Rural Research Report

Winter, 2017
Volume 27, Issue 2

By Adee Athiyaman, Professor
Chris Merrett, Director & Professor
Timothy Collins, Assist. Director
Illinois Institute for Rural Affairs

Published by Illinois Institute
for Rural Affairs

Stipes Hall 518
Western Illinois University
Macomb, IL 61455-1390
309.298.2237

www.IIRA.org

AIR TRAVEL DEMAND IN THE UPPER MIDWEST: POTENTIAL FOR LOW-COST CARRIERS

Overall, around 0.53 billion long-distance trips are taken by the upper Midwest residents every year. Since economically successful regions are likely to use discount airlines or low cost carriers (LCCs) to move information and people securely, quickly, and efficiently we explore the upper-Midwest aviation market for room for LCC entry. A demand system that involves simultaneous estimation of passenger numbers, drivers of air fare, and determinants of competition suggests that LCC entry in "routes" such as Evansville, In - Cincinnati, OH would increase passenger traffic by 50%. LCCs looking for opportunity gaps could benefit from results presented in the paper.

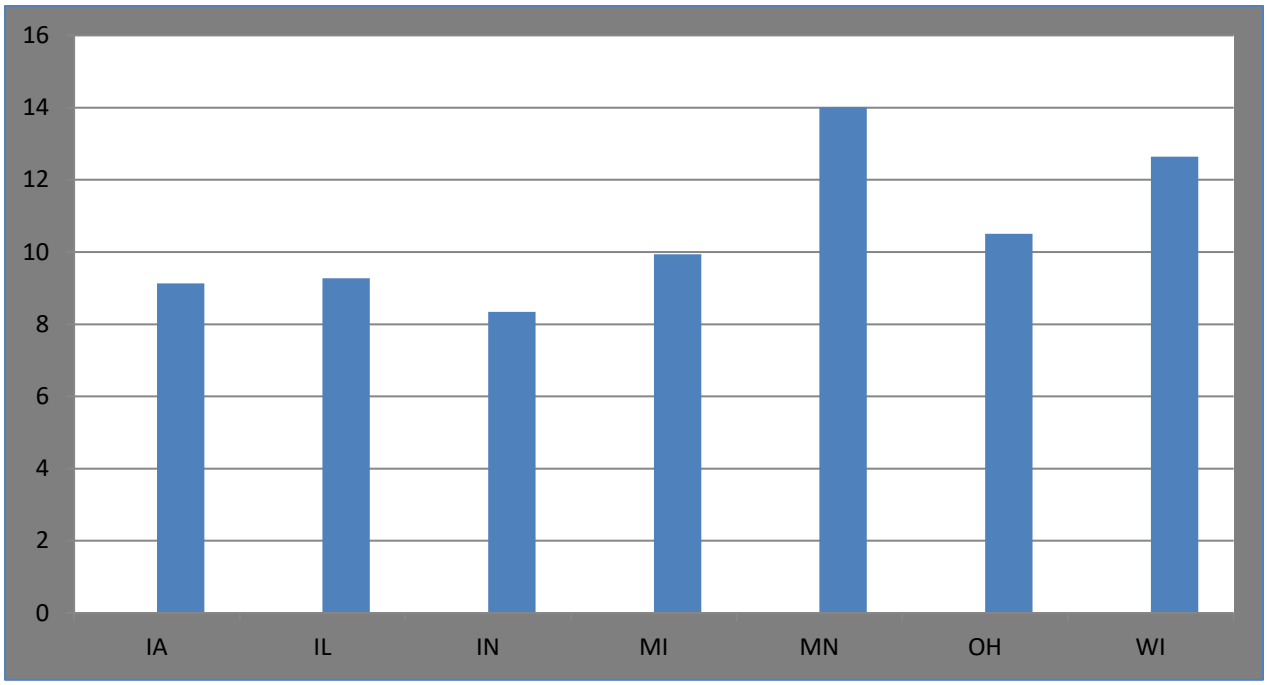
1.0 Introduction

This paper explores demand for air-travel among the upper Midwest states of Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. Collectively, they house 88 airports that possess part-139 certification for passenger-carrying operations (see http://www.faa.gov/airports/airport_safety/part139_cert/). Most of these airports tend to be 'focus cities' - a focus city is a destination from which an airline operates limited point-to-point routes which are ideal for service by low-cost carriers (LCCs) (Piper, 2009). The definition of LCC is based on the business model that offers low fares, direct flights emphasizing point-to-point transit, a single passenger class, unreserved seating, charges for priority boarding, and snacks and drinks (Lawton, 2003). Research suggests that lower prices of LCCs influence people to take weekend breaks in destinations that are farther afield and take advantage of job opportunities hundreds of miles away (Daraban, and Fournier, 2006).

2.0 Long-Distance Travel in the Upper Midwest

Overall, around 0.53 billion long-distance trips are taken by the upper Midwest residents every year; nationally the number is 3.2 billion long-distance trips (NHTS, 2009). These are trips of 50 miles or more away from home for people of all ages, by all modes of travel, and for any purpose. People in Indiana take the least number of trips (8 trips per year); residents of Minnesota travel the most, they average 14 trips per year (Figure 1).

Figure 1: Average Number of Long-Distance Trips in a Year: Upper-Midwest States

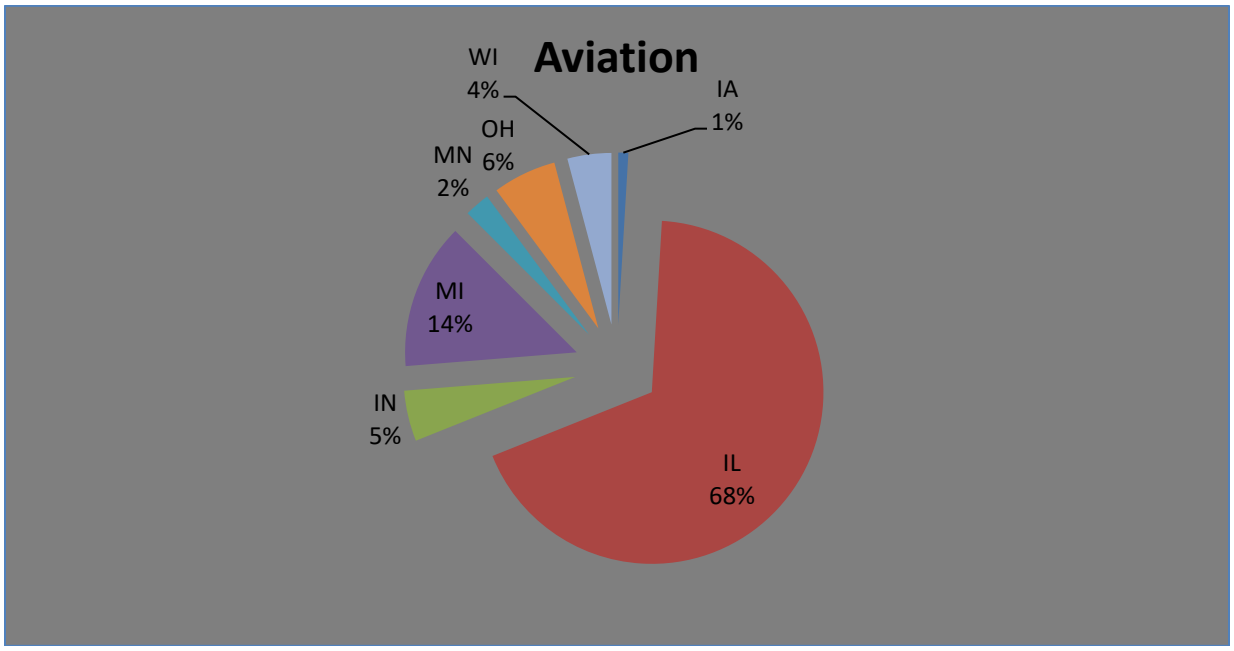


Although the residents of Illinois take only nine long-distance trips in a year they travel the farthest, 773 miles compared to the 361 miles for the entire upper Midwest (Table 1). These lengthier trips often require airplane travel. Figure 2 shows the share of aviation state-wise on total long-distance trips originating in the region.

Table 1: Long-Distance Trips: Distance and Model of Travel

		Travel Mode	
State	**Avg. Trip Distance (Miles)**	**Automobile**	**Airplane**
Iowa	191	91%	2%
Illinois	702	64%	33%
Indiana	263	91%	5%
Michigan	285	87%	8%
Minnesota	189	98%	2%
Ohio	361	94%	3%
Wisconsin	209	97%	3%
Upper Midwest	361	87%	10%

Figure 2: Share of Aviation in the Region: Upper Midwest States



The motivation for long-distance travel includes social and recreation activities (52%) and work (15%). Long-distance travel for family reasons accounts for less than 3% of all long-distance trips.

Given these travel patterns and motives why study LCC opportunities in the upper-Midwest region? In the next section we address this question using economic theory. Empirical analysis of the upper-Midwest aviation market follows.

3.0 Rationale for the Study

The salience of LCCs to the economic development of a region can be gleaned from the 'economies of flows' framework (Williams and Balaz, 2009; Hudson, 2004). The framework is built on the premise that geographical regions are constituted of local and more spatially stretched social and economic relationships. These relationships are facilitated by LCCs (Docherty 2004; Neal 2010). For instance, labor migration is shaped by changes in the costs of air travel. Furthermore, LCCs shape business connectivity by facilitating face-to-face contacts among business personnel; these contacts facilitate knowledge transfer and inward investment or capital flows.

The economies of flows framework is part of the general theories of regional competitiveness and regional externalities (Camagni 2003). These theories conceptualize a region as having absolute competitive advantages in one or more technological, social, infrastructural or institutional assets. These assets, although external to firms, benefit individual firms in a manner that no set of alternative factor prices would induce a geographical redistribution of economic activity.

4.0 The Demand Model

Data from National Household Travel Survey suggest that IA, and OH residents travel by plane mostly for work purposes. In contrast a majority of Wisconsin

residents (80%) travel by plane for social and recreational purposes.
Irrespective of motivation, research on factors influencing air travel suggests that air fares, presence of LCC, and attractions of the origin-destination cities as major determinants (Ito and Lee 2003). A demand function based on these drivers is posited:

$$PASS_{AB} = f\{FARE_{AB}, LCC_{AB}, POP_{AB}, INC_{AB}\} \quad (1)$$

where, $PASS_{AB}$ = annual passengers between cities A and B;
$FARE_{AB}$ = vector of average airfares between routes A and B;
LCC_{AB} = Presence of LCCs in the route;
POP_{AB} = Population of the origin/ destination or endpoints, and
INC_{AB} = Per capita income of the population at endpoints.

A careful scrutiny of equation 1 reveals that $FARE_{AB}$ is endogenous, or determined within the system. The determinant of $FARE_{AB}$ is number of airlines servicing the route (COMP):

$$FARE_{AB} = f\{COMP_{AB}\} \quad (2)$$

Again, since $COMP_{AB}$ is endogenous equation 3 highlights the hypotheses about its predictors:

$$COMP_{AB} = f\{LF_{AB}, FARE_{AB}\} \quad (3)$$

Where, $LF_{AB}$is the average load factor or flight productivity in the route $_{AB}$.

Since the structural equation system of three interdependent equations is a set of simultaneous equations, we use three stage least squares (3SLS) to obtain parameter estimates. Table 2 lists the definitions of variables used in model construction.

Table 2: Variables, Definitions, and Data Source

Variable	Description	Source
$PASS_{AB}$	Annual total passengers for the route.	<http://www.transtats.bts.gov/Data_Elements.aspx?>
$FARE_{AB}$	Vector of average airfares between routes A and B.	**<**http://www.transtats.bts.gov/DL_SelectFields.asp?Table_ID=247&DB_Short_Name=Origin%20and%20Destination%20Survey**>**
POP_{AB}	Product of population at the end points.	<http://www.census.gov>
INC_{AB}	Median weekly per capita income at the end points.	<http://www.census.gov>
$COMP_{AB}$	Number of competitors in the route; calculated by adding operating carriers between the origin and destination airports.	<http://www.transtats.bts.gov/DL_SelectFields.asp?Table_ID=258&DB_Short_Name=Air%20Carriers>
LF_{AB}	The percentage of available seats, or maximum carrying weight paid for and used by passengers; average for A and B.	<http://www.transtats.bts.gov/Data_Elements.aspx?Data=5>
LCC	Indicates the presence of low cost carrier(s) in the route.	LCCs = 1; Otherwise = 0

5.0 Results

The 143 city-pair observations used in the analysis had a combined total of 18.44 million airline seats (Appendix 1). The busiest route in the region is the Chicago, IL - Minneapolis-St. Paul International connection. Five airlines service the route. The load factor for the city-pair connection is 81%.

Table 3 highlights the descriptive statistics for the variables. The zero-order correlations among the variables indicate that LCCs are associated with increased competition and reduced roundtrip fares. Forty one percent of the routes had one or more LCCs (Appendix 1). In general, population in the city-pair route co-varies with number of passengers in the route.

Table 3: Descriptive Statistics

Variable	Mean (SD)	PASS	FARE	POP	INC	COMP	LF	LCC
PASS	128923 (15603)	1						
FARE	278 (105)	-.308**	1					
POP	982662 (54776)	.393**	-.037	1				
INC	458 (69)	.156	.052	.202*	1			
COMP	4 (.87)	.214*	-.12	.07	-.21*	1		
LF	78 (3.5)	.377**	-.21*	-.02	-.17*	.465**	1	
LCC	.41 (.49)	.03	-.31**	-.145	-.07	.183*	.357**	1

Note: **Correlation is significant at the 0.01 level; *Correlation is significant at the 0.0 level

The results of the simultaneous estimation of equations 1 to 3 are presented in Table 4. As expected, number of passengers in the route depends on fare, population, income, and the presence of one or more LCCs in the route. Collectively the explanatory variables account for 83% of the single-equation variation in passenger numbers between the 143 pairs. As a double-log function the parameter estimates can be interpreted as elasticities.

Table 4: Passenger Demand Model

Explanatory Variable	Parameter (SD)	t	p
Ln (product of populations at city pair)	0.402 (0.539)	7.44	$2.54408*10^{-11}$
Ln (product of weekly per capita income at the end points)	0.502 (0.194)	2.58	0.0151066
Dummy variable that indicates the presence of LCCs in the route	0.898 (0.35)	2.52	0.0182334
Ln (average fare)	-0.187 (.07)	-2.43	0.0215703
Constant	-6.652 (2.68)	-2.48	0.0193091
R^2			0.83
Adjusted R^2			0.82
Number of observations			143

As shown in Table 4 the presence of LCCs is expected to stimulate passenger traffic. Also, air fare decreases with competition (see the air fare model shown in Table 5).

Table 5: The Air Fare Model

Explanatory Variable	Parameter (SD)	t	p
Ln (number of competitors in the route)	-0.931289 (0.280739)	-3.31727	$1.50873*10^{-36}$
Constant	6.84417 (0.392703)	17.4284	0.00191837
R^2			0.41
Adjusted R^2			0.39
Number of observations			143

Finally, Table 6 summarizes the results of the competition model. All right-hand-side variables except the constant are statistically significant at the $p \leq 0.001$ level. Load factor is positively related to number of competitors. In line with expectations airfare decreases with increased competition.

Table 6: Airline Competition

Explanatory Variable	Parameter (SD)	t	p
Ln (load factor)	0.762423 (0.224741)	3.39245	0.00151813
Ln (average fare)	-0.438334 (0.11065)	-3.96447	0.000220022
Constant	-2.80867 (2.25306)	-1.2466	0.182872
R^2			0.21
Adjusted R^2			0.17
Number of observations			143

6.0 Introduction of Lccs: Scenario Analysis

In this section we address the question what would happen to passenger traffic if LCCs enter the market. The model system discussed in the previous section is employed to implement the scenario analysis.

If LCC is introduced in each of the 85 routes that are functioning without a low-cost airline total passenger movements would increase from the current 18.44 mil to around 32mil. However, since it might be difficult for LCCs to service from Chicago O'Hare (airport charges and aviation gridlock would be the major constraints), we focus on the non-O'Hare routes shown in Table 7.

As shown in the Table, we expect the Cincinnati, OH (CVG) - Fort Wayne, IN (FWA) route to benefit the most from LCC introduction, passenger numbers are forecast to more than double from approximately 31,000 to 70,000. The Evansville, In – Cincinnati, OH link and the Detroit, MI – Fort Wayne, IN route are forecast to see at least 50% surge in passenger numbers with the introduction of LCC services.

Table 7: Impact of Introducing a LCC on Passenger Movements

		No. of Passengers	
Airport A	**Airport B**	**Current (2010)**	**Prediction with LCC**
Cincinnati, OH (CVG)	Columbus,OH (CMH)	85418	104534
Cincinnati, OH (CVG)	Detroit,MI (DTW)	94306	99084
Cincinnati, OH (CVG)	Fort Wayne, IN (FWA)	30978	69912
Cleveland,OH (CLE)	Detroit,MI (DTW)	63995	78503
Dayton, OH (DAY)	Cleveland,OH (CLE)	35215	47408
Detroit,MI (DTW)	Appleton, WI (ATW)	51241	58837
Detroit,MI (DTW)	Fort Wayne, IN (FWA)	53753	80861
Duluth International (DLH)	Minneapolis-St Paul International (MSP)	62215	68910
Evansville, IN (EVV)	Cincinnati, OH (CVG)	30313	49875
La Crosse, WI (LSE)	Minneapolis-St Paul International (MSP)	46760	51254
Wausau/Marshfield, WI (CWA)	Detroit,MI (DTW)	30585	45394
Wausau/Marshfield, WI (CWA)	Minneapolis-St Paul International (MSP)	48279	51887
Total		633058	806459

7.0 Conclusion

Ryan Air, the low cost Irish Airline, plans to sell standing room tickets on flights of less than two hour duration. Other discount airlines including the Chinese carrier Spring have expressed interest in adapting the Ryan Air model. While in this country the FAA stipulates that every passenger over the age of two must have a seat, new discount airlines are expected to emerge in the coming years and takeaway market share from major, legacy airlines. We hope that the modeling system developed in this paper would be of use to LCCs wanting to enter the Upper Midwest marketplace.

APPENDIX 1 – RAW DATA

Airport A	Airport B	Avg. Pop	Avg.Inc	Pax	Avg. LF	MF	LCCexist	Comp
Evansville, IN (EVV)	Cincinnati, OH (CVG)	223042.5	431.71	30313	68.495	260	0	2
Wausau/Marshfield, WI (CWA)	Detroit,MI (DTW)	437343.5	380.33	30585	72.08	302	0	4
Chicago,IL (ORD)	Dubuque, IA (DBQ)	1428657	485.98	30700	71.26	301	0	1
Cincinnati, OH (CVG)	Fort Wayne, IN (FWA)	291144	458.73	30978	78.205	424	0	4
Chicago,IL (ORD)	Saginaw/Bay City/Midland, MI (MBS)	1427095	444.73	31930	70.425	446	0	4
Cleveland,OH (CLE)	Columbus,OH (CMH)	592898.5	386.02	32896	78.44	139	0	5
Milwaukee, WI (MKE)	Grand Rapids, MI (GRR)	388858.5	353.575	33672	78.64	265	1	5
Columbus,OH (CMH)	Cleveland,OH (CLE)	592898.5	386.02	34914	78.425	211	0	5
Columbus,OH (LCK)	Milwaukee, WI (MKE)	665881	408.795	35057	77.35	137	1	4
Dayton, OH (DAY)	Cleveland,OH (CLE)	296751.5	326.465	35215	77.47	382	0	5
Chicago,IL (ORD)	Lansing, MI (LAN)	1457683	430.17	35506	72.165	326	0	3
Chicago,IL (ORD)	CAPITAL REGION INTL, MI (LAN)	1417667	450.9308	35506	72.165	376	0	3
Cleveland,OH (CLE)	Dayton, OH (DAY)	296751.5	326.465	35679	77.7	202	1	4
Lansing/CAPITAL REGION INTL, MI (LAN)	Chicago,IL (ORD)	1456901	450.9308	36041	72.55	275	0	4
Bloomington, IL (BMI)	Chicago,IL (ORD)	1435241	550.055	36535	75.805	353	1	4
Milwaukee, WI (MKE)	Columbus,OH (CMH)	665881	408.795	36876	77.41	135	1	4
Cincinnati, OH (CVG)	Cleveland,OH (CLE)	385250	390.55	37555	80.255	387	0	4
Chicago,IL (ORD)	Kalamazoo, MI (AZO)	1435721	420.295	37644	70.46	362	0	5
Chicago, IL (ORD)	Springfield, IL (SPI)	1455479	534.885	37761	68.675	290	0	2
Minneapolis-St Paul International (MSP)	Moline, IL (MLI)	355297.5	551.825	38062	77.4	261	1	4
Moline, IL (MLI)	Minneapolis-St Paul International (MSP)	355297.5	551.825	38088	77.4	318	0	4
Milwaukee, WI (MKE)	Madison, WI (MSN)	401925	473.295	39085	78.74	218	1	3
Akron, OH (CAK)	Chicago, IL (ORD)	1503967	451.01	39323	80.3	315	0	4
KALAMAZOO/BATTLE CREEK INTL, MI (AZO)	Chicago,IL (ORD)	1524204	501.825	39334	70.7	424	0	4
Chicago,IL (ORD)	Evansville, IN (EVV)	1456814	459.785	39543	69.72	449	0	4
Detroit,MI (DTW)	Cedar Rapids/Iowa City, IA (CID)	482053.5	405.735	39797	78.695	432	0	4
Evansville, IN (EVV)	Chicago,IL (ORD)	1456814	459.785	41124	68.795	404	0	4
FLINT - BISHOP INTL, MI (FNT)	Chicago,IL (ORD)	1455738	409.1135	42354	78.975	154	1	5

Cleveland,OH (CLE)	Cincinnati, OH (CVG)	385250	390.55	42449	80.325	342	0	5
Des Moines, IA (DSM)	Minneapolis/St. Paul (MSP)	431901	531.365	42458	77.195	209	1	5
Detroit,MI (DTW)	Akron, OH (CAK)	522822.5	336.61	43032	81.035	228	1	5
Chicago,IL (ORD)	Flint, MI (FNT)	1454152	409.49	44231	80.715	254	0	4
La Crosse, WI (LSE)	Chicago,IL (ORD)	1425484	463.635	44742	70.44	100	0	3
Chicago,IL (ORD)	La Crosse, WI (LSE)	1425484	463.635	44964	70.44	286	0	4
Akron, OH (CAK)	Detroit,MI (DTW)	522822.5	336.61	45410	80.95	368	1	5
Cincinnati, OH (CVG)	Dayton, OH (DAY)	243959.5	395.415	45431	78.165	407	0	5
Cedar Rapids/Iowa City, IA (CID)	Minneapolis/St. Paul (MSP)	396600	557.31	45782	78.035	362	0	4
Detroit,MI (DTW)	Moline, IL (MLI)	440751	400.25	45786	78.06	234	1	5
Cleveland,OH (CLE)	Indianapolis, IN (IND)	614428.5	404.645	46077	79.41	120	1	4
Minneapolis-St Paul International (MSP)	La Crosse, WI (LSE)	358886	500.81	46195	70.43	319	0	3
Moline, IL (MLI)	Detroit,MI (DTW)	440751	514.65	46222	77.4	228	1	4
La Crosse, WI (LSE)	Minneapolis-St Paul International (MSP)	358886	500.81	46760	70.43	209	0	4
Minneapolis-St Paul International (MSP)	Rochester Municipal (RST)	385145	610.7212	46966	74.455	274	0	4
Indianapolis, IN (IND)	Cleveland,OH (CLE)	614428.5	404.645	47047	79.41	139	1	4
Wausau/Marshfield, WI (CWA)	Minneapolis-St Paul International (MSP)	351890	531.905	48279	71.42	268	0	4
Rochester Municipal (RST)	Minneapolis-St Paul International (MSP)	385145	610.7212	48592	74.43	154	0	4
Minneapolis-St Paul International (MSP)	Cedar Rapids/Iowa City, IA (CID)	396600	557.31	48771	78.035	338	0	4
Cincinnati, OH (CVG)	Milwaukee, WI (MKE)	458232.5	413.325	49006	79.165	265	1	5
Detroit,MI (DTW)	Appleton, WI (ATW)	453864	400.235	51241	82.135	435	0	3
Detroit,MI (DTW)	Dayton, OH (DAY)	496586	309.09	51293	79.115	229	1	4
Detroit,MI (DTW)	Des Moines, IA (DSM)	517354.5	379.79	52290	77.855	244	1	4
Des Moines, IA (DSM)	Detroit,MI (DTW)	517354.5	379.79	52594	77.935	200	1	3
Rochester Municipal (RST)	Chicago, IL (ORD)	1451743	515.65	52622	74.44	95	0	3
Minneapolis-St Paul International (MSP)	Wausau/Marshfield, WI (CWA)	351890	531.905	52681	71.42	268	0	4
Detroit,MI (DTW)	Fort Wayne, IN (FWA)	543770.5	372.405	53753	78.855	213	0	4
Dayton, OH (DAY)	Detroit,MI (DTW)	496586	309.09	54476	78.885	316	1	4
Madison, WI (MSN)	Milwaukee, WI (MKE)	401925	473.295	54566	78.92	231	1	4
Appleton, WI (ATW)	Minneapolis-St Paul International (MSP)	368410.5	551.81	54593	81.475	358	1	2
Chicago,IL (ORD)	Wausau/Marshfield, WI (CWA)	1418488	494.73	58042	71.43	378	0	4

Champaign/Urbana, IL (CMI)	Chicago,IL (ORD)	1437936	491.125	58717	72.445	324	0	1
Wausau/Marshfield, WI (CWA)	Chicago,IL (ORD)	1418488	494.73	58780	71.43	293	0	3
Chicago,IL (ORD)	Champaign/Urbana, IL (CMI)	1437936	491.125	59017	72.5	319	0	1
Chicago,IL (ORD)	Fort Wayne, IN (FWA)	1524915	486.805	60368	78.505	393	0	4
Detroit,MI (DTW)	Cleveland,OH (CLE)	637876.5	304.225	61135	81.19	164	0	5
Milwaukee, WI (MKE)	Cleveland,OH (CLE)	511024.5	344.375	61327	78.7	105	1	4
Duluth International (DLH)	Minneapolis-St Paul International (MSP)	375611.5	526.5962	62215	78.665	222	0	4
Cleveland,OH (CLE)	Detroit,MI (DTW)	637876.5	304.225	63995	81.205	169	0	5
Cleveland,OH (CLE)	Milwaukee, WI (MKE)	511024.5	344.375	65179	78.7	191	1	4
KALAMAZOO/BATTLE CREEK INTL, MI (AZO)	Detroit,MI (DTW)	543059	501.825	66796	72.52	240	0	4
Chicago,IL (ORD)	South Bend, IN (SBN)	1449258	443.51	70162	81.695	518	0	5
Traverse City/CHERRY CAPITAL, MI (TVC)	Chicago,IL (ORD)	1407266	471.74	72339	72.35	464	0	4
Appleton, WI (ATW)	Chicago,IL (ORD)	1435009	514.635	72382	81.485	410	1	5
Chicago,IL (ORD)	Appleton, WI (ATW)	1435009	514.635	72641	81.485	480	1	5
Chicago,IL (ORD)	Traverse City, MI (TVC)	1407266	471.74	73076	73.335	457	0	4
Traverse City/CHERRY CAPITAL, MI (TVC)	Detroit,MI (DTW)	426121.5	357.34	75312	74.17	260	0	4
Chicago, IL (ORD)	Peoria, IL (PIA)	1455676	523.51	75919	80.62	286	0	4
Peoria, IL (PIA)	Chicago,IL (ORD)	1455676	523.51	77018	81.29	412	0	4
Minneapolis-St Paul International (MSP)	Duluth International (DLH)	375611.5	526.5962	80074	78.385	242	0	5
Chicago,IL (ORD)	Duluth International (DLH)	1442210	489.4212	80074	78.395	428	0	4
Lansing/CAPITAL REGION INTL, MI (LAN)	Detroit,MI (DTW)	475756.5	450.9308	83624	74.37	349	0	4
Cincinnati, OH (CVG)	Columbus,OH (CMH)	540106.5	454.97	85418	78.905	352	0	4
Detroit,MI (DTW)	Cincinnati, OH (CVG)	585084.5	373.175	86108	81.74	333	0	5
Minneapolis-St Paul International (MSP)	Des Moines, IA (DSM)	431901	531.365	86893	77.195	186	1	4
Chicago,IL (ORD)	Dayton, OH (DAY)	1477731	423.49	88286	78.235	361	0	5
Dayton, OH (DAY)	Chicago, IL (ORD)	1477731	423.49	90608	78.18	345	0	5
FLINT - BISHOP INTL, MI (FNT)	Detroit,MI (DTW)	474593	409.1135	90738	80.135	243	1	4
Minneapolis-St Paul International (MSP)	Columbus,OH (CMH)	707279.5	520.22	94275	79.195	173	0	5
Cincinnati, OH (CVG)	Detroit,MI (DTW)	585084.5	373.175	94306	81.67	428	0	4
Minneapolis-St Paul International (MSP)	Green Bay/Clintonville, WI (GRB)	382640	509.865	96140	75.93	414	0	3
Green Bay/Clintonville, WI (GRB)	Minneapolis-St Paul International (MSP)	382640	509.865	98022	75.93	394	1	4

Detroit,MI (DTW)	Columbus,OH (CMH)	792733	368.645	100951	79.915	285	1	5
Cincinnati, OH (CVG)	Minneapolis-St Paul International (MSP)	499631	524.75	101119	81.01	327	1	5
Chicago, IL (ORD)	Moline, IL (MLI)	1421896	514.65	103026	77.64	370	0	5
Green Bay/Clintonville, WI (GRB)	Detroit,MI (DTW)	468093.5	358.29	103891	76.59	479	0	3
Chicago IL (MDW)	Indianapolis, IN (IND)	1795408	501.67	104343	79.005	176	1	5
Minneapolis-St Paul International (MSP)	Cleveland,OH (CLE)	552423	455.8	109139	80.545	156	1	5
Moline, IL (MLI)	Chicago, IL (ORD)	1421896	514.65	109642	77.355	287	0	4
Minneapolis-St Paul International (MSP)	Grand Rapids, MI (GRR)	430257	465	110524	80.485	396	1	5
Chicago,IL (ORD)	Green Bay/Clintonville, WI (GRB)	1449238	472.69	111539	75.94	475	1	5
Cleveland,OH (CLE)	Minneapolis-St Paul International (MSP)	552423	455.8	112098	80.545	156	1	4
Green Bay/Clintonville, WI (GRB)	Chicago,IL (ORD)	1449238	472.69	112507	75.94	476	0	3
Indianapolis, IN (IND)	Chicago,IL (MDW)	1795408	501.67	125687	79.005	189	1	4
Madison, WI (MSN)	Minneapolis-St Paul International (MSP)	443323.5	584.72	127316	80.585	236	1	4
Minneapolis-St Paul International (MSP)	Madison, WI (MSN)	443323.5	584.72	141666	80.585	280	1	3
Cedar Rapids/Iowa City, IA (CID)	Chicago, IL (ORD)	1463198	520.135	146525	78.045	380	0	4
Chicago,IL (ORD)	Cedar Rapids/Iowa City, IA (CID)	1463198	520.135	146601	78.045	406	0	4
Chicago, IL (ORD)	Milwaukee, WI (MKE)	1692004	441.4	147605	79.465	144	1	5
Madison, WI (MSN)	Detroit,MI (DTW)	528777	433.145	154657	81.245	389	0	4
Minneapolis-St Paul International (MSP)	Indianapolis, IN (IND)	728809.5	538.845	155354	80.165	277	0	4
Detroit,MI (DTW)	Madison, WI (MSN)	528777	433.145	157958	81.245	363	1	4
Milwaukee, WI (MKE)	Chicago,IL (ORD)	1692004	441.4	160530	79.465	149	1	5
Indianapolis, IN (IND)	Minneapolis-St Paul International (MSP)	728809.5	538.845	163223	80.165	156	1	5
Detroit,MI (DTW)	Indianapolis, IN (IND)	814263	387.27	169315	80.825	173	0	4
Indianapolis, IN (IND)	Detroit,MI (DTW)	814263	387.27	171187	80.825	173	1	5
Des Moines, IA (DSM)	Chicago, IL (ORD)	1498499	494.19	173431	77.205	268	1	4
Chicago,IL (ORD)	Grand Rapids, MI (GRR)	1496836	443.335	183000	80.495	341	0	5
Madison, WI (MSN)	Chicago,IL (ORD)	1509922	547.545	183456	80.595	366	1	5
Chicago, IL (ORD)	Des Moines, IA (DSM)	1498499	494.19	187149	77.205	233	1	5
Detroit,MI (DTW)	Green Bay/Clintonville, WI (GRB)	468093.5	358.29	199314	76.59	490	0	4
Chicago, IL (MDW)	Columbus,OH (CMH)	1773878	483.045	210222	78.035	213	1	5
Chicago, IL (MDW)	Cleveland,OH (CLE)	1619021	418.625	214314	79.385	173	0	4

Columbus,OH (LCK)	Chicago, IL (MDW)	1773878	483.045	221732	78.035	230	1	5
Cleveland,OH (CLE)	Chicago, IL (MDW)	1619021	418.625	224028	79.385	242	1	5
Chicago, IL (ORD)	Cincinnati, OH (CVG)	1566229	487.575	230704	81.02	176	0	3
Cincinnati, OH (CVG)	Chicago, IL (ORD)	1566229	487.575	238325	80.965	362	0	5
Chicago, IL (MDW)	Detroit,MI (DTW)	1818856	401.25	267605	80.8	169	1	5
Detroit,MI (DTW)	Chicago, IL (MDW)	1818856	401.25	293262	80.8	169	1	4
Columbus,OH (CMH)	Chicago, IL (ORD)	1773878	483.045	295025	79.15	147	0	5
Chicago,IL (ORD)	Columbus,OH (CMH)	1773878	483.045	296141	79.205	208	0	5
Indianapolis, IN (IND)	Chicago,IL (ORD)	1795408	501.67	297544	80.175	201	0	5
Chicago,IL (ORD)	Indianapolis, IN (IND)	1795408	501.67	298217	80.175	193	0	5
Cleveland,OH (CLE)	Chicago, IL (ORD)	1619021	418.625	335531	80.5	80	0	5
Chicago, IL (ORD)	Cleveland,OH (CLE)	1619021	418.625	336705	80.555	112	0	5
Milwaukee, WI (MKE)	Minneapolis-St Paul International (MSP)	625405.5	478.575	395407	79.455	90	1	4
Minneapolis-St Paul International (MSP)	Chicago, IL (MDW)	1733402	552.825	401284	79.79	171	1	4
Minneapolis-St Paul International (MSP)	Milwaukee, WI (MKE)	625405.5	478.575	402046	79.455	188	1	4
Chicago, IL (MDW)	Minneapolis-St Paul International (MSP)	1733402	552.825	406304	80.14	179	1	2
Minneapolis-St Paul International (MSP)	Detroit,MI (DTW)	752257.5	438.425	486707	81.96	251	1	5
Detroit,MI (DTW)	Minneapolis/St. Paul	752257.5	438.425	509424	81.96	279	1	5
Detroit,MI (DTW)	Chicago,IL (ORD)	1818856	401.25	530805	80.8	178	0	5
Chicago,IL (ORD)	Detroit,MI (DTW)	1818856	401.25	535326	82.05	259	0	5
Chicago,IL (ORD)	Minneapolis-St Paul International (MSP)	1733402	552.825	828583	81.31	179	0	4
Minneapolis-St Paul International (MSP)	Chicago, IL (ORD)	1733402	552.825	1228685	81.255	113	0	5

REFERENCES

Camagni, R. (2003) Regional clusters, regional competencies and regional competition. Cluster Management and Stuctural Policy- International Experiences and Consequences for Northrhine-Westfalia. Duisburg.

Daraban, B., & Fournier, G. M. (2006). The impact of low cost carriers on airfares: Insights from spatial econometrics, Working paper: Florida State University.

Docherty, J. (2004). Transport and regional economic competitiveness in the global economy, *Journal of Transport Geography,* 12, 341–342

Hudson, P., 2004, "Industrial Organization and Structure," in Floud, R. and Johnson, P., editors, *The Cambridge Economic History of Modern Britain*, London, UK: Cambridge University Press.

Lawton, T. C. (2003). Low Fare Airlines in Asia: An Exploratory Study of Cost Competition, Market Dynamics and Sustainable Advantage, Air Transportation Research Society World Conference, July 10-12, 2003, Toulouse, France.

Neal, Z (2011). From Central Places to Network Bases: A Transition in the US Urban Hierarchy, 1900 – 2000, *City and Community* 10, 49 – 74.

NHTS (2009). U.S. Department of Transportation, Federal Highway Administration, 2009 National Household Travel Survey. URL: http://nhts.ornl.gov.

Piper, A. (2009). Delta move no surprise, *Telegraph Herald* (Dubuque, IA), July 1, 2009.

Williams, A., and Balaz, V. (2009). Low Cost Carriers, Economies of Flows and Regional Externalities, *Regional Studies*, 43(5), 677-691.

The Rural Research Report is a series published by the Illinois Institute for Rural Affairs to provide brief updates on innovative best practices and applied research on rural issues. Rural Research Reports are peer-reviewed and are made available to elected officials, public libraries, the general public, and other rural development stakeholders.

WESTERN ILLINOIS UNIVERSITY