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Introduction

One of the principal concerns which has surfaced since the passage of the Airline Deregulation Act of 1978 is the effect which airline deregulation has had on rates and services outside of major metropolitan regions. Chambers of Commerce, as well as state and local governments, have on occasion, voiced concern regarding perceived trends in rate and service levels at non-hub air centers.

At the time the Act was passed, it was not known exactly how rates and service levels would be affected in various markets. The benefits to the public which would result from deregulation had been clearly identified in terms of greater price competition and, consequently, reduced fares. The distribution of these benefits, however, was less clearly defined. Although certain precautions were taken in terms of determining essential airline service, the degree of service benefits and/or rate reductions which would be achieved on the "spokes" of the route structure as opposed to the hubs, or at smaller communities which were off major airline routes, was not known.

Subsequent to the passage of the Act, concerns began to surface regarding who would be the major beneficiaries of airline deregulation and what the Act's long-run effects on the general public would be [4]. Stephenson and Beier [5] analyzed a cross-section of "small communities" which had been identified by the Department of Transportation as being in danger of losing some degree of certificated airline service. More recently, the Civil Aeronautics Board [1], in its report to Congress, presented data and analysis concerning

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service levels in non-hub areas.

This study presents the results of an analysis of changes in air fares and service levels in North Dakota after passage of the Airline Deregulation Act. While the route structures and data are specific to a particular geographic region, North Dakota should constitute a good microcosm of areas outside of major metropolitan areas which have relatively low route densities.

Objectives of the Study

The general objective of this study was to investigate effects of airline deregulation on fares and service over low density routes. Specific objectives were to:

1) analyze absolute changes in airline fares from North Dakota communities and changes relative to other markets, and

2) analyze changes in service levels from North Dakota communities.

Data Sources

The data utilized in this analysis consists primarily of: (1) the number of arrival and departure flights, (2) the type of equipment used, from which the number of available seats was determined, and (3) rate and mileage information between origin and destination pairs. From these latter data, the number of revenue passenger miles along each route was calculated.

The information used in this analysis was obtained from three primary sources: (1) the North Dakota Aeronautics Commission, which maintains service and rate statistics for routes within the State, (2) the Official Airline Guide, which contains flight and rate information for most airlines and cities, and (3) from the airlines themselves and/or local travel agencies.

Airline Passenger Fares

This section contains analyses of various airline fares. A comparative analysis is presented that includes 1979 and 1982 air fares from both Bismarck

and Fargo, North Dakota to several destinations. The analysis includes: (1) examining actual increases between 1979 and 1982; (2) indexing 1979 fares to December 1981 levels using the Consumer Price Index (CPI); and (3) comparing per passenger mile costs to the consumer for selected discount and coach fares. In addition, regression analysis was used to determine the statistical relationship between air fares and mileages for selected movements between Bismarck, Fargo, Chicago, Houston, Los Angeles and Minneapolis to various destinations. Also, both coach and discount fares were compared among the six origins on a per passenger mile basis.

Changes in North Dakota Airline Passenger Fares

Air fares from both Bismarck and Fargo to various destinations increased substantially from January 1979 to February 1982 (Table 1). Actual increases in one-way passenger fares from Bismarck varied from a low of eight percent for flights to Winnipeg, Manitoba, to a high of 134 percent for flights to both Fargo and Seattle. Fares on flights leaving Fargo increased from a low of 28 percent to Seattle, to a high of 134 percent to Bismarck. As indicated in Table 1, a substantial portion of the fares increased by more than 100 percent. Thirteen out of 19 fares from Bismarck more than doubled between January 1979 and February 1982. Four additional fares were increased by more than 85 percent. Fares for nine of the 11 flights departing from Fargo increased by more than 100 percent during this same time period. Average fare increases for the Bismarck flights were 106 percent compared to 99 percent for Fargo flights.

Inflationary Increases

Both the consumer price index (CPI) and producer price index (PPI) for transportation equipment were used to index January 1979 fares to December 1981 levels (Table 1). The index numbers were 144.1 and 142.2 for the CPI

TABLE 1, COMPARISION OF ACUTAL AND CONSUMER PRICE INDEXED ONE-WAY AIR FARES[1] BISMARCK AND FARGO, NORTH DAKOTA, JANUARY, 1979 AND FEBRUARY, 1982.

Route	1/1/79 Fare	Dec. 1981* CPI Indexed Fare	2/1/82 Fare	Increase (Decrease) Relative to Inflation	Actual Increase (Decrease) 1979 to 1982
	Dollars			Percent	
From Bismarck to:					
Fargo[2]	19	27	44	63	132
Fargo	38	55	89	62	134
Minneapolis	58	84	133	58	129
Chicago	87	125	193	54	122
Wash., D.C.	133	192	290	51	118
New York City	140	202	304	50	117
Miami	177	255	382	50	116
Billings	58	84	136	62	134
Seattle	110	159	253	59	130
Seattle[3]	110	159	199	25	72
Denver	85	122	181	48	113
Phoenix	142	205	283	38	99
Phoenix[4]	142	205	265	29	87
Dallas	136	196	269	37	98
Dallas[4]	136	196	266	36	96
Winnipeg	52	75	56	(25)	8
Kansas City, Mo.	92	133	189	42	105
Omaha	77	111	160	44	108
St. Louis	100	144	214	49	114
Average Increase				43	106
From Fargo to:					
Bismarck[2]	19	27	44	63	312
Bismarck	38	55	89	62	134
Minneapolis	42	61	96	57	129
Chicago	75	108	167	55	123
Wash., D.C.	120	173	253	46	111
New York City	126	182	274	51	117
Miami	165	238	346	45	110
Billings	75	108	175	62	133
Seattle[4]	161	232	206	(11)	28
Seattle	161	232	285	23	77
Denver	91	131	198	51	118
Average Increase				38	99

[1] Standard Fares
[2] 50% Discount
[3] Special Fare
[4] Via Minneapolis

*Calculated by multiplying December, 1981 CPI (144.1) times individual 1-1-79 fares. CPI was calculated using 1978 as the base year (1978=100).

and PPI, respectively, using 1978 as the base year (1978=100). Since the CPI was only 1.33 percent higher than the PPI for transportation equipment, the subsequent analysis will focus on CPI indexed fares.

Flights departing from Fargo and Bismarck (with the exception of the Winnipeg flight), were subject to fares 23 to 62 percent higher in February 1982 compared to fares suggested by the CPI indexing procedure. In other words, if the airlines serving Fargo and Bismarck had increased air fares concurrent with the CPI, 1979 rates would have increased roughly 44 percent in all instances. However, actual increases in air fares averaged roughly 50 percent above CPI indexed fares. For example, the Bismarck to New York City one-way fare was $140 in January 1979. If this fare had been increased concurrent with changes in the CPI, the fare would have been $202 in February 1982. Actual increases in air fares resulted in a February 1982 fare of $304, which was 50 percent above the CPI indexed price and 117 percent above the original fare. Consequently, the air fares examined from Bismarck and Fargo to the various destinations had been raised disproportionately compared to normal inflationary increases. These increases, therefore, may be attributed in part to the fact that Bismarck and Fargo are light density markets compared to other major metropolitan centers in the United States such as Minneapolis [2].

Minneapolis Fare Increases

Air fares were also examined for various flights departing from Minneapolis. Destinations used in the analysis were the same destinations used in the Bismarck/Fargo analysis. However, the time series data are for October 15, 1978 to March 15, 1982 compared to January 1, 1979 to February 1, 1982 for the Bismarck/Fargo analysis. Some slight time discrepancies exist with the two data bases; however, basic relationships generally will be conclusive.

As was the case with both Bismarck and Fargo air fares, Minneapolis fares increased substantially between the two periods (Table 2). Rate increases averaged 78 percent between October 1978 and March 1982 for the destinations examined. While these increases may be substantial, they were considerably less compared to increases in air fares for flights from Bismarck and Fargo (106 and 99 percent, respectively). Actual increases in air fares for the Bismarck and Fargo flights averaged 43 and 38 percent above the CPI indexed fares, respectively, while fares from Minneapolis were 24 percent above CPI indexed fares.

Differential Pricing by Airlines

Regular air fares typically are based on a class system with many airlines offering fares for both "coach" and "first class" service. However, in an attempt to utilize unused capacity, many airlines offer rates substantially lower than either coach or first class. These promotional fares are a form of multi-part pricing based on demand or value of service and theoretically are offered to tap sources of traffic that are on the lower portion of the demand curve [3]. However, in order for the fares to work effectively (raise revenues), they must not divert too much traffic from first class and/or coach. Thus, in order to qualify for discount fares, passengers must frequently purchase tickets well in advance of the flights and abide by certain restrictions.

Discount fares often offer passengers substantial savings relative to standard coach fares. These savings were examined for flights departing from six origins based on March 1982 data (Table 3). Savings on discount fares were comparable for all locations except Chicago. Passengers boarding at Fargo, Bismarck and Minneapolis saved 25, 27 and 32 percent, respectively, on discount fares compared to coach fares. Passengers from Chicago, on the

TABLE 2. COMPARISON OF ACTUAL AND CONSUMER PRICE INDEXED ONE-WAY AIR FARES FOR MINNEAPOLIS, MINNESOTA, OCTOBER 15, 1978 AND MARCH 15, 1982.

Destination	10-15-78 Fare	Dec. 1981* CPI Indexed Fare	3-15-82 Fare	Increase (Decrease) Relative to Inflation	Actual Increase (Decrease) 1979 to 1982
	Dollars			Percent	
From Minneapolis to:					
Bismarck	58	84	133	58	129
Fargo	42	61	96	57	129
Chicago	54	78	115	47	113
Washington, D.C.	103	148	184	24	79
New York City	111	160	135	(16)	22
Miami	148	213	170	(20)	15
Billings	89	128	197	54	121
Seattle	140	202	302	50	116
Denver	85	122	171	40	101
Phoenix	131	189	200	6	53
Dallas	98	141	120	15	22
Winnipeg	59	85	119	40	102
Kansas City, Mo.	59	85	125	47	112
Omaha	48	69	97	41	102
St. Louis	65	94	133	41	105
Average Increase				24	78

*Calculated by multiplying December 31, 1981 CPI (144.1) times individual 10-15-78 fares. CPI was calculated using 1978 as the base year (1978=100).

other hand, saved an average of 56 percent on discount fares. It should be noted that while discount fare savings from Houston and Los Angeles were comparable with savings at Bismarck and Fargo, the coach fares from Houston and Los Angeles were at lower "per passenger mile" levels (see later section on Per Passenger Mile Costs of Air Fares). Consequently, passengers from Bismarck and Fargo may not be receiving discount fare savings at levels comparable to the other origins.

TABLE 3. PERCENT SAVINGS, DISCOUNT FARES VERSUS COACH FARES, MARCH, 1982.

Origin	Number of Destinations	Average Savings	Minimum Value	Maximum Value
		percent		
Bismarck	42	27	-4	65
Fargo	42	25	-8	65
Chicago	41	56	-4	70
Houston	39	26	-5	59
Los Angeles	41	22	-9	60
Minneapolis	42	32	0	60

Analysis of Fare-Distance Relationship

Regression analysis was used to determine the statistical relationship between air fares and mileage. Representative air fares from the same six origins were regressed against distances to selected cities in the United States. Coach and discount fares were examined. It was hypothesized that coach fares from all six origins would be equally dependent on distance. Alternatively stated, coach fares should increase proportionately with distance regardless of origin. A second hypothesis was that discount fares from the six locations would not be as dependent on distance. In other words,

exogenous factors such as market elasticity, traffic density, etc., and not distance, may become increasingly important explanatory variables. The general form of the linear regression model was:

$$AF = a + b\ (D)$$

where: AF = air fare (coach or discount)

D = distance of the flight

a = constant regression parameter

b = slope regression parameter

If air fares (AF) are statistically dependent on distance (D), the coefficient of determination (R^2) will approach one. For example, an R^2 equal to one would indicate that distance is the sole factor contributing to variation in air fares. Conversely, an R^2 equal to .50 would indicate that other factors contribute to the variation in air fares. Stated differently, R^2 is the proportion of the total variation in AF explained by the regression of AF on D.

Results of regression analysis indicated that coach fares were more dependent on distance than discount fares for Bismarck, Fargo and Minneapolis flights (Table 4). Coach fares for flights from Chicago, Houston and Los Angeles proved to be less dependent on distance than discount fares. For example, regressions on fares from Bismarck, Fargo and Minneapolis yielded R-squares of .77, .84 and .83, respectively for coach fares and .37, .28 and .53, respectively for discount fares. R-squares for coach rates from Chicago, Houston and Los Angeles were .34, .33 and .39, respectively, and .65, .57 and .54, respectively, for discount fares. These results indicate that coach fares from North Dakota and Minneapolis may be priced based largely on cost of service while coach fares from the other three origins may be priced based on other factors such as competition and traffic density. These low coach fares, therefore, may be priced below the cost of service and may be subsidized by other routes. This cross-subsidization may be partially identified

TABLE 4. CALCULATED REGRESSION COEFFICIENTS OF VARIOUS AIR FARE EQUATIONS FOR FLIGHTS ORIGINATING IN BISMARCK, FARGO, CHICAGO, HOUSTON, LOS ANGELES AND MINNEAPOLIS, 1982.

Equation Number	Origin	Type of Fare	Regression Parameters* Intercept	Slope[a]	R^2
1	Bismarck	Coach	89.7 (15.6)	0.075 (0.006)	.77
2	Bismarck	Discount	76.8 (25.0)	0.049 (0.010)	.37
3	Fargo	Coach	84.4 (11.6)	0.078 (0.005)	.84
4	Fargo	Discount	93.4 (22.9)	0.04 (0.01)	.28
5	Chicago	Coach	87.1 (13.8)	0.075 (0.017)	.34
6	Chicago	Discount	26.4 (4.7)	0.047 (0.006)	.65
7	Houston	Coach	71.5 (23.1)	0.089 (0.020)	.33
8	Houston	Discount	43.6 (10.3)	0.063 (0.009	.57
9	Los Angeles	Coach	34.0 (42.8)	0.115 (0.023)	.39
10	Los Angeles	Discount	71.6 (13.4)	0.05 (0.007)	.54
11	Minneapolis	Coach	66.1 (10.6)	0.079 (0.006)	.83
12	Minneapolis	Discount	61.2 (12.2)	0.044 (0.007)	.53

*Standard errors of the estimated coefficients are listed in parenthesis.

[a]All significant at the .05 level.

by examining fares on a per passenger mile basis. Although not conclusive (especially since air costs for the different routes were not available), routes that have high per passenger mile fares may partially subsidize routes with low per passenger mile fares.

Per Passenger Mile Costs of Air Fares[1]

Air fares from the six origins to 42 destinations were compared on a per passenger mile basis (Table 5). Per passenger mile figures did not vary significantly among Bismarck, Fargo and Minneapolis. However, coach fares from Houston and Los Angeles and discount fares from Chicago, Houston and Los Angeles were all considerably lower compared to North Dakota and Minneapolis fares. In fact, coach fares from Houston and Los Angeles were lower on a per passenger mile basis, than discount fares from Bismarck, Fargo and Minneapolis.

TABLE 5. PER PASSENGER MILE COSTS FOR 42 FLIGHTS FROM BISMARCK, FARGO, CHICAGO, HOUSTON, LOS ANGELES AND MINNEAPOLIS, 1982.[a]

	Coach Fares				Discount Fares			
Origin	Mean Value	Minimum Value	Maximum Value	n	Mean Value	Minimum Value	Maximum Value	n
	-- $/Passenger Mile ---				-- $/Passenger Mile ---			
Bismarck	.231	.170	.344	42	.168	.089	.231	42
Fargo	.245	.174	.310	42	.182	.094	.283	42
Chicago	.259	.051	.932	42	.106	.028	.396	41
Houston	.162	.066	.255	42	.099	.060	.267	39
Los Angeles	.137	.051	.218	42	.099	.060	.267	41
Minneapolis	.250	.137	.386	42	.170	.102	.296	42

[a] The number of observations (n) will not always total 42 since discount fares were not available for all flights.

Los Angeles had the lowest per passenger mile costs of any origin for both coach and discount rates. This may be partially due to the fact that these flights were generally longer in distance. Thus, the lower rates may be an indication of economies of longer hauls in the airline industry.

[1] Per passenger mile costs refer to costs to the consumer, not the airline.

Consumers in the North Dakota and Minneapolis markets are disadvantaged relative to consumers in the Chicago, Houston, and Los Angeles markets based on per passenger mile prices of air service. While reasons for this disparity may vary, it is apparent that the Chicago, Houston and Los Angeles markets are characterized by high density traffic and a large number of competing firms. Conversely, the North Dakota markets are lower density routes and do not have a large number of competing firms.

The fact that per passenger mile costs from Bismarck and Fargo did not vary significantly compared to the Minneapolis market is somewhat surprising. However, since the majority of these flights ultimately are routed through Minneapolis it is apparent that the fares are highly correlated to the Minneapolis fares.

Service-Related Effects of Deregulation

Much of the recent concern which has surfaced over deregulation centers on the effects which deregulation may have on service levels to small towns and lighter-density routes. In general, it has been hypothesized that capacity (as measured by the number of available seats) and absolute frequency of service may have declined. A comparative study, however, of the changes in service levels to small communities through March of 1980 showed mixed results, rather than any major change of airline service.

In a study conducted by Stephenson and Beier [5], 102 communities were examined, representing a cross-section of small towns which had either major trunk-line or local airline service prior to deregulation. Conclusions reached were that: (1) there was an absolute decline in the existing level of airline service to small communities as measured by the number of direct flights per week, (2) the amount of capacity provided, as measured by the number of available seats per week, declined, (3) service to hub airports had been maintained, (4) deregulation had accelerated the withdrawal of certificated

trunk-line carriers from small communities, and (5) the emergence of commuter airlines appears to have facilitated competition at small towns and intermediate points.

The conclusions of the study in general were that while airline service to small communities has been negatively affected since deregulation, the impacts were not major. Also, the positive effects of commuter airlines have offset, to a certain extent, the negative changes in service levels and capacity.

Methodology

This analysis includes service related impacts of deregulation on North Dakota communities along the same general lines as those pursued in the Stephenson-Beier study. The frequency of service, airline capacity, the type of carrier providing the service, as well as the number of carriers serving the market were considered.

Changes in airline service are generally not as readily quantifiable as changes in airline fares. There are certain measures of service levels or proxies, however, which may be used to gauge change in service levels which have occurred. The first of these is the frequency of service.

The Frequency Variable

Frequency of service is the most widely used variable in measuring airline service (Williamson, et.al., 6). The frequency variable, admittedly, cannot measure certain quality aspects of service, such as the time-attractiveness of flights or the range of destinations served. Together with the amount of available capacity, however, the frequency variable may be used as a suitable proxy for the absolute level of airline services to each community.

The number of daily arrival and departure flights at each North Dakota city, just subsequent to deregulation and again in February 1982, is shown in Table 6. As indicated, most North Dakota communities have enjoyed an increase in the number of arrival and departure flights since November 1978.

TABLE 6. NUMBER OF DAILY ARRIVAL AND DEPARTURE FLIGHTS FOR NORTH DAKOTA CITIES.

	November 1978	February 1982	Absolute Change	Percentage Change
Bismarck	34	38	+4	+11.76%
Devils Lake	4	8	+4	+100.00%
Fargo	32	32	0	0
Grand Forks	24	20	-4	-16.67%
Jamestown	4	8	+4	+100.00%
Minot	14	10	-4	-28.57%
Williston	10	19	+9	+90.00%
Total all Cities	122	135	+13	+10.65%

Devils Lake and Jamestown doubled the number of arrival and departure flights between November 1978 and February 1982. Dickinson, which did not have established airline service in 1978, had 8 daily arrival and departure flights in 1982. Williston also enjoyed a substantial increase in the number of flights per day, while Bismarck showed a smaller percentage increase and Fargo maintained the same number of arrival and departure flights.

Of the North Dakota communities with established airline service, only two had a decline in the number of daily arrival and departure flights since 1978 (Grand Forks and Minot). For the State as a whole, the number of daily arrival and departure flights has increased by 17 percent. Excluding the newly established service at Dickinson, the State has realized a gain of over 10 percent in the number of daily arrival and departure flights at locations which were served prior to deregulation.

As noted above, frequency of service alone does not completely address changes in service levels which have occurred. The number of available seats must still be considered. In addition, there is the question of which sets of destinations are served and how accessibility between city pairs has been affected.

Changes in Service Levels Along Various Routes

Stephenson and Beier concluded that service between small cities and major hubs had been relatively maintained. They suggested a "shakeout" of sorts had occurred where there was a "general consolidation" of traffic through major hubs.

The data for North Dakota are generally supportive of this conclusion. Service appears to be improved, in fact, between North Dakota's major airports and Minneapolis during the time period studied. Service along the "spokes" of the hub, however, has been affected in a different manner.

Fargo, for example, has retained the same level of service, as measured by the number of daily arrival and departure flights. The number of flights between Fargo and Minneapolis, both arrival and departure, has increased from 10 to 17 during the period November 1, 1978 to February 1, 1982. Bismarck also appears to have maintained its previous level of service to and from the Minneapolis market. Service levels between Bismarck and Fargo, however, have declined over the 40-month period. The number of arrival and departure flights has dropped from 8 to 4 daily and time schedules have been rearranged as well.

The trend thus appears to be one of market consolidation resulting from a shakeout as suggested by Stephenson and Beier. Direct service to Minneapolis has increased along North Dakota's major air corridors. Service at intermediate points has declined. Two-way accessibility has diminished. More "fly-overs" or direct flights to the major market (hub) are evident.

Available Capacity

The number of seats available is one measure of capacity provided at various communities. The number of available seats is not a utilization factor. The measure says nothing of the number of seats filled (load factors) or whether or not capacity is adequate. The number of seats available is

simply a proxy for monitoring the changes in the amount of capacity made available at various locations since November 1, 1978.

Stephenson and Beier [5] concluded the number of available seats at the 102 communities studied had declined since deregulation. This conclusion was hedged, however, because the frequency of flights in some instances had increased. Stephenson and Beier felt that this resulted in a better distribution of capacity throughout the week for some of those communities studied.

Data with respect to the amount of seats available at North Dakota communities are presented in Table 7. These data tend to support the original conclusion of Stephenson and Beier that the amount of available capacity has declined in lighter density markets subsequent to deregulation. For the State as a whole, those cities which had established airline service in November of 1978 collectively lost 273 available seats, or 2.36 percent of their previous capacity. With the addition of service at Dickinson, however, the loss becomes less apparent. Including the 136 seats added, existing capacity declined by only 1.18 percent over the 40 month study period.

TABLE 7. CHANGES IN CAPACITY AVAILABLE AT NORTH DAKOTA CITIES.

	1978 Seats Per Day	1982 Seats Per Day	Absolute Change	Percentage Change
Bismarck	3122	3324	+202	+6.47%
Devils Lake	192	136	-56	-29.17%
Fargo	3624	3944	+320	+8.83%
Grand Forks	2624	2266	-358	-13.64%
Jamestown	512	136	-376	-73.44%
Minot	1322	1156	-166	-12.56%
Williston	170	331	+161	+94.7%
State Total	11,560	11,293	-273	-2.36%

This seems compatible with the results of the Stephenson-Beier study. North Dakota cities appear to have suffered a decline in existing capacity, but the decline is not of major proportions when viewed in the aggregate. Also, it must be noted that North Dakota cities collectively realized a gain in daily arrival and departure flights. Thus, capacity may be somewhat more appropriately distributed over a greater number of flights, as suggested by Stephenson and Beier.

Withdrawal of Certificated Carriers

Stephenson and Beier found that deregulation had "accelerated" the withdrawal of certificated carriers from small cities and lower-density routes, but suggestions have been made that withdrawal would have occurred anyway--deregulation only served to speed up the process.

This thesis appears to hold true for North Dakota communities as well. North Central (Republic) has pulled out of Devils Lake, where service was provided in 1978, and Northwest has dropped service to Jamestown. This was an anticipated result of relaxed exit controls and does appear to have disrupted service connections. In both instances, Big Sky Airlines (a commuter airline) has moved to replace trunk-line carrier service in these markets.

One result of the loss of trunk-line service has been a loss of capacity at both locations (Table 8). However, the number of daily flights has increased. The amount of capacity may therefore be better distributed across a greater number of flights, as suggested earlier. If capacity is indeed adequate at these locations, then the additional frequency should somewhat offset the decline in capacity.

TABLE 8. CHANGES IN WEEKLY FLIGHT FREQUENCIES AND CAPACITY AT COMMUNITIES LOSING TRUNK-LINE AND/OR REGIONAL AIR SERVICE.

	Change in Flight Frequency	Change in Seats Available
Devils Lake	+4	-56
Jamestown	+4	-376

The Emergence of Commuter Airlines

Since deregulation, the growth of commuter airline service to small communities has increased substantially. Commuters have replaced certificated carriers in many small communities, and as noted by Stephenson and Beier, have increased the frequency of flights at specific locations. This is particularly true of North Dakota, where Big Sky airlines has established 51 flights since November 1975.

The most notable route addition has been the establishment of daily service between Bismarck and Dickinson. Big Sky airlines has instituted a flight schedule consisting of three arrival and departure flights daily. Big Sky, in general, has moved to increase the degree of accessibility between western North Dakota and Bismarck since deregulation.

Summary

Air fares from Bismarck and Fargo increased substantially from January 1979 to February 1982. Fares increased approximately 100 percent for both Bismarck and Fargo flights, considerably more than inflation would suggest. Increases in fares for similar flights from Minneapolis were not as substantial.

Regression analysis indicated that coach fares from Bismarck, Fargo and Minneapolis were predominately dependent on distance. Discount fares, on the other hand, were less dependent on distance indicating that other variables such as traffic density and competition predominated in rate setting.

Coach fares for flights from Bismarck, Chicago, Fargo and Minneapolis were fairly consistent on a per passenger mile basis. Similarly, discount fares were uniform for Bismarck, Fargo and Minneapolis flights. Houston and Los Angeles had substantially lower coach and discount fares compared to the North Dakota and Minneapolis routes. Also, discount fares from Chicago were relatively low. Consequently, airline deregulation has not been disadvantageous to the North Dakota markets relative to the Minneapolis market. However, high density markets such as Chicago, Houston and Los Angeles offer substantially lower rates (coach and/or discount) in terms of per passenger mile costs to the consumer.

Since the time period included in this study (January 1979 to February 1982), fares from North Dakota cities have stabilized relative to fares from Chicago, Houston and Los Angeles. Between March 1982 and March 1984, both Fargo and Bismarck coach fares increased nine percent, compared to increases of about 60 percent each from Chicago, Houston and Los Angeles. Discount fares from North Dakota were virtually unchanged, while discount fares from the higher density markets increased from eight to 31 percent.

A limitation of the analyses presented in this section is that many of the North Dakota flights examined are routed through Minneapolis. Fares from Bismarck and Fargo may be highly correlated to Minneapolis fares. Hence, in order to effectively compare the routes, specific data should be gathered on flights that are not routed through the Minneapolis market.

Service-related impacts are more difficult to quantify than changes in the rate structure. Based on the data available, however, certain conclusions may be drawn:

1. Existing capacity has declined for the State as a whole. The frequency of flights, however, has risen, tending to partially offset capacity declines. This is explained, in part, by the growth of commuter airline service, which is characterized by more frequent flights in smaller aircraft.

2. Deregulation appears to have accentuated the withdrawal of certificated carriers from lower-density markets. Both Jamestown and Grand Forks have lost certificated carrier service. The number of certificated carrier daily arrival and departure flights statewide has decreased. Commuter airline service has moved to supplement certificated carrier service in these markets.

3. In general, access to major hubs has been maintained or enhanced since deregulation. Two-way accessibility between intermediate points has diminished on the spokes; however, a consolidation of traffic through major hubs appears to be occurring.

Certain areas were not addressed in this analysis because of data accessibility and time constraints involved. Airline costs for route segments were not developed, nor were measures of utilization such as load factors considered. Segment densities, type of aircraft operated, load factors and the airlines involved can all affect the cost-of-service and evolution of rate structures. Such data, however, were beyond the scope of this study, and to the extent which they are relevant, must be considered as limitations to the study.

Certain quality aspects of service could not be included in the study. The timing of flights (scheduling), the percentage of non-stop as opposed to route intermediate-stop flights, and factors such as space, comfort, and in-flight service were not considered. Safety related aspects, in addition, were not included. To the extent that these are relevant service criteria, they must also act as constraints against the scope of the analysis. The study shows the need for more detailed research in this area, particularly in the analysis of specific route densities and airline costs. It is only through the establishment of route-specific costs that the presence or absence of cross-subsidization and/or differential pricing may be conclusively established.

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