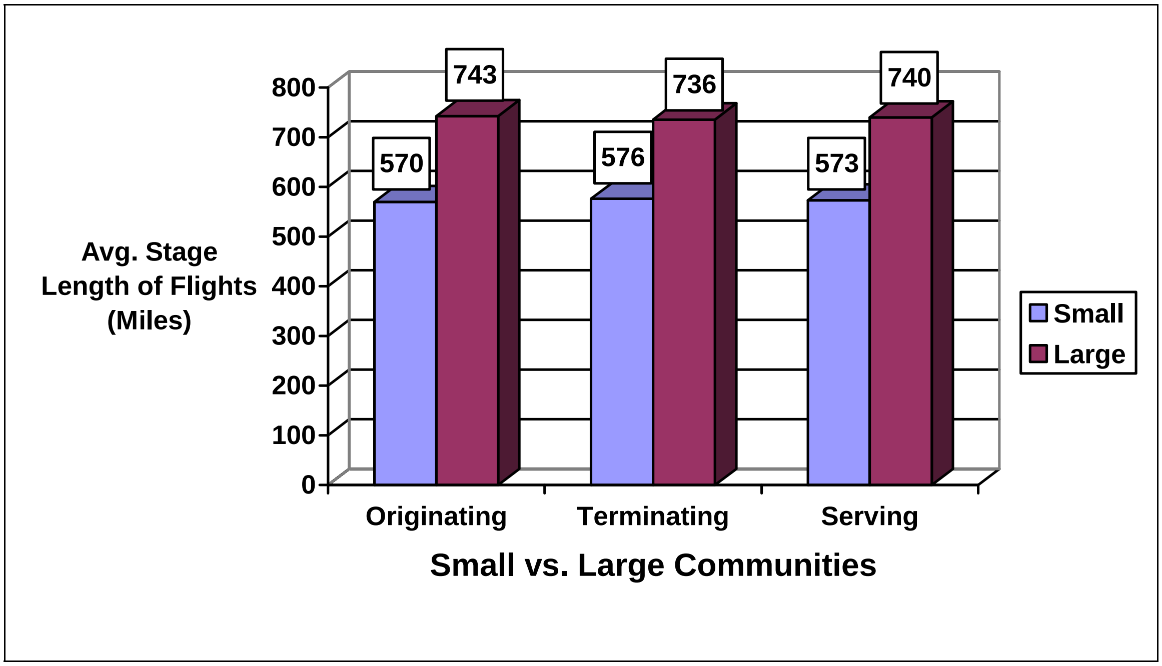

Figure 6. Average Stage Length for Flights Serving Small and Large Communities (3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B).
T-test of equal means (small vs. large; originating) = t-value: 9.94, p-value<.0001
T-test of equal means (small vs. large; terminating) = t-value: 8.15, p-value<.0001
T-test of equal means (small vs. large; serving) = t-value: 12.66, p-value<.0001

Figure 7 compares average load factors (passenger miles divided by seat miles) for flights serving large and small communities. As the figure shows, average load factors are significantly higher for airports serving large communities with an average load factor of 66 percent. Average load factors for airports serving small communities are around 58 percent. These higher load factors for large community airports suggest higher utilization of equipment and lower costs per passenger.

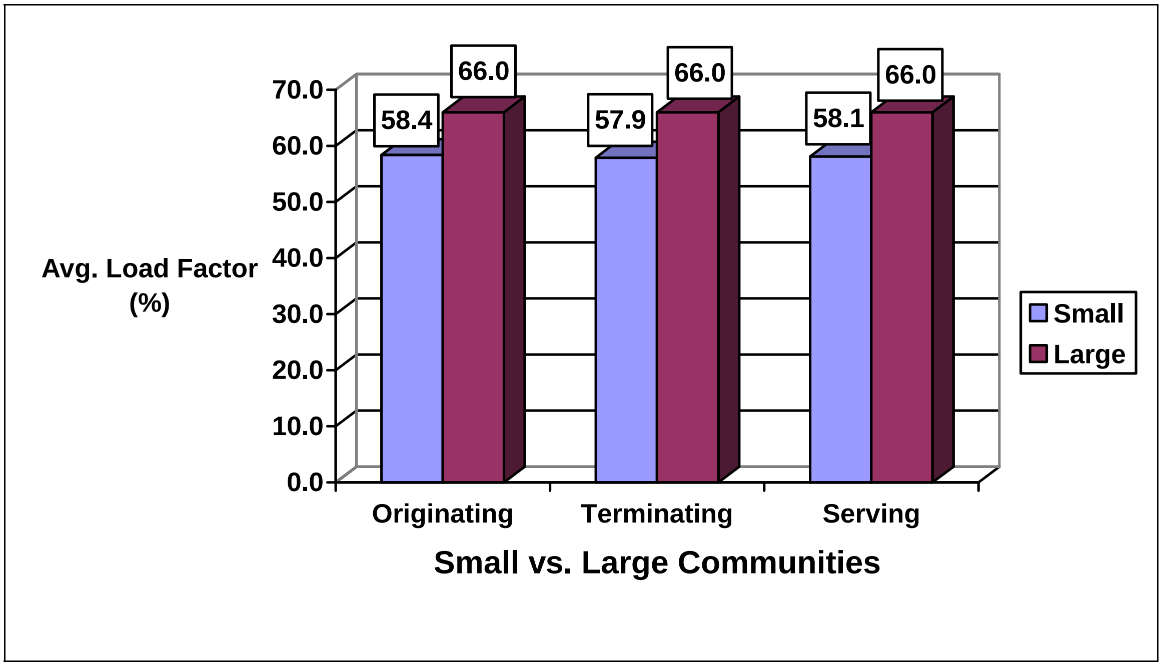

Figure 7. Average Load Factor for Flights Serving Small and Large Communities (weighted by total frequency of flights in airport, 3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).
T-test of equal means (small vs. large; originating) = t-value: 10.89, p-value<.0001
T-test of equal means (small vs. large; terminating) = t-value: 11.73, p-value<.0001
T-test of equal means (small vs. large; serving) = t-value: 16.00, p-value<.0001

Additional insight into the load factor realized for individual flights can be obtained from total flight distance. Borenstein (1989) suggests that average load factors are likely to be higher on longer distance flights. Thus, to some extent, longer distances may capture the effect of higher load factors on subsequent flight segments of a particular trip. Figure 8 shows average flight distance for small and large communities. As the figure shows, average flight distances are lower for small communities whether looking at originating flights or terminating flights. For example, average distance of flights originating in small communities (1,199 miles) is more than 200 miles shorter than large communities (1,432 miles). In addition to the effect of longer distances on load factors, there may be a competitive element to flight distance. Longer flight distances may experience more airport to airport competition, as travelers are more willing to go to alternative airports when traveling long distances. On the other hand, however, demand for long-distance airplane travel may be more inelastic due to a lack of intermodal alternatives. To the extent that higher load factors are realized on longer flights, larger communities may realize lower costs and lower fares. However, as noted previously, longer distances could have effects on rates through impacts on airline-to-airline or intermodal competition.

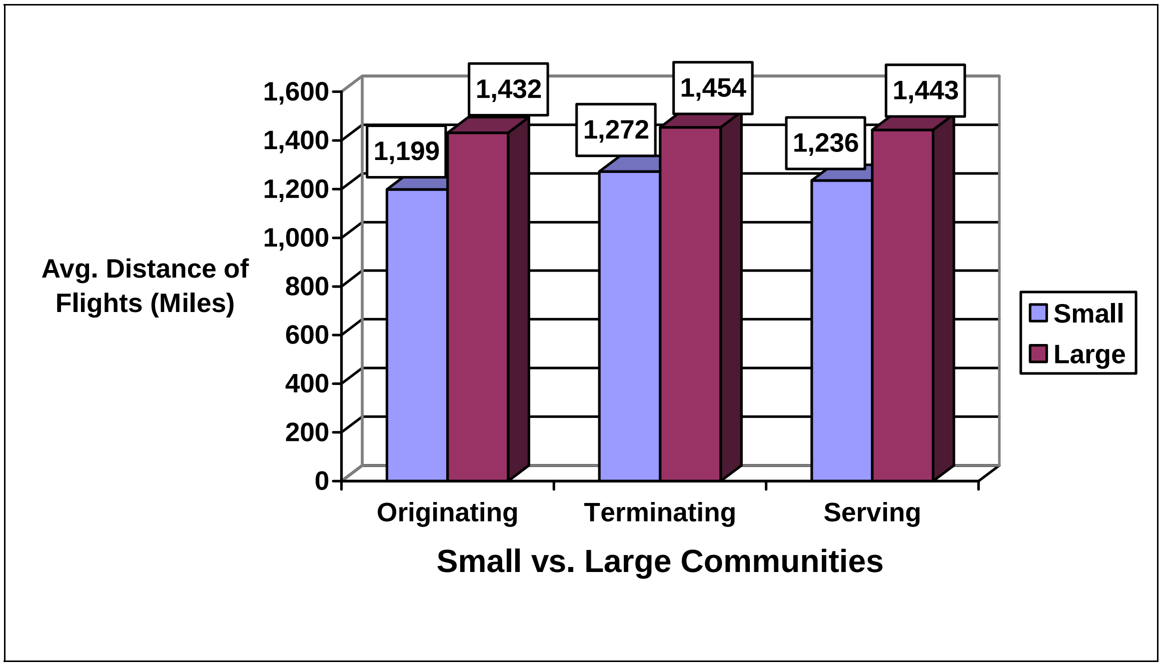

Figure 8. Average Distance for Flights Serving Small and Large Communities (3rd quarter of 2000 through 2nd quarter of 2001 in the DB1B).
T-test of equal means (small vs. large; originating) = t-value: 5.69, p-value<.0001
T-test of equal means (small vs. large; terminating) = t-value: 4.34, p-value<.0001
T-test of equal means (small vs. large; serving) = t-value: 7.18, p-value<.0001

Figure 9 shows average aircraft size per flight originating, terminating, and serving small and large communities. As the figure shows, the average aircraft size serving small communities is much smaller than that serving large communities. To the extent that economies are associated with using larger aircraft, this suggests that large communities will realize lower fares because of this cost impact, holding other factors constant.

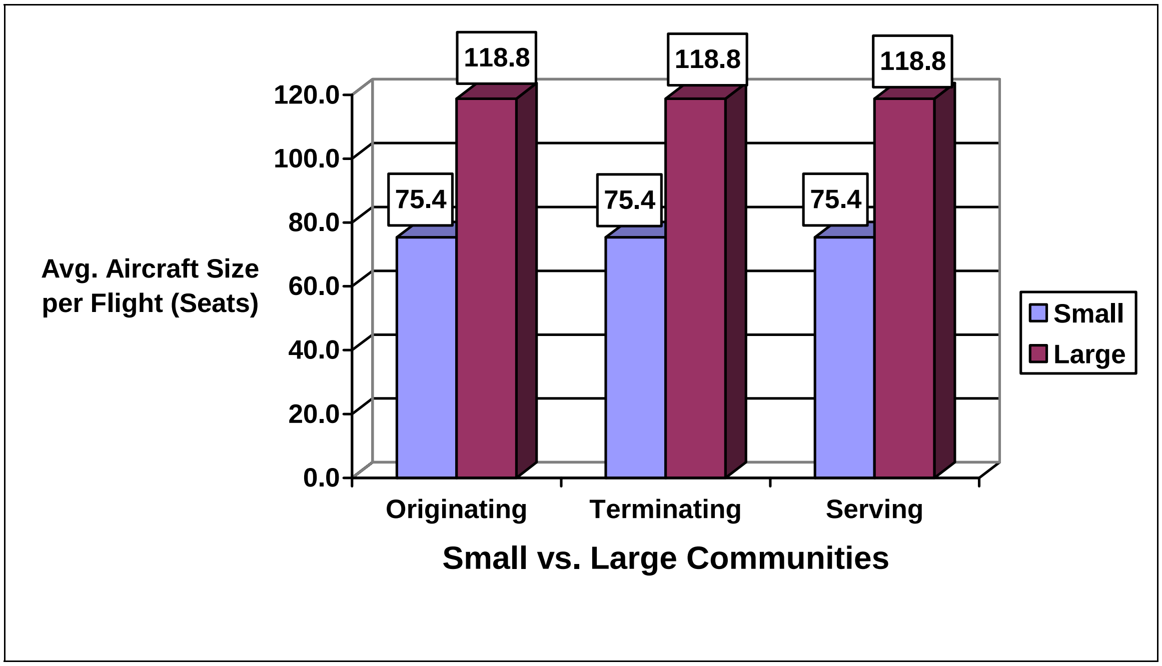

Figure 9. Average Aircraft Size per Flight Serving Small and Large Communities (weighted by total frequency of flights in airport, 3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).
T-test of equal means (small vs. large; originating) = t-value: 17.85, p-value<.0001
T-test of equal means (small vs. large; terminating) = t-value: 17.96, p-value<.0001
T-test of equal means (small vs. large; serving) = t-value: 25.35, p-value<.0001

The share of flights serving small and large communities that use jet aircraft is shown in Figure 10. As highlighted in the previous section, jet aircraft are more expensive to operate than turbo props and they are quieter and perceived to be more comfortable. For all of these reasons, the significantly higher proportion of flights using jet aircraft in larger communities is likely to lead to higher fares for large communities, holding other factors constant.

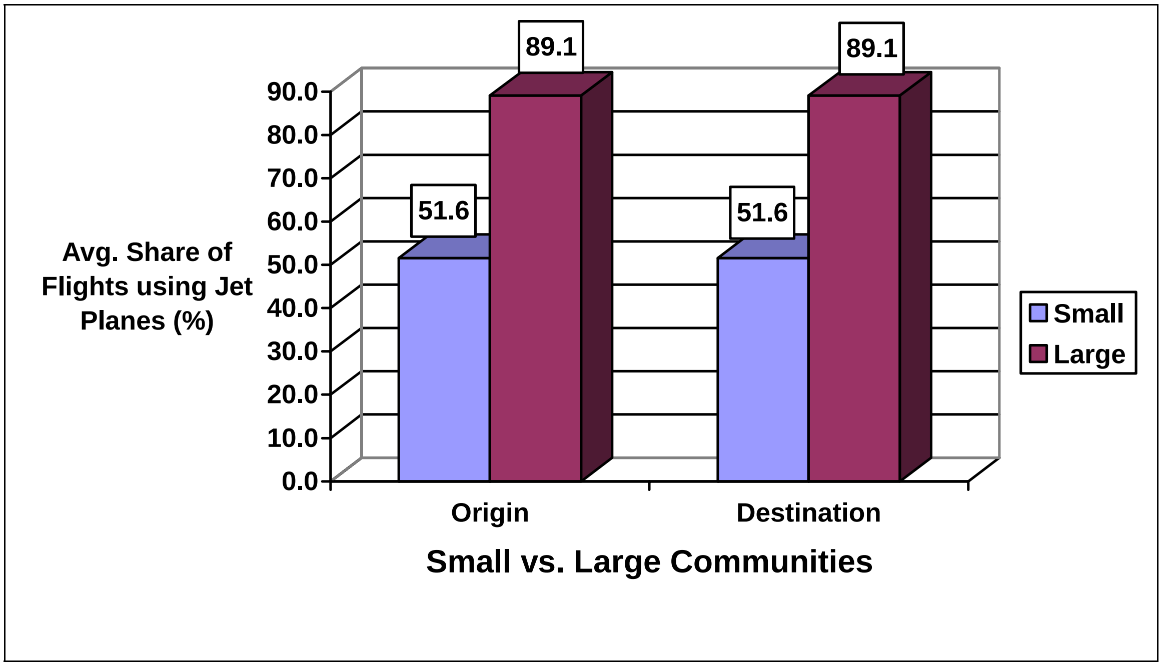

Figure 10. Average Share of Flights using Jet Planes at Origin/Destination in Small and Large communities (weighted by total frequency of flights in airport, 3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).
T-test of equal means (small vs. large; origin) = t-value: 17.71, p-value<.0001
T-test of equal means (small vs. large; destination) = t-value: 17.88, p-value<.0001

The final cost variable examined in this study is the proportion of trips that are round trips. Because of the increased utilization of equipment that is likely associated with round trip travel, the costs of round-trip travel may be expected to be lower than one-way travel. Moreover, airline pricing may include some discount for round-trip travel to prevent travelers from buying a reverse-trip one-way ticket from a different carrier. Figure 11 shows that a significantly higher portion of flights traveling from small communities are round trip than those from large communities. This should result in lower average fares realized in small communities, all else constant.

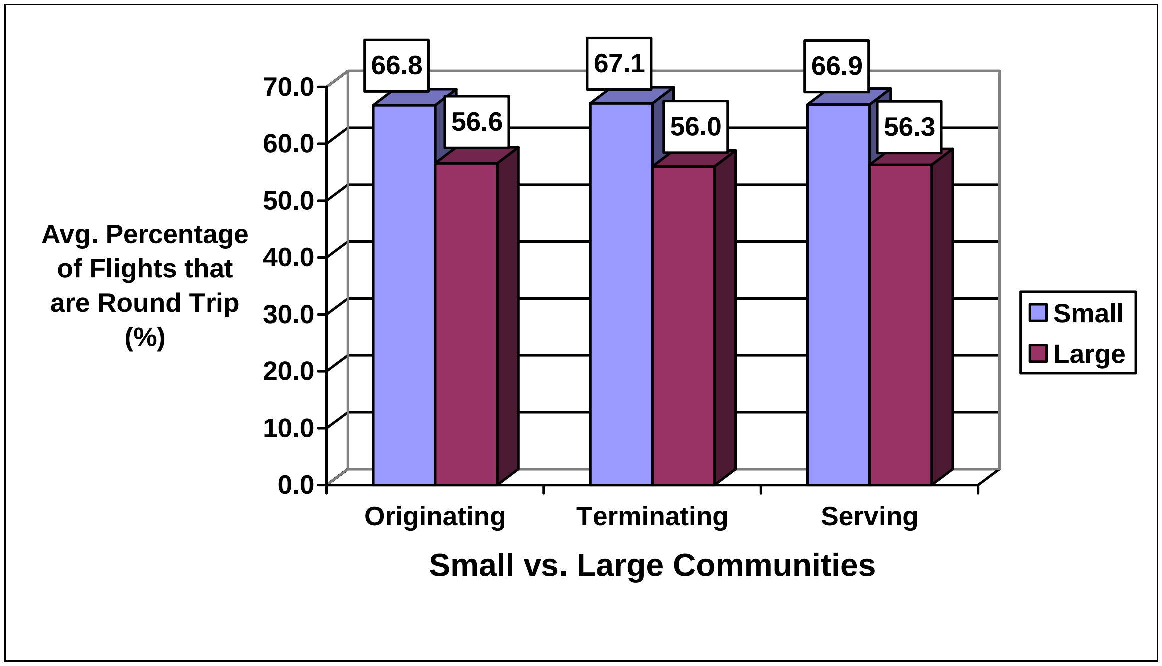

Figure 11. Average Percentage of Serving Flights that are Round Trip in Small and Large Communities (3^{rd} quarter of 2000 through 2^{nd} quarter of 2001 in the DB1B).
T-test of equal means (small vs. large; originating) = t-value: -6.70, p-value<.0001
T-test of equal means (small vs. large; terminating) = t-value: -8.11, p-value<.0001
T-test of equal means (small vs. large; serving) = t-value: -10.43, p-value<.0001

In addition to the demand component associated with many of the variables that primarily impact costs, there are also unique characteristics of flights that affect demand. As highlighted previously, the elasticity of demand for airline travel is likely to be higher for vacation travelers than for business travelers. As a result, we would expect average airfares to be lower when a larger percentage of travelers are vacation travelers. We proxy this percentage by using a list of the top 59 tourist cities as classified by the U.S. Department of Commerce.[14] Figure 12 shows that a much higher percentage of airports serving large cities are in tourist locations than airports serving small communities. For this reason, average airfares for flights serving large communities should be lower, ceteris paribus.

[14] Tourist cities are defined by the percentage of foreign tourist dollars spent in each city in 2000 and 2001.

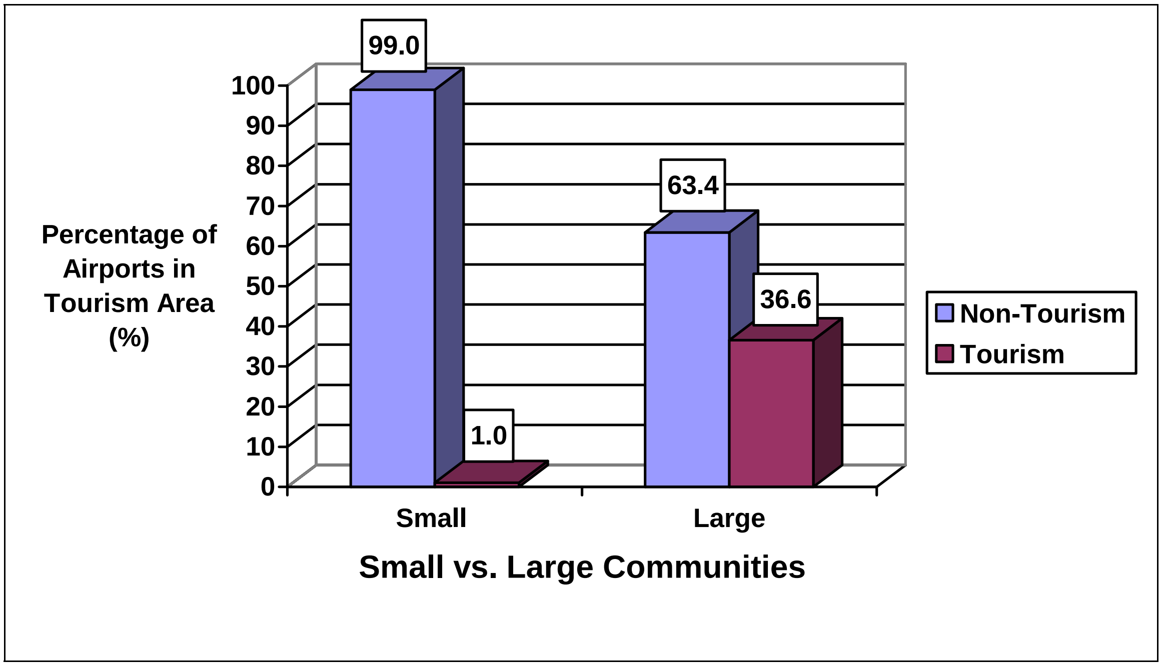

Figure 12. Percentage of Airports in Tourism Area in Small and Large Communities (major tourism cities from the Office of Travel & Tourism Industries in the U.S. Department of Commerce; A list of airports is collected from 3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).

Market power variables influencing fares include a Herfindahl-Hirschman Index (Herfindahl Index), the market share of the carrier, and whether an airport is served by a low-cost carrier. The Herfindahl Index measures the level of intramodal competition at a particular airport. This measure decreases with a larger number of air carriers and increases with larger inequalities among air carriers. It is measured as follows:

$$H = \sum_{i=1}^{n} S_i^{\,2}$$

$$where: \quad S_i = \textit{the share of passengers enplaned by airline } i$$

This measure varies between zero and one, and is expected to have a positive influence on fare per passenger mile, since a larger Herfindahl Index means a higher level of market concentration, and consequently more carrier market power.[15]

[15] This study estimates the Herfindahl index using shares of ticketing carriers. Based on codesharing information of carriers by airport in the DB1B, the study estimated the number of passengers by ticketing carrier using the T-100 Domestic Segment Data. For non-ticketing operating carriers, all passengers for the carrier are assigned to the ticketing carrier. If the operating carriers have a codesharing contract with multiple ticketing carriers, operating carrier passengers are assigned to ticketing carriers based on ticketing carrier market share at that airport.

Figure 13 shows the average Herfindahl Index for small and large communities.[16] Because the Herfindahl Index is measured at the airport level, it measures potential competition as well as actual competition. That is, even if a carrier does not serve a particular route, it can act to discipline rates over a particular route by serving one endpoint.[17] As the figure shows, the average Herfindahl Index at origin and destination is significantly higher for small communities than it is for large communities. This suggests that market power and fares should be higher in small communities, with other factors held constant.

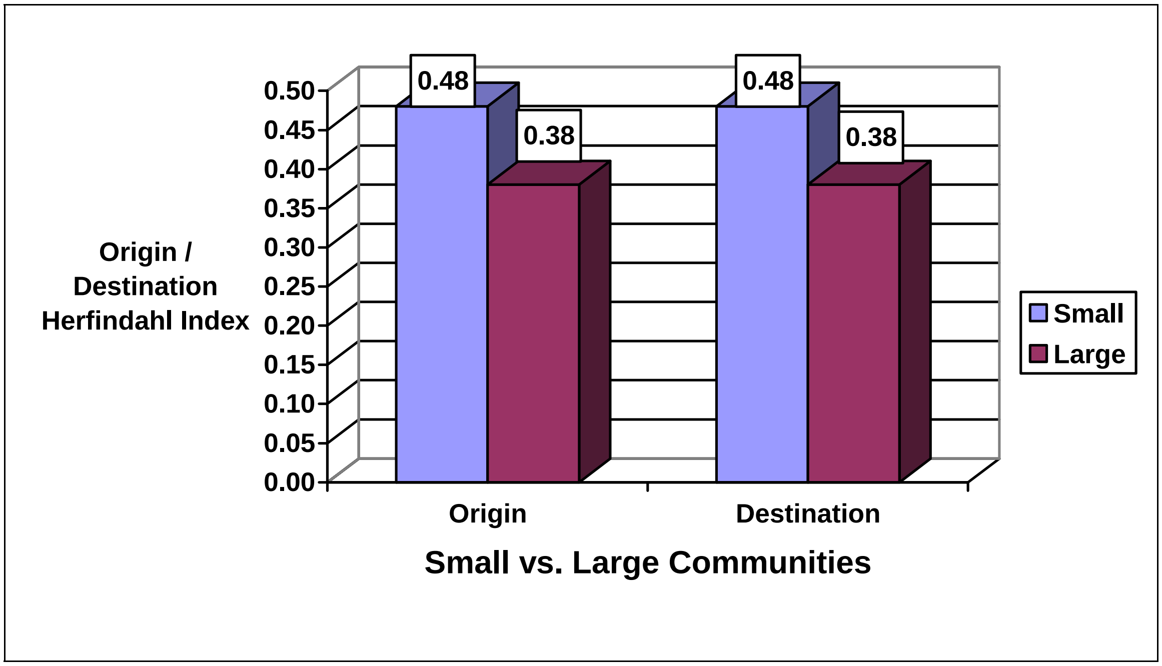

Figure 13. Origin/Destination Herfindahl Index in Small and Large Communities (weighted by total passengers in airport, 3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).
T-test of equal means (small vs. large; origin) = t-value: -4.52, p-value<.0001
T-test of equal means (small vs. large; destination) = t-value: -4.39, p-value<.0001

The advantages of having a dominant share of the market are likely to go beyond the advantages from increased market concentration, as discussed in the previous section. Figure 14 shows average carrier market shares for small and large communities. As the figure shows, the average market share is significantly higher for small community airports in comparison to large community airports. This suggests that airfares will be higher in small communities, ceteris paribus.

[16] Our Herfindahl Index also includes passengers that are in mid-route. The only reliable data on passenger shares at airports is segment data, which includes all passengers enplaning or deplaning.
[17] In theory, serving a particular endpoint makes entry into a particular route easier. Serving an endpoint is used as a measure of potential competition by Morrison and Winston (1989).

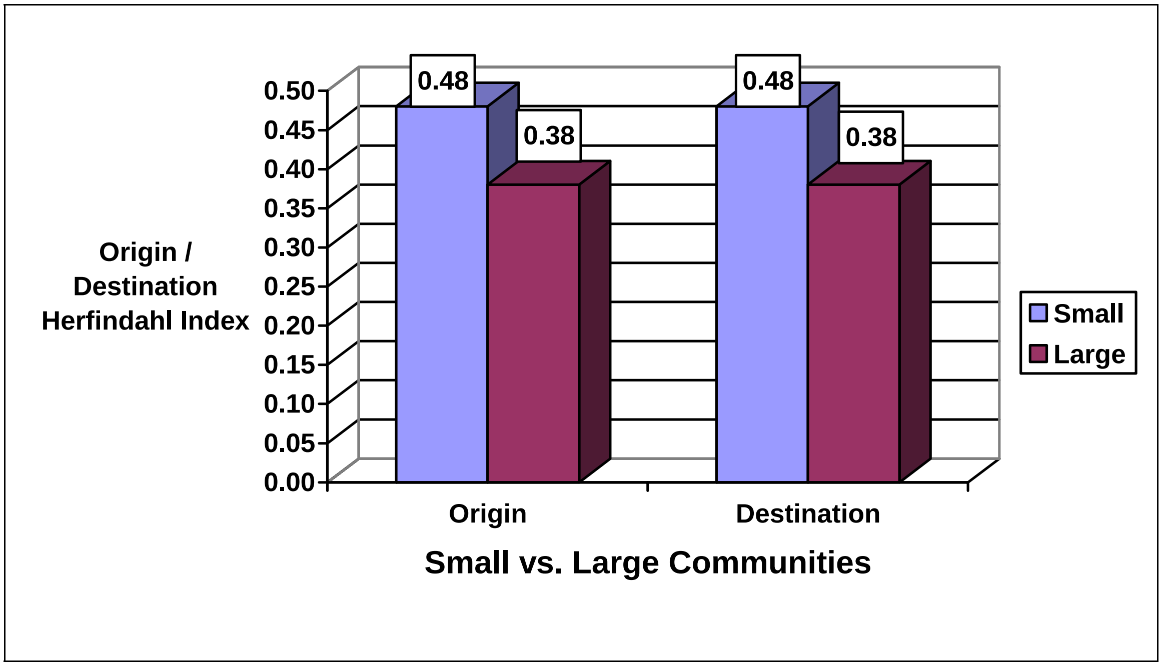

Figure 14. Average Origin/Destination Market Share Index in Small and Large Communities (weighted by total passengers in airport, 3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).
T-test of equal means (small vs. large; origin) = t-value: -12.14, p-value<.0001
T-test of equal means (small vs. large; destination) = t-value: -12.13, p-value<.0001

Low cost carriers are small airlines characterized by point-to-point service, low fares, few ticket restrictions, and limited in-flight service.[18] Although low cost carriers have accounted for small percentage of US domestic passengers, their market share has increased. Currently, the low cost carriers transport about 23 percent of domestic passengers in the United States.[19] Figure 15 shows the percentage of airports served by low cost carriers in small and large communities.[20] Because they typically serve high density city-pairs, large community airports are more frequently served by low cost carriers (49.5 percent of large communities vs. 7.6 percent of small communities). This suggests that carriers serving small communities are expected to have more pricing power on average, because of the more limited role of low cost carriers.

[18] Entry Patterns of Low-Cost Airlines, Mara Lederman and Silke Januszewski, Massachusetts Institute of Technology, August 8, 2003
[19] Low Cost Carrier Growth in the U.S. Airline Industry: Past, Present, and Future, Harumi Ito and Darin Lee, Brown University, April 9, 2003
[20]We obtain a list of low cost carriers from Ito and Lee (2003). The low cost carrier list includes SouthWest, Air South, Access Air, AirTran, American Trans Air, Eastwind, Frontier, JetBlue, Kiwi, Morris Air, National, Pro Air, Reno, Spirit, Sun Country, ValuJet, Vanguard, and Western Pacific.

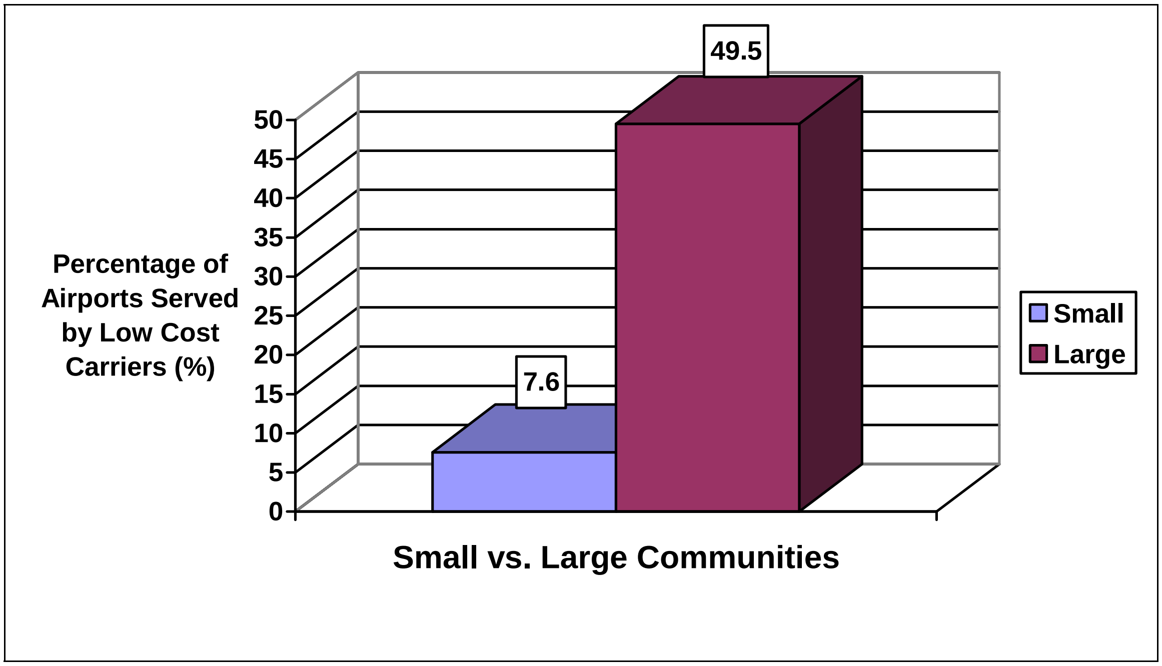

Figure 15. Percentage of Airports Served by Low Cost Carriers (LCCs) in Small and Large Communities (A list of airports is collected from 3rd quarter of 2000 through 2nd quarter of 2001 in the T-100 Domestic Segment Data).

This section of the report has shown that there are important differences between airports serving small communities and those serving large communities. Differences exist in factors expected to influence costs, demand, and market power. These differences are expected to have important influences on rates. The following section of the report develops an empirical model to examine fare differences.

EMPIRICAL MODEL

In order to obtain a better understanding of the reasons for rate disparity among communities of various sizes, and the magnitude of various reasons, an empirical model relating airfares to factors influencing air carrier route costs, factors influencing the strength of air passenger demand, and factors influencing the amount of market power air carriers serving various markets are likely to have is estimated.

Specifically, the following general relationship is estimated:

$$RPPM = f(Cost\ Chars., Demand, Market\ Power)$$

The dependent variable used is the airfare paid per passenger mile. To the extent that variables influencing demand and market power are controlled, the variables influencing costs should influence airfares in the same way. Similarly, to the extent that cost characteristics and those influencing the strength of demand are controlled for, the parameter estimates for market power variables should show the influence of those variables on the airline's ability to price above marginal cost.

In this specification, a variety of flight characteristics are hypothesized to affect the costs of operating a given flight. These include the total distance of the flight itinerary, the average stage length on a flight, the average load factors of all flights at the origin and destination, the average airplane size used at the origin and destination, the percentage of flights using jets at origin and destination, and the quarterly frequency of flights at the origin and destination.

As shown in previous studies, each of these factors has an important impact on the costs of operating flights over a given segment. The total distance of a flight itinerary has a negative effect on the costs per passenger mile of operating a given flight for two reasons.[21] One reason for the expected lower operating cost per passenger mile for longer distance flights is a higher expected load factor for such flights, increasing the utilization of flight equipment. Another reason for this expectation is that longer flight distances are expected to be correlated with longer stage lengths (flight segment distances). Caves, Christensen, and Tretheway (1984) and others have shown an important role for stage length in determining airline costs. Terminal costs which occur regardless of flight length decrease as a portion of total cost as flight distance increases, meaning that average terminal costs decline with distance. To separate out these two effects, our specification also includes the average stage length. Thus, the total distance of the flight itinerary should reflect the tendency of longer flights to have greater load factors – not the effect of longer stage lengths.

Average load factors at origin and destination are the average number of passenger miles per seat mile for all flights originating or terminating at the origin and destination city. While average load factor for a particular flight itinery would be preferred, available data do not allow its measurement. As shown by Caves, et. al (1984), higher load factors are expected to decrease costs per passenger mile due to increased utilization of aircraft.

Average airplane size at origin and destination is the average number of seats per plane for all flights serving origin and destination cities. Again, average plane size for the entire route cannot be calculated from available data.

The proportion of flights using jets at origin and destination accounts for differences in the costs of maintaining and operating turbo-props and jets. Thus, the proportion of flights using jets is expected to have a positive influence on costs and rates.

The final cost variable is flight frequency. Frequency of flights per quarter at origin and destination airports is expected to have a negative impact on the flight costs per passenger mile. Borenstein (1989) points out that aircraft utilization is generally higher on routes that have greater flight frequencies, leading to a lower cost of operation.

Although no specific variables influencing the strength of demand are included in the model, nearly all of the variables hypothesized to influence costs may also have an impact on demand. For example, flight frequency, while proxying greater aircraft utilization, may also influence the desirability of flights from a particular city, and therefore demand. To the extent that more frequent flights allow for more convenient flight schedules, a higher frequency of flights may cause an increase in demand. Thus flight frequency could have a negative or positive influence on fare per passenger mile depending on whether the cost effect or the demand effect dominates. Another cost variable that also may influence demand is load factor. While a higher load factor suggests greater aircraft utilization, it may also reflect a lower comfort level of flying because of more crowded flights. Thus, to the extent that a higher load factor reduces the desirability of a flight, we would expect an even greater negative influence of this variable on fare paid

[21] Severin Borenstein (1989) Hubs and High Fares: Dominance and Market Power in the U.S. Airline Industry, RAND Journal of Economics, Vol 20, No. 3, Autumn, 1989.

per passenger mile. However, as pointed out by Borenstein (1989), flights with higher load factors are also more likely to be operating at peak times, suggesting a potential positive influence on fares. Aircraft size, while reflecting economies associated with larger aircraft, may also reflect differences in comfort level. Borenstein (1989) suggests that larger aircraft are generally more comfortable and thought to be safer. Thus, there may be some offsetting demand effect of larger aircraft opposing the cost effect. Jets are also considered to be more comfortable than turbo props. This suggests the proportion of flights using jets has a positive effect on rates through its effect on demand. Finally, flight distance may partially reflect market power in addition to its effect on cost. For long distance travel, there are few alternatives to air for same-day travel. Thus, one may expect some offsetting positive effect of distance on price. On the other hand, however, the number of airline alternatives is likely to be greater the longer the flight. This would suggest a negative effect of distance on price. In summary, although there may be some offsetting demand or market power effects from many of these so-called cost variables, previous studies have shown the cost effects dominate in most cases. The one exception is flight frequency, where previous studies found positive parameter estimates. This may be expected since flight frequency has the weakest theoretical relationship to cost and the strongest case for being tied to demand. With the current hub and spoke networks used by airlines, frequency may be a poor proxy for aircraft utilization because aircraft are not generally isolated to one route. Moreover, the effect of flight frequency on the quality of service is more apparent than aircraft size or load factor.

A variety of variables hypothesized to influence market power are also included in the specification. These include Herfindahl-Hirschman Indices at origin and destination, airline market share at origin and destination, a low cost carrier dummy variable at origin and destination, and tourist dummy variables for cities designated as tourist cities at origin and destination.

This study uses an improved measure of the Herfindahl-Index over many previous studies. That is, the study calculates a Herfindahl index at origin and destination using estimated ticketing carrier shares rather than operating carrier shares. In many cases, several operating carriers may be carrying passengers in a market when they are actually engaged in a cooperative agreement. For example, a Herfindahl-Hirschman Index for Fargo, N.D., calculated by operating carrier would include market shares for Messaba Airlines and Northwest Airlines, even though both are engaged in a cooperative agreement. Thus, in many cases a Herfindahl-Hirschman Index calculated by operating carrier shares may overstate the true level of competition in a market.[22]

In addition to market concentration, as shown by Borenstein (1989), the market share of an individual carrier can have an important effect on market power that does not create an umbrella effect for other carriers. That is, airport dominance by one carrier can give it a pricing advantage over rivals due to frequent flier programs, computer reservation systems, and travel agent commissions. As a result, individual market shares at origin and destination airports are expected to have positive impacts on the fares charged per passenger mile.

A low-cost carrier dummy at origin and destination is also included in the model to account for the fact that the pricing power of an individual carrier will be limited by the more effective potential competition provided by a low-cost carrier in a particular market. Because the low-cost carrier is also competing in the market, this variable will measure price differences due to differences in cost structure as well as market power.

Finally, dummy variables are included in the model to account for the top U.S. tourist cities. Tourist cities are expected to realize lower rates due to a greater presence of vacation travelers, who consequently

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[22] Airline segment data show the number of passengers originating and terminating at each U.S. airport by operating carrier. We use DB1B ticket sample data to identify cooperative operating-ticketing carrier agreements.

have a higher elasticity of demand for air transportation. This higher elasticity gives less pricing power to carriers on such routes.

The specific model used to estimate airfares is specified as:

$$\begin{aligned}
\ln Fare_{ij} = {} & \beta_0 + \beta_1 \ln TOTAL\ DIST + \beta_2 \ln STAGE\ DIST + \beta_3 \ln ORIGIN\ EQUIP + \\
& \beta_4 \ln DEST\ EQUIP + \beta_5 \ln ORIGIN\ LOAD + \beta_6 \ln DEST\ LOAD + \\
& \beta_7 \ln ORIGIN\ FREQ + \beta_8 \ln DEST\ FREQ + \beta_9 \ln ORIGIN\ PROPJET + \\
& \beta_{10} \ln DEST\ PROPJET + \beta_{11} LOW\ COST\ ORIGIN + \beta_{12} LOW\ COST\ DEST + \\
& \beta_{13} ROUND\ TRIP + \beta_{14} ORIGIN\ TOURISM + \beta_{15} DEST\ TOURISM + \\
& \beta_{16} \ln ORIGIN\ HERF + \beta_{17} \ln DEST\ HERF + \beta_{18} \ln ORIGIN\ SHARE + \\
& \beta_{19} \ln DEST\ SHARE + \beta_{20} \ln ORIGIN\ SLOT\ CONTR + \beta_{21} \ln DEST\ SLOT\ CONTR + \\
& \beta_{22} Q_2 + \beta_{23} Q_3 + \beta_{24} Q_4 + \varepsilon
\end{aligned}$$

where:

where:	TOTAL DIST	=	total flight distance (round trip distance when the flight is round trip)
	STAGE DIST	=	total flight distance divided by the number of airports minus one
	ORIGIN EQUIP	=	average airplane size by carrier/airport/qtr (origin airport)
	DEST EQUIP	=	average airplane size by carrier/airport/qtr (dest airport)
	ORIGIN LOAD	=	average load factor by carrier/airport/qtr (passenger miles/flight miles)
	DEST LOAD	=	average load factor by carrier/airport/qtr (destination)
	ORIGIN FREQ	=	frequency of flights by carrier/airport qtr (origin)
	DEST FREQ	=	frequency of flights by carrier/airport qtr (destination)
	ORIGIN PROPJET	=	proportion of flights using jets by carrier/airport/qtr (origin)
	DEST PROPJET	=	proportion of flights using jets by carrier/airport/qtr (dest)
	LOW COST OR	=	dummy for origins served by low cost carriers
	LOW COST DES	=	dummy for destinations served by low cost carriers
	ROUND TRIP	=	dummy for round trip flights
	ORIGIN TOURI	=	dummy for origin as a tourist location
	DEST TOURISM	=	dummy for destination as a tourist location
	ORIGIN HERF	=	Herfindahl-Hirschman Index for the quarter (origin airport)
	DEST HERF	=	Herfindahl-Hirschman Index for the quarter (destination)
	ORIGIN SHARE	=	Share of passengers by carrier/airport/qtr (origin)
	DEST SHARE	=	Share of passengers by carrier/airport/qtr (destination)
	ORIGIN SLOT	=	dummy for slot control airport (origin – O'Hare, Laguardia, JFK, Reagan National)
	DEST SLOT	=	dummy for slot control airport (destination)
	Q2, Q3, Q4	=	quarterly dummies

In estimating this model, all data are averaged by origin, destination, airline, round trip, and quarter. This is done to eliminate fare variation where very little variation in independent variables exists. For example, there may be 20 different flights between Fargo, N.D., and Washington, D.C., that show up in the sample fare data. In our estimation, each of these fares would have the same total distance, the same stage length, the same average equipment size at origin, etc. By averaging data in this way, we have one observation for each origin-destination-carrier-flight type pair that exists in every quarter.

One major area of concern in estimating this airfare equation is the possible endogeneity of several right hand side variables. Load factors, Herfindahl indexes, market shares, and service frequency may all be endogenous. That is, not only do these variables influence price, but price likely influences them. For example, higher prices are likely to lead to lower load factors, lower flight frequency, and entry into the market by other air carriers. In order to remedy this problem, we estimate our model using two- stage least squares, where lagged load factors, lagged frequency of service, lagged Herfindahl indexes, lagged market shares, origin population, and destination population are used as instruments.

Table 5 shows the estimation results using OLS and Two-stage least squares. As the table shows, there is very little difference in the parameter estimates in estimating them either way. In both estimations, nearly all variables have their expected signs and all are significant at the one-percent level.

In focusing on the two-stage least squares results, several factors are shown to affect airfares through their effects on costs. Individual flight characteristics, such as flight length and average stage length, are shown to have a negative influence on airfares. Similarly, several average characteristics of airlines at specific airports, such as larger airplane sizes, higher load factors, and a larger percentage of flights using turbo props, also have negative influences on airfares. All of these effects were as expected, a priori, due to hypothesized effects on costs.

The quarterly frequency of service is shown to have a positive sign at the origin airport and a negative sign at the destination airport. While it is difficult to explain why the sign might be different at the origin than at the destination, the positive sign at the origin suggests that the effect of greater flight frequency on demand overshadows its effect on costs. As stated previously, higher flight frequencies translate into more convenient flight schedules, increasing the desirability of service.

Market power variables also play an important role in determining airfares as shown by the Herfindahl-Hirschman indexes at origin and destination, market shares, low-cost carrier dummies, and tourism dummies. The Herfindahl indexes at origin and destination show that a one percent increase at origin or destination leads to about a .06 to .07 percent increase in airfare. While the effect of market share is somewhat smaller, it is still positive and significant, supporting the hypothesis by Borenstein that market share gives carriers an additional market power benefit beyond its effect on market concentration. Low-cost carrier dummies show that the existence of a low-cost carrier at an airport decreases fares by 7 to 8 percent. Finally, parameter estimates suggest that tourist locations realize fares that are 3 to 4 percent lower than other locations.

While a previous section of the study highlighted differences in cost, demand, and market power characteristics between airports serving small and large communities, it did not provide insight into the magnitude of the effects of such differences on airfares. We can use the parameter estimates from the two-stage least squares estimation, along with mean small and large community sample characteristics to estimate the proportion of small community/large community fare differences attributable to cost factors, demand factors, and market power factors.

Table 5: Two-Stage Least Squares Estimation of Airfares per Passenger Mile – 2001		
Variable	**Parameter Estimate**	
	2SLS	**OLS**
Intercept	3.0835* (0.0186)	3.2115* (0.0162)
TOTAL DIST	-0.2976* (0.0026)	-0.2999* (0.0026)
STAGE DIST	-0.2433* (0.0030)	-0.2513* (0.0030)
ORIGIN EQUIP	-0.0817* (0.0042)	-0.0656* (0.0039)
DEST EQUIP	-0.1017* (0.0042)	-0.1190* (0.0039)
ORIGIN LOAD	-0.2503* (0.0078)	-0.2272* (0.0057)
DEST LOAD	-0.2954* (0.0075)	-0.1779* (0.0044)
ORIGIN FREQ	0.0377* (0.0009)	0.0388* (0.0008)
DEST FREQ	-0.0066* (0.0007)	-0.0054* (0.0006)
ORIGIN PROPJET	0.0285* (0.0017)	0.0290* (0.0015)
DEST PROPJET	0.0185* (0.0017)	0.0190* (0.0016)
LOW COST ORIGIN	-0.0770* (0.0032)	-0.0812* (0.0031)
LOW COST DEST	-0.0805* (0.0030)	-0.0795* (0.0028)
ROUND TRIP	-0.3067* (0.0018)	-0.3026* (0.0018)
ORIGIN TOURISM	-0.0357* (0.0022)	-0.0385* (0.0021)
DEST TOURISM	-0.0402* (0.0021)	-0.0510* (0.0019)
ORIGIN HERF	0.0574* (0.0016)	0.0542* (0.0015)
DEST HERF	0.0698* (0.0016)	0.0723* (0.0015)
ORIGIN SHARE	0.0156* (0.0009)	0.0144* (0.0009)
DEST SHARE	0.0035* (0.0008)	0.0034* (0.0007)
ORIGIN SLOT CONTR	0.0961* (0.0033)	0.0940* (0.0032)
DEST SLOT CONTR	0.1393* (0.0034)	0.1407* (0.0033)
Q2	-0.0099* (0.0024)	-0.0225* (0.0022)

Table 5: Two-Stage Least Squares Estimation of Airfares per Passenger Mile – 2001		
Variable	**Parameter Estimate**	
	2SLS	**OLS**
Q3	0.0071* (0.0023)	-0.0062* (0.0022)
Q4	-0.0076* (0.0022)	-0.0149* (0.0021)
2SLS Adjusted R^2 = 0.3797 F = 17,460 N = 684,531 * significant at the 1 percent level	OLS Adjusted R^2 = 0.3809 F = 18,103 N = 706,243	

A simple average fare-per-mile comparison between flights originating in small and large communities from the sample data used to estimate fares per mile using two-stage least squares (684,531 observations) shows a fare that is 13.6 percent higher for small communities. Sample average distances are used to estimate fare differences attributable to differences in distances using the following formula:

$$PCT\ DIFF = e^{(\beta_1(\ln TOTAL\ DIST_{small} - \ln TOTAL\ DIST_{large}))} - 1$$

Airfare differences attributable to differences in other characteristics are estimated in the same way.

Table 6 shows sample average characteristics for flights originating in small and large cities, as well as the estimated percent fare differences attributable to the differences in these characteristics. As the table shows, small city fares are estimated to be higher than large city fares on average by about 10 percent. This is reasonably close to the actual 13.6 percent difference.

Beyond the overall estimate of fare differences, there are several other interesting things in Table 6. First, the table shows that cost differences in serving small and large communities appear to play an important role in fare differences. Small community fares are 1.3 percent higher because of traveling shorter distances, 3.5 percent higher because of traveling shorter stage lengths, 2.7 percent higher due to smaller average plane sizes at origin and destination, and 2.7 percent higher because of smaller load sizes at origin and destination. Offsetting this somewhat are slightly lower fares resulting from using a lower proportion of jets for flights from small cities, and lower fares resulting from a larger proportion of small city originating flights being round trip (-3.01 percent difference). In total, differences in these cost characteristics suggest fares that are 6.9 percent higher for flights originating in small communities than for those originating in large communities.

As highlighted previously, many of the variables hypothesized to influence costs are also likely to influence demand. However, in most cases, the cost effects seem to dominate. In contrast, the demand aspect of frequency of service seems to dominate the cost aspect. Higher service frequency leads to more convenient flight schedules, which increase the demand for service. We estimate that fares serving small communities are about 8 percent lower as a result of a lower flight frequency – i.e. lower quality of service. Fares are estimated to be about 2.6 percent higher in small communities due to a smaller portion of small community locations that are tourist locations. Combined, these demand characteristics result in fares that are about 5.4 percent lower for flights originating in small communities than for those originating in large communities.

Table 6: Estimated Percentage Differences in Fares Originating at Airports Serving Small and Large Communities Attributable to Mean Sample Characteristics			
	Small	**Large**	**Pct. Fare Diff.**
TOTAL DIST	2361.73	2467.9	1.32%
STAGE DIST	787.988	908.771	3.53%
ORIGIN EQUIP	109.45	131.297	1.50%
DEST EQUIP	114.874	129.49	1.23%
ORIGIN LOAD	0.6268	0.68147	2.11%
DEST LOAD	0.66174	0.67475	0.58%
ORIGIN FREQ	967.6	9089.06	-8.09%
DEST FREQ	4829.95	5728.11	0.11%
ORIGIN PROPJET	0.88947	0.97724	-0.27%
DEST PROPJET	0.92753	0.97679	-0.10%
LOW COST ORIGIN	0.43595	0.94175	3.97%
LOW COST DEST	0.8416	0.89214	0.41%
ROUND TRIP	0.5906	0.49083	-3.01%
ORIGIN TOURISM	0.04819	0.70747	2.38%
DEST TOURISM	0.57703	0.6303	0.21%
ORIGIN HERF	0.52047	0.32489	2.74%
DEST HERF	0.36975	0.33779	0.63%
ORIGIN SHARE	0.49482	0.22075	1.27%
DEST SHARE	0.2492	0.21986	0.04%
ORIGIN SLOT CONTR	0	0.064186	-0.62%
DEST SLOT CONTR	0.048861	0.054306	-0.08%
Q2	0.23971	0.24493	0.01%
Q3	0.27233	0.25925	0.01%
Q4	0.25061	0.25474	0.00%
Total			9.89%

Finally, market power variables show an important effect on average airfares. Airfares for flights originating small communities are estimated to be 3.4 percent higher as a result of higher concentration indices at origin and destination than for those originating in large communities. Similarly, a higher average market share among carriers serving origins and destinations for flights originating in small communities is estimated to result in 1.3 percent higher fares over flights originating in large communities. A smaller proportion of small community originating flights serving airports where low-cost carriers compete results in 4.4 percent higher fares, in comparison to flights originating in large communities. In total, these market power characteristics are estimated to increase fares for flights originating in small communities by 9.05 percent in comparison to those originating in large communities. The following section predicts fare differences between small and large cities based on weighted average characteristics of such cities that were shown previously.

PREDICTED FARE DIFFERENCES USING WEIGHTED AVERAGE CHARACTERISTICS OF SMALL AND LARGE COMMUNITIES

A previous section of the report showed weighted average characteristics of flights serving small and large communities for those represented in the T-100 Domestic Segment database. The parameter estimates obtained in the previous section are applied to the weighted average small and large community characteristics to predict fare differences between small and large communities represented in the T-100 Domestic Segment database.

Table 7 shows predicted fare differences for flights originating in small and large communities based on weighted average differences in characteristics. As the table shows, large percentage fare differences between small and large communities are predicted based on cost characteristics. Small communities are predicted to have 2.2 percent higher fares because of shorter average distances traveled, 6.4 percent higher fares because of shorter average stage lengths, 3.8 percent higher fares because of smaller equipment sizes, and 3.2 percent higher fares because of smaller load factors. Offsetting these effects are lower fares because of a higher percentage of small community airport flights that are round trip and a lower proportion of small community airport flights that use jets. In total, smaller communities are predicted to have fares that are about 11 percent higher due to differences in cost characteristics.

Table 7: Estimated Percentage Differences in Fares Originating at Airports Serving Small and Large Communities Attributable to Mean Sample Characteristics (Non-Slot)

	Small	Large	Pct. Fare Diff.
TOTAL DIST	2,042.00	2,200.00	2.24%
STAGE DIST	572.75	739.58	6.42%
ORIGIN EQUIP	75.40	118.80	3.78%
ORIGIN LOAD	0.58	0.66	3.24%
ORIGIN FREQ	586.47	10,026.00	-10.15%
ORIGIN PROPJET	0.52	0.89	-1.52%
LOW COST ORIGIN	0.08	0.50	3.28%
ROUND TRIP	0.67	0.56	-3.21%
ORIGIN TOURISM	0.01	0.37	1.28%
ORIGIN HERF	0.48	0.38	1.35%
ORIGIN SHARE	0.19	0.04	2.46%
Total			9.17%

On the demand side, a much lower frequency of flights serving small communities on average translates into predicted fares that are about 10.2 percent lower. On the other hand, a lower percentage of small community airport locations that are tourist destinations leads to a predicted fare increase of 1.3 percent above large community airport locations. Airfares for flights originating in small communities are predicted to be 8.9 percent lower than those for flights originating in large communities based on demand characteristics.

As Table 7 shows, market power characteristics are also shown to have an important influence on airfare differences between small and large communities. As the table shows, fares for flights originating in small communities are predicted to be 1.4 percent higher due to higher market concentration as represented by the Herfindahl Index, 2.5 percent higher due to a higher average share of air carriers serving small communities, and 3.3 percent higher due to a smaller proportion of small communities served by low-cost carriers in comparison to large communities. In total, differences in market power variables are predicted to result in fares that are about 7 percent higher for flights originating in small communities in comparison to those serving large communities.

POLICY IMPLICATIONS

As the previous discussion indicates, the predicted fare differences using the regression sample data and the weighted average T-100 segment data are very similar. Both predict an average fare for flights serving small communities that is about 9 to 10 percent higher than for flights serving large communities. This is close to the average overall fare difference between fares for flights serving small and large communities of 11 percent, as shown in Figure 1.

Moreover, both predictions of fare differences show cost and market power effects that are similar in magnitude, with a demand effect that partially offsets cost and market power effects. For example, in predicting fare differences using the regression sample data, cost and market power effects are predicted to increase small-community fares above large-community fares by 7 and 9 percent, respectively, while demand effects are predicted to decrease small-community fares relative to large-community fares by 5 percent. For the predictions using the weighted average small-and large-community characteristics from the T-100 segment database, cost and market power effects are predicted to increase average small community airfares above large community airfares by 11 and 7 percent, respectively. Demand effects are predicted to result in 9 percent lower average small community airfares in comparison to large community airfares. In summary, the picture painted by these predicted fare differences is that the role played by cost and market power are roughly equal, and these effects are partially offset by somewhat lower quality service in terms of the schedules available to small community travelers.

While it is tempting to think of the differences in fares that are attributable to costs as unavoidable and differences in fares that are attributable to market power as avoidable, it appears that the low density nature of small community air service naturally leads to both cost and market power fare differences. Moreover, any attempt to force market power differences at airports serving small communities is likely to lead to offsetting cost differences. To illustrate why market power fare differences are likely unavoidable for small communities, each market power variable will be discussed in turn.

Both simulations of fare differences between small and large communities show a large impact of the higher prevalence of low-cost carriers in large communities. In the first simulation the percentage difference in average airfare due to differences in the number of communities served by low-cost carriers is 4 percent, while it is 3.3 percent in the second. As highlighted previously, one of the defining characteristics of low-cost carriers is extensive use of point-to-point service. The lower traffic base in small communities cannot support such point-to-point service in most cases. Thus, although this 3 to 4 percent fare difference partially reflects increased pricing discipline in markets served by low-cost carriers, there is no way to introduce this same kind of competition into markets with traffic bases that are too small to support point-to-point service.

In addition to the market power fare differences from a difference in the prevalence of low-cost carriers, the other major market power fare differences result from differences in market concentration and in individual carrier shares. In the context of larger communities, several observers have suggested various potential policy remedies for high market concentration and large individual carrier shares. Such policies include allowing foreign carriers to provide service within the United States, requiring airports to allow competitive access to gates where such gates are dominated by one or a few airlines, and expanding available slots at slot-controlled airports. None of these policies appear to be relevant to small communities, because the primary reason for higher concentration appears to be a lower density of service rather than anticompetitive actions. This is supported by the fact that the smaller number of airlines in small communities experience smaller load factors, use smaller equipment, and serve these communities less often. Moreover, any attempt to try to force more competition at these smaller community airports is likely to lead to offsetting cost effects. That is, introducing more competition by increasing the number of airlines at a small community airport will decrease load factors for existing airlines and decrease the economical equipment sizes. Both of these decreases will lead to an increase in the cost of serving small community airports. While the average frequency of service is also likely to decrease, potentially leading to a reduction in fares, it will also lead to a deterioration in service and an increase in the costs of serving small communities. In sum, increased competition in small communities does not appear to be viable, because of an increased pressure on costs and increased competitive pressure.

SUMMARY

This study examines airfares for flights serving small and large communities, and attempts to explain their differences using a 10 percent sample of all tickets sold nationwide in the year prior to the terrorist attacks of Sept. 11, 2001. The study finds airfares that are 11 percent higher for those serving communities of 300,000 or less in comparison to those serving communities of more than 300,000, on average. However, the study finds that there are wide differences in fares among different communities within various size categories.

In examining reasons for fare differences, the study finds that average fares are higher for small communities due to a higher cost of serving such communities and due to market power differences. Moreover, these cost and market power differences in fares are roughly equal to each other.

While it may be tempting to think of market power differences in fares as fixable through some competitive policy prescription, it is unlikely that any such policy would be successful. The market power differences accounting for fare differences between small and large communities are the result of the low-density nature of small communities. Remedies aimed at increasing competition in small communities are likely to contribute to increasing costs, and service that is not viable for private airlines.

Furthermore, despite recent complaints over the higher rates paid by air travelers going to or coming from small communities, most observers agree that deregulation has been beneficial for small community travelers (Morrison and Winston, 1999). Although gains to small communities have been smaller than those to large communities, small community travelers have realized lower fares, more service, and a larger variety of destinations as a result of deregulation.

Finally, while this study provides an explanation of average fare differences between small and large communities, it does not examine different fare classes. More study is needed to examine fare differences among business class and vacation class travelers traveling to or from various communities.

REFERENCES

Bailey, Elizabeth (2002): "Aviation Policy: Past and Present." Southern Economic Journal, 69: 12-20.

Bailey, Elizabeth, David Graham, Daniel Kaplan (1985): *Deregulating the Airlines.* MIT Press, Cambridge, MA.

Borenstein, Severin. (1989): "Hubs and High Fares: Dominance and Market Power in the U.S. Airline Industry." *RAND Journal of Economics*, 20: 344-65.

Call, Gregory and Theodore Keeler (1985): "Air Deregulation, Fares, and Market Behavior: Some Empirical Evidence." in Andrew F. Daughety, *Analytical Studies in Transport Economics*. Cambridge University Press: Cambridge, UK.

Caves, Douglas, Laurits Christensen and Michael Tretheway (1984): "Economies of Density versus Economies of Scale: Why Trunk and Local Service Airline Costs Differ." *RAND Journal of Economics*, 15: 471-89.

General Accounting Office (GAO) (1999): "Airline Deregulation: Changes in Airfares, Service Quality, and Barriers to Entry." Report to Congressional Requesters, Washington, D.C.

General Accounting Office (GAO) (1996): "Airline Deregulation: Changes in Airfares, Service, and Safety at Small, Medium-Sized, and Large Communities." *GAO/RCED-96-79*, Washington, D.C.

General Accounting Office (GAO) (1999): "Airline Deregulation: Changes in Airfares, Service Quality, and Barriers to Entry." *GAO/RCED-99-92*, Washington, D.C.

General Accounting Office (GAO) (1990) "Airline Deregulation: Trends in Airfares at Airports in Small and Medium-Sized Communities." *GAO/RCED-91-13*, Washington, D.C.

Graham, David, Daniel Kaplan and David Sibley (1983): "Efficiency and Competition in the Airline Industry." *Bell Journal of Economics*, 14: 118-38.

Ito, Harumi, and Darin Lee (2003): "Low Cost Carrier Growth in the U.S. Airline Industry: Past, Present, and Future." Brown University, Providence, RI. Available at *www.brown.edu/Departments/Economics/Papers/2003/2003-12_paper.pdf*.

Keeler, Theodore (1972): "Airline Regulation and Market Performance." *Bell Journal of Economics*, 3: 399-424.

Larsen, Tulinda (2003): "Crisis in Small Community Air Service." *Regional Airline Association (RAA) Convention News*.

Lederman, Mara, and Silke Januszewski (2003) "Entry Patterns of Low-Cost Airlines." Massachusetts Institute of Technology, Cambridge, MA. Available at *www.rotman.utoronto.ca/mara.lederman/entry.pdf*.

Morrison, Steven, and Clifford Winston (1989): "Enhancing the Performance of the Deregulated Air Transportation System." In *Brookings Papers on Economic Activity: Microeconomics*. The Brookings Institution: Washington, D.C.

Morrison, Steven, and Clifford Winston (1987): "Empirical Implications and Tests of the Contestability Hypothesis." *Journal of Law & Economics*, 30: 53-66.

Tinsley, Anna M (1998): "Officials Form Group to Work on Solutions to Airline Problems in Smaller Communities." *Abiliene Reporter-News*, June 5, 1998.

U.S. Department of Transportation (DOT) (1998): News Release. "DOT Submits Report to Congress on Rural Airfares." 4/21/98. Available at *www.dot.gov/affairs/1998/dot8198.htm*

APPENDIX A:

Data Appendix

The two primary data sources used in this study were the Airline Origin and Destination Survey (DB1B) and T-100 Domestic Segment Data (T-100), both from the Bureau of Transportation Statistics. The DB1B contains a random 10 percent sample of airline tickets from carriers providing scheduled service in air craft with at least 60 seats. The database includes individual records of ticket prices actually paid by passengers, the operating and ticketing carriers, the airports traveled through, stage lengths, and the dates of travel. In this study, we limited our analyses to trips between airports located within the boundaries of the United States. Furthermore, we eliminated routes where we could not clearly define the destination, such as circle trips (e.g. LAX-MIA-MSP-LAX).

The T-100 Domestic Segment contains monthly non-stop segment data by aircraft type and service class. In 2001, large certificated U.S. air carriers were required to report traffic data in T-100 format, while smaller carriers reported voluntarily. We find that 82.5 percent of airports serving large communities have T-100 domestic segment data associated with them, while 63.7 percent of airports serving small communities have T-100 domestic segment data in 2001. Data elements in T-100 include origin, destination, operating carrier, airplane size, aircraft type, passengers, departures, and available seats. This study uses these data to create various flight operating variables (EQUIP, LOAD, FREQ, and PROPJET) and market power variables (HERF, and SHARE).

SPECIFIC VARIABLE DEFINITIONS AND SOURCES

FARE: Average fare per passenger mile paid by itinerary, carrier, and other flight characteristics. The average fare per passenger mile was obtained from the DB1B. Because of nature of sampling data, careful data selection and interpretation were required. The study eliminated the top and bottom 1 percent of fares. This process helped remove outliers resulting from Frequent Flyer Plans (FFP) and input errors in the DB1B.

TOTAL DIST: Total flight distance. It was calculated by summing mileages for all the coupons of the observed routes. The study used coupon distances in the DB1B.

STAGE DIST: Average stage length. Total flight distance was divided by the number of coupons. The DB1B was used.

ORIGIN EQUIP: Average size of aircraft by carrier and quarter at the origin city – based on number of seats. The T-100 Domestic Segment Data were used to create the ORIGIN EQUIP by origin, carrier, and quarter.

DEST EQUIP: Average size of aircraft by carrier and quarter at the destination city. The T-100 Domestic Segment Data were used to create the DEST EQUIP by destination, carrier, and quarter.

ORIGIN LOAD: Average load factor of flights by carrier and quarter at the origin city. It was calculated by dividing total revenue passenger-miles by total available seat-miles. The ORIGIN LOAD by origin, carrier, and quarter was obtained from the T-100 Domestic Segment Data.

DEST LOAD: Average load factor of flights by carrier and quarter at the destination city. The DEST LOAD by destination, carrier, and quarter was obtained from the T-100 Domestic Segment Data.

ORIGIN FREQ: Average frequency of flights by carrier and quarter at the origin city. The ORIGIN FREQ by origin, carrier, and quarter was calculated from the T-100 Domestic Segment Data.

DEST FREQ: Average frequency of flights by carrier and quarter at the destination city. The DEST FREQ by destination, carrier, and quarter was calculated from the T-100 Domestic Segment Data.

ORIGIN PROPJET: Average proportion of flights using jet planes by carrier and quarter at the origin city. The ORIGIN PROPJET by origin, carrier, and quarter was obtained from the T-100 Domestic Segment Data.

DEST PROPJET: Average proportion of flights using jet planes by carrier and quarter at the destination city. The DEST PROPJET by destination, carrier, and quarter was obtained from the T-100 Domestic Segment Data.

LOW COST OR: Dummy for origin airport served by Low Cost Carriers (LCCs). The study used a list of LCCs categorized by the Ito and Lee[23].

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[23] Low Cost Carrier Growth in the U.S. Airline Industry: Past, Present, and Future, Harumi Ito and Darin Lee, Brown University, April 9, 2003

LOW COST DES: Dummy for destination airport served by LCCs.

ROUND TRIP: Dummy for round trip flights. The study considered the round trip if origin and final stop are the same.

ORIGIN TOURISM: Dummy for origin in tourism area. The study used a list of tourism areas in the Office of Travel and Tourism Industries (OTTI) in the U.S. Department of Commerce. These tourism areas were selected based on tourism market share by overseas visitors in 2000 and 2001[24].

DEST TOURISM: Dummy for destination in tourism area.

ORIGIN HERF: Herfindahl-Hirschman Index for segment market share of ticketing carriers at origin. It is calculated by summing the squared values of individual segment market share of passengers of all ticketing carriers at the origin city. In order to get passengers of ticketing carriers, the study obtained codeshare information of carriers for all airports from the DB1B. Then, the study estimated the number of passengers of ticketing carriers using the number of passengers of operating carriers in the T-100 Domestic Segment Data. For non-ticketing operating carriers, the number of passengers of the carrier was attributed to their ticketing carrier. If the operating carriers have a codesharing contract with multiple ticketing carriers, a ratio of the number of passengers of ticketing carriers was used to allocate the passengers of operating carriers. For example, if XJ is the non-ticketing operating carrier, and UA and NW are its ticketing carriers and if UA has 80 passengers and NW has 20 passengers, then 80 and 20 percent of XJ's passengers are attributed to UA and NW, respectively. For ticketing carriers that are also operating carriers, passengers on flights they operated were assigned to their ticketing share. The study created Herfindahl-Hirschman Indexes by origin and quarter.

DEST HERF: Herfindahl-Hirschman Index for segment market share of ticketing carriers at destination.

ORIGIN SHARE: Segment market share of passengers of the ticketing carrier at origin. It is calculated by dividing passengers of a carrier by passengers of all carriers at origin. The study used the T-100 Domestic Segment Data to create ORIGIN SHARE by origin, carrier, and quarter.

DEST SHARE: Segment market share of passengers of ticketing carrier at destination.

ORIGIN SLOT: Dummy for slot control origin airport. Slot control airports are O'Hare International (ORD), Laguardia (LGA), JFK International (JFK), and Ronald Reagan National airports (DCA).

DEST SLOT: Dummy for slot control destination airport

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http://www.brown.edu/Departments/Economics/Papers/2003/2003-12_paper.pdf

[24] http://tinet.ita.doc.gov/view/f-2001-45-561/index.html?ti_cart_cookie=20031218.101715.05676

APPENDIX B:

Examples of Fares to Washington, DC and New York, NY from 10 Large and 10 Small Communities

Table 8. Average Fares and Characteristics for Flights Originating in 10 Small Communities and Terminating in Ronald Reagan National Airport in DC (DCA).

	Origin	Destination	Price per mile (cents)[1]	Distance (miles)[2]	Average Stage Length (miles)	Frequency[3]	AirCraft Size[3]	Load Factor[3]	Herfindahl Index[4]	Share of the largest Carrier[4]	Number of Carrier[4]	Share of Flights using Jet	Hub	LCCs	Tourism
1	Fargo, Hector International Airport, ND	Ronald Reagan National Airport, DC	22.0	1,192	759	3,916	84.6	0.66	0.75	0.85	7	0.90	No	Yes	No
2	Duluth International Airport, MN	Ronald Reagan National Airport, DC	23.2	1,107	695	4,080	67.3	0.56	0.73	0.84	8	0.83	No	Yes	No
3	Green Bay, Austin Straubel International Airport, WI	Ronald Reagan National Airport, DC	25.0	781	489	8,058	70.9	0.62	0.41	0.59	6	0.90	Yes (Small)	No	No
4	Sioux Falls Regional Airport, SD	Ronald Reagan National Airport, DC	16.4	1,177	744	6,136	79.9	0.65	0.39	0.53	9	0.67	Yes (Small)	Yes	No
5	Lincoln Municipal Airport, NE	Ronald Reagan National Airport, DC	17.3	1,142	717	4,088	79.3	0.66	0.40	0.54	7	0.58	No	Yes	No
6	Dothan Regional Airport, AL	Ronald Reagan National Airport, DC	22.9	788	475	2,481	38.5	0.67	1.00	1.00	1	0.001	No	No	No
7	Paducah, Barkley Regional Airport, KY	Ronald Reagan National Airport, DC	23.4	902	578	936	29.2	0.38	1.00	1.00	1	0.01	No	No	No
8	Fort Smith Regional Airport, AR	Ronald Reagan National Airport, DC	16.7	1,324	852	4,339	33.8	0.48	0.48	0.51	6	0.11	No	No	No
9	Wilmington International Airport, NC	Ronald Reagan National Airport, DC	43.7	530	320	4,793	71.8	0.61	0.58	0.71	5	0.55	No	No	No
10	College Station, Easterwood Airport, TX	Ronald Reagan National Airport, DC	19.8	1,374	861	4,654	33.2	0.58	0.52	0.60	2	0.01	No	No	No

1. **Average price per passenger mile from origin to destination (DB1B).**
2. **Value was estimated from the sum of all coupon distances. The value was divided by 2 if it is a round trip (DB1B).**
3. **Value was estimated from operating carriers (T-100 Domestic Segment Data).**
4. **Value was estimated from passengers of a ticketing carrier that has at least one passenger at origin (DB1B & T-100 Domestic Segment Data).**

Table 9. Average Fares and Characteristics for Flights Originating in 10 Large Communities and Terminating in Ronald Reagan National Airport in DC (DCA).

	Origin	Destination	Price per mile (cents)[1]	Distance (miles)[2]	Average Stage Length (miles)	Frequency[3]	AirCraft Size[3]	Load Factor[3]	Herfindahl Index[4]	Share of the largest Carrier[4]	Number of Carrier[4]	Share of Flights using Jet	Hub	LCCs	Tourism
1	Minneapolis/St. Paul International Airport, MN	Ronald Reagan National Airport, DC	22.8	1,028	846	206,994	112.7	0.64	0.65	0.80	22	0.81	Yes (Large)	Yes	Yes
2	Milwaukee, General Mitchell International Airport, WI	Ronald Reagan National Airport, DC	23.3	689	584	47,654	98.3	0.60	0.22	0.24	20	0.97	Yes (Med)	Yes	No
3	Omaha, Eppley Airfield, NE	Ronald Reagan National Airport, DC	14.8	1,098	848	25,766	111.6	0.67	0.13	0.21	13	0.98	Yes (Med)	Yes	No
4	Chicago, O'Hare International Airport, IL	Ronald Reagan National Airport, DC	37.1	693	614	361,951	115.9	0.66	0.39	0.49	29	0.96	Yes (Large)	Yes	Yes
5	St. Louis, Lambert-St. Louis International Airport, MO	Ronald Reagan National Airport, DC	34.8	796	693	197,902	116.8	0.63	0.58	0.74	21	0.88	Yes (Large)	Yes	Yes
6	Mobile Regional Airport, AL	Ronald Reagan National Airport, DC	23.5	1,008	602	5,936	114.0	0.56	0.88	0.93	3	0.99	Yes (Small)	No	No
7	Memphis International Airport, TN	Ronald Reagan National Airport, DC	24.7	872	704	74,982	106.8	0.64	0.68	0.82	15	0.97	Yes (Med)	Yes	Yes
8	Little Rock National Airport, AR	Ronald Reagan National Airport, DC	21.4	1,068	671	18,848	107.3	0.63	0.23	0.34	12	0.84	Yes (Small)	Yes	No
9	Raleigh-Durham International Airport, NC	Ronald Reagan National Airport, DC	48.9	318	253	76,930	95.1	0.68	0.18	0.33	20	0.95	Yes (Med)	Yes	Yes
10	Austin Bergstrom International Airport, TX	Ronald Reagan National Airport, DC	22.7	1,435	884	44,840	129.6	0.66	0.23	0.39	17	1.00	Yes (Med)	Yes	Yes

Table 10. Average Fares and Characteristics for Flights Originating in 10 Small Communities and Terminating in John F. Kennedy International Airport in NY (JFK).

	Origin	Destination	Price per mile (cents)[1]	Distance (miles)[2]	Average Stage Length (miles)	Frequency[3]	AirCraft Size[3]	Load Factor[3]	Herfindahl Index[4]	Share of the largest Carrier[4]	Number of Carrier[4]	Share of Flights using Jet	Hub	LCCs	Tourism
1	Fargo, Hector International Airport, ND	JFK International Airport, NY	16.1	1,272	771	3,916	84.6	0.66	0.75	0.85	7	0.90	No	Yes	No
2	Duluth International Airport, MN	JFK International Airport, NY	17.7	1,165	697	4,080	67.3	0.56	0.73	0.84	8	0.83	No	Yes	No
3	Green Bay, Austin Straubel International Airport, WI	JFK International Airport, NY	20.8	1,181	602	8,058	70.9	0.62	0.41	0.59	6	0.90	Yes (Small)	No	No
4	Sioux Falls Regional Airport, SD	JFK International Airport, NY	9.6	1,319	849	6,136	79.9	0.65	0.39	0.53	9	0.67	Yes (Small)	Yes	No
5	Lincoln Municipal Airport, NE	JFK International Airport, NY	15.2	1,317	824	4,088	79.3	0.66	0.40	0.54	7	0.58	No	Yes	No
6	Dothan Regional Airport, AL	JFK International Airport, NY	13.6	931	621	2,481	38.5	0.67	1.00	1.00	1	0.001	No	No	No
7	Paducah, Barkley Regional Airport, KY	JFK International Airport, NY	30.3	1,037	639	936	29.2	0.38	1.00	1.00	1	0.01	No	No	No
8	Fort Smith Regional Airport, AR	JFK International Airport, NY	12.0	1,493	632	4,339	33.8	0.48	0.48	0.51	6	0.11	No	No	No
9	Wilmington International Airport, NC	JFK International Airport, NY	15.5	1,137	704	4,793	71.8	0.61	0.58	0.71	5	0.55	No	No	No
10	College Station, Easterwood Airport, TX	JFK International Airport, NY	10.2	1,517	1,011	4,654	33.2	0.58	0.52	0.60	2	0.01	No	No	No

Table 11. Average Fares and Characteristics for Flights Originating in 10 Large Communities and Terminating in John F. Kennedy International Airport in NY (JFK).

	Origin	Destination	Price per mile (cents)[1]	Distance (miles)[2]	Average Stage Length (miles)	Frequency[3]	AirCraft Size[3]	Load Factor[3]	Herfindahl Index[4]	Share of the largest Carrier[4]	Number of Carrier[4]	Share of Flights using Jet	Hub	LCCs	Tourism
1	Minneapolis/St. Paul International Airport, MN	JFK International Airport, NY	13.2	1,146	984	206,994	112.7	0.64	0.65	0.80	22	0.81	Yes (Large)	Yes	Yes
2	Milwaukee, General Mitchell International Airport, WI	JFK International Airport, NY	20.6	967	574	47,654	98.3	0.60	0.22	0.24	20	0.97	Yes (Med)	Yes	No
3	Omaha, Eppley Airfield, NE	JFK International Airport, NY	17.5	1,477	825	25,766	111.6	0.67	0.13	0.21	13	0.98	Yes (Med)	Yes	No
4	Chicago, O'Hare International Airport, IL	JFK International Airport, NY	26.8	1,746	897	361,951	115.9	0.66	0.39	0.49	29	0.96	Yes (Large)	Yes	Yes
5	St. Louis, Lambert-St. Louis International Airport, MO	JFK International Airport, NY	29.8	1,018	876	197,902	116.8	0.63	0.58	0.74	21	0.88	Yes (Large)	Yes	Yes
6	Mobile Regional Airport, AL	JFK International Airport, NY	13.6	1,190	670	5,936	114.0	0.56	0.88	0.93	3	0.99	Yes (Small)	No	No
7	Memphis International Airport, TN	JFK International Airport, NY	13.9	1,186	720	74,982	106.8	0.64	0.68	0.82	15	0.97	Yes (Med)	Yes	Yes
8	Little Rock National Airport, AR	JFK International Airport, NY	19.1	1,312	775	18,848	107.3	0.63	0.23	0.34	12	0.84	Yes (Small)	Yes	No
9	Raleigh-Durham International Airport, NC	JFK International Airport, NY	33.0	630	478	76,930	95.1	0.68	0.18	0.33	20	0.95	Yes (Med)	Yes	Yes
10	Austin Bergstrom International Airport, TX	JFK International Airport, NY	14.4	1,842	1,019	44,840	129.6	0.66	0.23	0.39	17	1.00	Yes (Med)	Yes	Yes