

The Economic Values of Iowa's Air Transportation Industries

An Economic Assessment Prepared by

David Swenson
and
Liesl Eathington[♦]

For the

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[♦] The researchers are both regional research consultants and, respectively, a scientist and a research associate at Iowa State University.

Summary of Findings

The accompanying report identifies the economic values of Iowa's air transportation services for the ten counties that are host to commercial airports, the remaining counties that host general aviation facilities, and for the state as a whole. These estimates were made using an input-output model for each of the ten counties with a commercial airport and another for all other counties in the state. It is important to note that the economic values represent air transportation services and not just the value of specific airport operations in an area. This allows us to identify air transportation economic transactions from an industry-wide basis as compared to a facility-specific basis. Appendix 1 of the report lists the kinds of air transportation services that are measured in this report.

Iowa's air transportation industries produced an estimated \$528.2 million in direct industrial output in 1999. To produce these sales, the air transportation industry required the purchase of \$133.2 million of goods and services from in-state suppliers. The industry paid \$188.4 million in personal income to its employees and owners, and it produced a total of 5,753 jobs.

When we account for all industrial interactions with the air transportation industry and for workers spending their wages and salaries on goods and services in the state, the air transportation industry in Iowa stimulated a total of \$834.1 million in statewide sales (or industrial output), \$296.2 million in total personal income, \$441.9 million in value added (of which personal income is a component), and 9,865 total jobs.

Other Highlights:

- Iowa's 10 counties that host commercial airports accounted for \$418.6 million of air transportation industrial output in 1999 (79 percent of the state total).
- The air transportation industries in these 10 counties generated \$151.03 million in direct personal incomes, \$213 million in value added, and 4,479 jobs.
- Total economic activity stimulated in the 10 counties as a result of air transportation transactions and from employee spending of wages and salaries on household needs resulted in \$658.1 million in total spending, supported \$236.6 million in personal income and \$353.1 million in value added, and sustained a total of 7,615 jobs.
- The air transportation industry in Polk County accounted for 48 percent of the total direct industrial output in the 10 counties and just over 38 percent of statewide air transportation output. Linn County air transportation industries were, in comparison, 11.6 percent of the 10 commercial airport counties and 9.2 percent of statewide air transportation output.
- The remaining air transportation activity in Iowa's counties that did not have commercial air transportation service produced \$109.6 million in direct output, \$37.34 million in personal income, \$52.7 million in value added, and 1,274 jobs.
- Total economic activity stimulated in these non-commercial counties as a result of air transportation transactions and from employee spending of wages and salaries on household needs resulted in \$176.0 million in total spending, supported \$59.54 million in personal income and \$88.83 million in value added, and sustained a total of 2,250 jobs.

- Of the non-commercial counties, Scott County air transportation industries accounted for 34 percent of all output, followed by Story County at 15 percent, and Johnson County at 10.4 percent. These three counties combined accounted for 60 percent of the air transportation industrial output among all non-commercial service counties, but just 12.4 percent of the state direct output in air transportation.
- Finally, all of the incomes that are generated in the state of Iowa due to air transportation employment and the concomitant economic activity that it stimulates produces state tax revenues. We found that for 1999, the air transportation industry in Iowa was either directly for or stimulated \$20.66 million in state government tax receipts, half of which (\$10.4 million) came in the form of personal income tax payments to the state.

The accompanying chart summarizes air transportation economic values for the ten commercial air service counties, the remaining counties with air transportation industries, and for the state of Iowa. Explanation of the different categories of economic activity and kinds of economic effects are found in the body of the report.

Air Transportation Economic Values for the 10 Commercial Air Service Counties

Effects Summary by Kind and Category	Air Transportation Direct	Total All Industries
Industrial Output (\$)	418,620,488	658,091,114
Total Personal Income (\$)	151,029,749	236,632,161
Value Added (\$)	213,098,317	353,086,695
Jobs	4,479	7,615

Air Transportation Economic Values for Counties with No Commercial Air Service

Effects Summary by Kind and Category	Air Transportation Direct	Total All Industries
Industrial Output (\$)	109,610,120	176,002,785
Total Personal Income (\$)	37,339,980	59,541,152
Value Added (\$)	52,686,216	88,826,229
Jobs	1,274	2,250

State of Iowa Air Transportation Economic Values

Effects Summary by Kind and Category	Air Transportation Direct	Total All Industries
Industrial Output (\$)	528,230,608	834,093,899
Total Personal Income (\$)	188,369,729	296,173,314
Value Added (\$)	265,784,533	441,912,924
Jobs	5,753	9,865

The Economic Values of Iowa's Air Transportation Industries

Introduction

This study reports on the economic values of air transportation services in Iowa. The analysis has been requested and funded by the Iowa Department of Transportation. This report assesses the localized economic values accruing to the counties that host the state's ten commercial airports (Level I) along with the economic values of all other air transportation industries in the remainder of the state considering counties that have only Level II or Level III general aviation facilities. In addition, from our estimate of the total economic values of air transportation services to the counties that are host to only Levels II or III facilities, we apportioned the economic effects to those counties for which secondary data indicated air transportation employment. Finally, we provide an estimate of total air transportation economic values for the state.

These economic values are compiled with the use of an input-output model of the industrial structure of each of the ten Level I counties along with a separate model of the remaining counties in which air transportation economic activity was identified. The results of this analysis will itemize the kinds of economic linkages that airport activities have with other industries in the study regions and the magnitude of those linkages. When we identify these linkages, we can produce sets of economic multipliers that are unique to transportation operations in the areas that we are studying.

Kinds of Economic Measures and Study Terminology

Input-output models (I-O) produce quite a bit of information for planners and decision makers. The more useful results for this project are estimates of total industrial output, total personal income, value added, and jobs.

Total industrial output for most industries is simply gross sales. For public or quasi-public institutions we include all public outlays, along with the value of government sales and other subsidies received, to isolate the current economic value of their output to the citizens or the area served. The total output of the air transportation services in the study areas would involve all private and public gross sales of any air cargo, air carrier, air courier, letter or package delivery, air taxis, air ambulances, and charter services utilizing the airport facilities. Finally, we would add all output that is associated with the physical operations

of the airport or airports that are located in the county of study. (Please see Appendix 1 for a description of the services that are measured).

Total Personal Income as used in this report includes the wages and salaries of employees in all of the industries that we study along with an estimate of the cash value of all benefits. It also includes normal profits to sole proprietors.

Value added is a measure of regional product. It includes all employment compensation, incomes to sole proprietors, property incomes (dividends, interests, and rents), and indirect tax payments (primarily excise and sales taxes paid by individuals to businesses). It is important to remember that value added already includes total personal incomes.

Jobs, the last measure, represent the number of positions in the economy, not the number of employed persons. The distinction is important. Many industries produce full-time jobs, primarily. Manufacturing firms, for example, tend only to hire full-time, full-year positions. Many other industries, like recreational services, retail sales, and dining and drinking establishments may hire a preponderance of part time or seasonal workers.

We also get detailed breakdowns of these economic data into the direct, indirect, induced, and total economic effects.

Direct effects refer to the operational characteristics of the firms or institutions that we are studying directly. In this case we are measuring the direct spending by business, households, and the public sector on all air transportation and airport operations.

Indirect effects measure the value of additional economic demands that the direct firms or institutions place on supplying industries in the region. When firms conduct business or public entities provide public goods, they must make many direct purchases from suppliers in the area. Public utilities, communications systems, fuel, wholesale goods and services, manufactured goods, financial and legal services, and a variety of professional services are necessary, for example, to produce air transportation in the region.

Induced effects accrue when workers in the direct and indirect industries spend their earnings on goods and services in the region. Induced effects can also be called household effects.

Total economic effects are the sum of direct, indirect, and induced effects. They are all of the transactions attributable, either directly or indirectly, to the activities that we are measuring.

The term *multiplier* or *multiplier effect* is often used when referring to economic effects or economic impacts. There are different kinds of multipliers, but in this study a multiplier is simply the total effects in a particular category divided by the direct effects. The multiplier tells you how much the overall economy changes per unit change in the direct effects (e.g., how much the remaining economy changes per change in a dollar of output, a dollar of personal income, or per job in the direct industries or institutions that we are analyzing). Multipliers help us to anticipate the potential change in the regional economy attributable to a change in direct activity in a particular industry.

Multipliers can be instructive for anticipating economic growth, in the case of a new or expanding firm, and economic decline, in the case of a plant closing. Firms with strong linkages to area supplying firms or that pay relatively high earnings may yield comparatively higher multipliers. Firms that are otherwise not linked strongly to local suppliers or that pay lower than average wages will usually produce lower multipliers. Urban areas with their more highly developed and diversified economies have, on the average, much higher multipliers than rural or smaller urban areas.*

The generic term *economic impact* is frequently used to describe a set of economic activities in a region. This term also suffers from misapplication. There are several kinds of economic activities that may occur within a particular region. A useful

* Economic multipliers are often misunderstood or misused because users fail to account for regional production and cost of living differences, they use the wrong multiplier to describe a phenomenon, or they seek out the largest multiplier possible within a range of industrial activity without consideration of either the appropriateness of the application or of the actual scope of local production.

For these reasons and others, there has been a generalized inflation in the reporting of multipliers by those not trained in their generation and interpretation. The multiplier that we produce is called the Type II multiplier. The multipliers for different categories of economic activity that are produced by our research are specific initially to region that we are studying and are not directly derivative of national averages. The resulting data are more sensitive to the kinds and amounts of earnings and incomes that are produced in the region than would be determined using national averages.

distinction can be made between firms that produce goods or services for export or which otherwise attract outside income and firms that produce goods and services for local consumption (either by industries or by households). Firms that produce goods intended primarily for export generate economic impacts because outside demand supports local employment.** Another category where a local impact may be evident is called *import substitution*. If an indigenous firm can begin to produce for sale a commodity that people had been importing, then money that would otherwise have gone elsewhere stays in the community. A true import substitution can be counted as a localized economic impact.

We are cautious about using the term *economic impact* when assessing the overall size or contribution of one industrial sector. Significant portions of the sales in the state's Level I airports are made to consumers that do not live in the county of assessment. To give the reader an idea of the size of each of the Level I trade areas, we use geographic information services (GIS) technology to demonstrate their potential primary service areas. Because the airports are regional service facilities, it would not be appropriate to call this service to non-local residents an economic impact. Accordingly, we generally refer to the economic values or the economic effects of air transportation industries in our report.

** If my town has a grocery store, it is probably primarily serving local household demand. We can measure the overall size and contribution of the grocery store to the local economy, but the presence or absence of that particular store in the region does not necessarily present an economic impact -- one way or another the aggregate regional demand for groceries will be met somehow. What we can identify is the overall size and contribution of the firm to the local mix of economic activity. Accordingly, we can measure its *economic effect* or *economic value* to the region along with interdependencies that exist between it and other firms or service suppliers. In this instance, when we use I-O models we are isolating the strength of linkages that exist among industries and the firm that we are studying and the overall value (output, incomes, and jobs) of its production.

In contrast, if my town has a rocking chair factory, then it is producing a good that is intended primarily for sales beyond my community. Money from outside of the region (in the form of sales) flows into our community and supports employment, industrial purchases, and household spending in my community. An external demand (for rocking chairs) is creating local economic activity. The associated local production that is linked to this demand is producing an export. In this instance we have a measurable *economic impact* – were it not for the external demand for the locally produced product, the economic activity would not be in the community. We are declaring economic causality. The firm is *causing* a measurable set of economic activity in the region that would otherwise not have existed were it not for the external (exported) demand.

Large public institutions also represent an economic export for a community. Hence the scramble by communities to bid for prisons or other public facilities. The goods exported are the overall value of state government services, legislation, justice, administration, or oversight statewide.

The Study Region

Input-Output study regions can range from a single county, to multiple counties, to states, to multiple states, to the nation, depending on the nature of the study and the industries assessed. This study compiles air transportation information at the county level. We produced county I-O models for

- Des Moines County (Burlington)
- Linn County (Cedar Rapids)
- Polk County (Des Moines)
- Dubuque County (Dubuque)
- Webster County (Fort Dodge)
- Cerro Gordo County (Mason City)
- Wapello County (Ottumwa)
- Woodbury County (Sioux City)
- Clay County (Spenser)
- Black Hawk County (Waterloo)

Separate assessments were made in each of these counties in which Level I airports were in operation to assess air transportation economic values. In some instances, a Level II airport is also located in the county. The general aviation airport in Ankeny, for example, is located in Polk County along with the Des Moines International Airport. As the county is the unit of observation, any inference to their (Ankeny's) economic values are subsumed in the Polk County summaries. For the remaining Level II and Level III facilities, we identified all of the counties in which they were located and we were able to isolate data from secondary sources indicating the size of air transportation industries in the county*. We compiled a separate I-O model for this group of counties. These counties are displayed in Table 1, and it is to these counties that the economic values for air transportation are estimated.

* We relied on an amalgam of data the U.S. Departments of Labor and Commerce, and, ultimately, the compilations in our input-output accounts to identify the presence of air transportation firms and facilities in our study counties. In some instances, there may be air transportation activity in a county that is not identified in our data. This most often happens in the case of a sole proprietorship, which is not necessarily required to report quarterly salary and social insurance withholding.

Table 1. All Other Iowa Counties for which Data Were Obtained

ALLAMAKEE	GREENE	MARION
AUDUBON	GUTHRIE	MARSHALL
BOONE	HAMILTON	MONTGOMERY
BREMER	HANCOCK	MUSCATINE
BUCHANAN	HARDIN	O'BRIEN
BUENA VISTA	HARRISON	OSCEOLA
BUTLER	HENRY	PALO ALTO
CARROLL	IDA	PLYMOUTH
CASS	JACKSON	POTTAWATTAMIE
CHEROKEE	JASPER	POWESHIEK
CLINTON	JEFFERSON	SAC
CRAWFORD	JOHNSON	SCOTT
DALLAS	JONES	STORY
EMMET	LEE	UNION
FAYETTE	LYON	WASHINGTON
FLOYD	MADISON	WINNESHIEK
FRANKLIN	MAHASKA	WRIGHT
FREMONT		

The Data

The Iowa Department of Workforce Development, the U.S. Department of Labor, and the U.S. Department of Commerce periodically compile information on specific Iowa industries, their employment, and their production and payroll characteristics. A major data source for the state of Iowa is the ES-202 file (ES means "employment security"), which isolates firm-level employment and the amount of payroll subject to withholding for social insurance tax purposes. Estimates of detailed industrial sector activity, including the air transportation industry, are not available, generally, at the county level. The state and federal agencies simply do not produce the estimates at that detail or there are so few firms that state and federal disclosure rules prevent reporting on the firms and their characteristics to protect their identities.

Very reliable estimates are produced by a private firm, however. Minnesota Implan, Inc., which produces the input-output modeling software used in this study, annually produces a complete set of county level industrial accounts for the U.S. for up to 538 industrial, governmental, and household sectors. One of the categories that they estimate using U.S. County Business Patterns, ES-202 files for the states, and data from the Department of Commerce's quinquennial industrial censuses is the air transportation sector. By building social account models for all of Iowa's counties we were able to identify which counties contained air transportation industries. Those counties contained in Table 1, along with the ten Level I counties in which commercial service is available, are assessed in this study.

The Economic Value of Air Transportation Industries In Iowa

Summary statistics and a description of the findings will now be presented for each of the ten counties with commercial airports, followed by an assessment of the economic value of all air transportation industries in the rest of the state and a summary of statewide economic values. We will also present a spatial analysis of the service territories of the Level I commercial airports in a separate appendix at the end of this analysis. The ten Level I airports are presented alphabetically by county.

The economic values of air transportation for Black Hawk County are displayed in the two tables to follow. The formatting for each of the remaining study areas will be the same. The first table summarizes the categories (industrial output, income, etc.) by the kind of economic value (direct, indirect, etc.). The second isolates the economic values by category and by industry. Most of the industries are self-explanatory, but a couple require translation. FIRE industries are finance, insurance, and real estate. TCPU industries are transportation, communications, and public utilities. Governments are actually state and local government enterprises, such as water supply, government electric and gas services, and transit systems; liquor systems; and federal postal services and other federal enterprises.

The direct values identify the characteristics of the air transportation industry in the county. The indirect values give us an idea of the value of inputs that the air transportation industry purchases from suppliers located in the county. The induced values represent household spending, primarily by workers in the direct and indirect industries. Total economic values are the sum of direct, indirect, and induced activities in a category. The multiplier is simply the total economic effect divided by the direct value.

Broad industrial totals are also included to help the reader to understand which industries other than the direct industry (air transportation) are, either by indirect relationships or by household spending, dependent on air transportation industries.

Black Hawk County Air Transportation Economic Values

Effects Summary by Kind and Category					Type II Multiplier
	Direct	Indirect	Induced	Total	
Industrial Output	27,283,688	7,465,110	10,451,193	45,199,989	1.66
Total Personal Income	10,107,379	2,653,832	3,969,932	16,731,143	1.66
Value Added	14,261,123	4,038,743	6,302,665	24,602,531	1.73
Jobs	279.8	95.3	169.2	544.4	1.95

Effects Summary by Category and Industry	Total			
	Industrial Output	Personal Income	Value Added	Jobs
Agriculture	80,746	21,436	39,025	1.0
Mining	4,574	1,505	2,865	0.0
Construction	315,622	115,586	124,130	3.7
Manufacturing	2,740,344	679,908	998,607	12.6
Trans., Commun., & Public Util.	3,072,977	866,046	1,621,099	24.4
Air Transportation	27,483,401	10,181,365	14,365,513	281.9
Trade	3,219,357	1,372,607	2,226,872	77.3
Finance, Ins., & Real Estate	2,693,598	638,049	1,983,786	24.1
Services	5,246,144	2,591,075	2,932,761	110.9
Government	333,023	259,898	297,674	8.0
Other	10,204	3,669	10,199	0.5
Total	45,199,989	16,731,143	24,602,531	544.4

Black Hawk County produced an estimated \$27.284 million in industrial output in its air transportation industries in 1999. This required \$7.465 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$10.1 million in personal incomes, generated \$14.3 million in direct value added, and accounted for 280 jobs. When these direct values and the demands for indirect goods and services worked their way through the Black Hawk County economy, they supported \$45.2 million in total industrial output, \$16.73 million in total personal income, \$24.6 million in value added, and 544 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.66 means that for every dollar of direct output in the air transportation industry, \$.66 of output is sustained in the remainder of the economy. The personal income multiplier of 1.66 means that for every \$1.00 in personal income paid in the industry, \$.66 in personal income is generated in the rest of the economy. The jobs multiplier of 1.95 means that for every job in air transportation industries in the county, 95/100^{ths} of a job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$36,100. In the indirect sector, earnings averaged \$27,850, and induced earnings averaged \$23,463. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 111 jobs were attributable to the air transportation industry, and 77 jobs in retail. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 24 jobs; transportation, communications, and public utilities, 24 jobs; manufacturing, 13 jobs; government, 8 jobs; and construction, 4 jobs.

Cerro Gordo County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	15,289,455	4,451,826	6,559,725	26,301,006	1.72
Total Personal Income	5,641,400	1,583,448	2,533,637	9,758,485	1.73
Value Added	7,959,805	2,424,185	3,926,680	14,310,670	1.80
Jobs	157.9	57.9	109.3	325.0	2.06

Effects Summary by Category and Industry	Industrial Output	Total Personal Income	Value Added	Jobs
Agriculture	69,420	14,456	27,071	0.7
Mining	4,576	1,439	2,760	0.1
Construction	214,876	77,186	82,891	2.5
Manufacturing	1,350,946	246,974	377,067	7.3
Trans., Commun., & Public Util.	2,065,897	581,177	1,143,784	15.1
Air Transportation	15,405,965	5,684,390	8,020,462	159.0
Trade	1,941,850	819,614	1,331,900	49.2
Finance, Ins., & Real Estate	1,763,555	442,450	1,228,094	15.3
Services	3,307,343	1,755,915	1,942,313	71.4
Government	171,037	132,657	148,793	4.1
Other	5,541	2,229	5,536	0.3
Total	26,301,006	9,758,485	14,310,670	325.0

Cerro Gordo County produced an estimated \$15.3 million in industrial output in its air transportation industries in 1999. This required \$4.45 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$5.64 million in personal incomes, generated \$7.96 million in direct value added, and accounted for 158 jobs. When these direct values and the demands for indirect goods and services worked their way through the Cerro Gordo County economy, they supported \$26.3 million in total industrial output, \$9.76 million in total personal income, \$14.3 million in value added, and 325 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.72 means that for every dollar of direct output in the air transportation industry, \$.72 of output is sustained in the remainder of the economy. The personal income multiplier of 1.73 means that for every \$1.00 in personal income paid in the industry, \$.73 in personal income is generated in the rest of the economy. The jobs multiplier of 2.06 means that for every job in air transportation industries in the county, a little over one more job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$35,730. In the indirect sector, earnings averaged \$27,350, and induced earnings averaged \$23,180. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 71 jobs were attributable to the air transportation industry, and 49 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 15 jobs; transportation, communications, and public utilities, 15 jobs; manufacturing, 7 jobs; government, 4 jobs; and construction, 2.5 jobs.

Clay County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	36,383,679	9,197,811	12,922,698	58,504,188	1.61
Total Personal Income	13,502,074	3,035,256	4,651,316	21,188,645	1.57
Value Added	19,050,896	4,675,245	7,625,401	31,351,542	1.65
Jobs	372.1	129.2	219.8	721.0	1.94

Effects Summary by Category and Industry	Industrial Output	Total Personal Income	Value Added	Jobs
Agriculture	201,839	35,633	66,735	1.5
Mining	12,104	5,116	8,641	0.1
Construction	378,662	137,508	147,671	4.4
Manufacturing	2,441,710	512,065	682,728	15.5
Trans., Commun., & Public Util.	4,059,992	1,009,732	1,870,722	36.3
Air Transportation	36,668,850	13,607,902	19,200,216	375.0
Trade	4,227,869	1,798,998	2,937,261	99.4
Finance, Ins., & Real Estate	3,288,549	623,893	2,430,837	23.7
Services	6,848,016	3,174,204	3,669,155	155.7
Government	368,028	280,430	328,996	9.0
Other	8,569	3,166	8,581	0.4
Total	58,504,188	21,188,645	31,351,542	721.0

Clay County produced an estimated \$36.4 million in industrial output in its air transportation industries in 1999. This required \$9.2 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$13.5 million in personal incomes, generated \$19.1 million in direct value added, and accounted for 372 jobs. When these direct values and the demands for indirect goods and services worked their way through the Clay County economy, they supported \$58.5 million in total industrial output, \$21.2 million in total personal income, \$31.4 million in value added, and 721 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.61 means that for every dollar of direct output in the air transportation industry, \$.61 of output is sustained in the remainder of the economy. The personal income multiplier of 1.57 means that for every \$1.00 in personal income paid in the industry, \$.57 in personal income is generated in the rest of the economy. The jobs multiplier of 1.94 means that for every job in air transportation industries in the county, just less than one more job (94/100^{ths}) is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$36,300. In the indirect sector, earnings averaged \$23,500, and induced earnings averaged \$21,160. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 156 jobs were attributable to the air transportation industry, and 99 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 24 jobs; transportation, communications, and public utilities, 36 jobs; manufacturing, 16 jobs; government, 9 jobs; and construction, 4.4 jobs.

Des Moines County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	14,591,802	4,175,843	5,358,617	24,126,262	1.65
Total Personal Income	5,405,723	1,534,575	2,046,037	8,986,335	1.66
Value Added	7,627,267	2,305,805	3,246,943	13,180,016	1.73
Jobs	149.7	53.6	91.9	295.1	1.97

Effects Summary by Category and Industry	Total			
	Industrial Output	Personal Income	Value Added	Jobs
Agriculture	52,919	14,244	26,786	0.6
Mining	2,225	735	1,304	0.0
Construction	166,581	63,938	68,664	1.9
Manufacturing	1,642,304	424,222	679,298	9.5
Trans., Commun., & Public Util.	2,031,062	665,988	1,109,519	14.6
Air Transportation	14,699,394	5,445,582	7,683,507	150.8
Trade	1,628,488	704,396	1,133,955	42.6
Finance, Ins., & Real Estate	1,090,810	185,834	812,244	8.5
Services	2,666,088	1,368,146	1,536,128	63.0
Government	141,724	111,596	123,929	3.4
Other	4,668	1,652	4,682	0.2
Total	24,126,262	8,986,335	13,180,016	295.1

Des Moines County produced an estimated \$14.6 million in industrial output in its air transportation industries in 1999. This required \$4.2 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$5.4 million in personal incomes, generated \$7.63 million in direct value added, and accounted for 150 jobs. When these direct values and the demands for indirect goods and services worked their way through the Des Moines County economy, they supported \$24.13 million in total industrial output, \$8.99 million in total personal income, \$13.2 million in value added, and 295 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.65 means that for every dollar of direct output in the air transportation industry, \$.65 of output is sustained in the remainder of the economy. The personal income multiplier of 1.66 means that for every \$1.00 in personal income paid in the industry, \$.66 in personal income is generated in the rest of the economy. The jobs multiplier of 1.97 means that for every job in air transportation industries in the county, just less than one more job (97/100^{ths}) is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$36,110. In the indirect sector, earnings averaged \$28,630, and induced earnings averaged \$22,260. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 63 jobs were attributable to the air transportation industry, and 43 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 8.5 jobs; transportation, communications, and public utilities, 14.6 jobs; manufacturing, 9.5 jobs; government, 3.4 jobs; and construction, 2 jobs.

Dubuque County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	16,637,157	4,949,237	6,591,569	28,177,963	1.69
Total Personal Income	6,218,525	1,709,015	2,455,936	10,383,475	1.67
Value Added	8,774,084	2,493,835	3,881,231	15,149,150	1.73
Jobs	168.1	61.2	103.4	332.7	1.98

Effects Summary by Category and Industry	Total			
	Industrial Output	Personal Income	Value Added	Jobs
Agriculture	75,736	23,651	35,192	0.9
Mining	4,359	1,436	2,741	0.0
Construction	215,009	81,314	87,324	2.4
Manufacturing	1,746,439	405,862	561,446	8.7
Trans., Commun., & Public Util.	2,172,716	591,532	959,134	16.2
Air Transportation	16,758,068	6,263,718	8,837,849	169.3
Trade	1,976,717	846,164	1,377,622	45.9
Finance, Ins., & Real Estate	1,557,866	322,024	1,168,528	12.1
Services	3,512,981	1,727,486	1,977,627	73.4
Government	153,265	119,040	136,867	3.5
Other	4,807	1,247	4,819	0.1
Total	28,177,963	10,383,475	15,149,150	332.7

Dubuque County produced an estimated \$16.6 million in industrial output in its air transportation industries in 1999. This required \$4.95 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$6.2 million in personal incomes, generated \$8.8 million in direct value added, and accounted for 168 jobs. When these direct values and the demands for indirect goods and services worked their way through the Dubuque County economy, they supported \$28.2 million in total industrial output, \$10.4 million in total personal income, \$15.15 million in value added, and 332 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.69 means that for every dollar of direct output in the air transportation industry, \$.69 of output is sustained in the remainder of the economy. The personal income multiplier of 1.67 means that for every \$1.00 in personal income paid in the industry, \$.67 in personal income is generated in the rest of the economy. The jobs multiplier of 1.98 means that for every job in air transportation industries in the county, just less than one more job (98/100^{ths}) is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$36,990. In the indirect sector, earnings averaged \$27,925, and induced earnings averaged \$23,750. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 73 jobs were attributable to the air transportation industry, and 46 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 12 jobs; transportation, communications, and public utilities, 16 jobs; manufacturing, 9 jobs; government, 3.5 jobs; and construction, 2.4 jobs.

Linn County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	48,399,311	14,665,888	18,138,401	81,203,601	1.68
Total Personal Income	17,243,497	4,802,161	6,589,706	28,635,363	1.66
Value Added	24,330,107	8,498,416	11,110,054	43,938,579	1.81
Jobs	527.9	156.5	253.8	938.2	1.78

Effects Summary by Category and Industry	Total			
	Industrial Output	Personal Income	Value Added	Jobs
Agriculture	119,192	46,070	81,168	2.1
Mining	17,910	6,064	11,308	0.1
Construction	601,023	239,532	257,237	6.5
Manufacturing	4,726,246	861,691	1,526,103	16.7
Trans., Commun., & Public Util.	6,665,127	1,693,225	4,375,032	36.5
Air Transportation	48,748,980	17,368,074	24,505,885	531.7
Trade	5,368,243	2,311,712	3,761,645	112.1
Finance, Ins., & Real Estate	5,180,052	1,152,826	3,690,313	36.5
Services	9,378,071	4,646,316	5,374,678	187.4
Government	386,971	306,617	343,434	8.3
Other	11,787	3,236	11,774	0.3
Total	81,203,601	28,635,363	43,938,579	938.2

Linn County produced an estimated \$48.4 million in industrial output in its air transportation industries in 1999. This required \$14.7 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$17.24 million in personal incomes, generated \$24.33 million in direct value added, and accounted for 527 jobs. When these direct values and the demands for indirect goods and services worked their way through the Linn County economy, they supported \$81.2 million in total industrial output, \$28.64 million in total personal income, \$43.94 million in value added, and 938 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.68 means that for every dollar of direct output in the air transportation industry, \$.68 of output is sustained in the remainder of the economy. The personal income multiplier of 1.66 means that for every \$1.00 in personal income paid in the industry, \$.66 in personal income is generated in the rest of the economy. The jobs multiplier of 1.78 means that for every job in air transportation industries in the county, 78/100^{ths} of a job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$32,660. In the indirect sector, earnings averaged \$30,680, and induced earnings averaged \$25,960. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 187 jobs were attributable to the air transportation industry, and 112 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 36.5 jobs; transportation, communications, and public utilities, 36.5 jobs; manufacturing, 17 jobs; government, 8.3 jobs; and construction, 6.5 jobs.

Polk County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	202,053,592	39,679,765	57,522,952	299,256,308	1.48
Total Personal Income	71,852,303	12,140,409	22,820,590	106,813,303	1.49
Value Added	101,381,692	21,768,270	36,136,762	159,286,730	1.57
Jobs	2,209.9	335.2	764.6	3,309.7	1.50

Effects Summary by Category and Industry	Total Personal			
	Industrial Output	Income	Value Added	Jobs
Agriculture	166,457	65,736	106,598	3.4
Mining	91,509	32,563	60,677	0.6
Construction	1,796,817	715,368	768,244	19.3
Manufacturing	11,459,542	2,657,450	3,770,364	59.0
Trans., Commun., & Public Util.	24,749,490	6,816,035	13,782,660	160.2
Air Transportation	203,599,899	72,402,187	102,157,568	2,226.8
Trade	20,344,672	8,680,336	14,301,912	352.3
Finance, Ins., & Real Estate	19,121,674	5,926,084	13,423,535	142.2
Services	16,996,709	8,754,901	9,960,341	326.7
Government	846,344	736,122	871,380	16.5
Other	83,196	26,521	83,449	2.6
Total	299,256,308	106,813,303	159,286,730	3,309.7

Polk County produced an estimated \$202.1 million in industrial output in its air transportation industries in 1999. This required \$36.7 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$71.85 million in personal incomes, generated \$101.4 million in direct value added, and accounted for 2,210 jobs. When these direct values and the demands for indirect goods and services worked their way through the Polk County economy, they supported \$299.3 million in total industrial output, \$106.8 million in total personal income, \$159.3 million in value added, and 3,310 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.48 means that for every dollar of direct output in the air transportation industry, \$.48 of output is sustained in the remainder of the economy. The personal income multiplier of 1.49 means that for every \$1.00 in personal income paid in the industry, \$.49 in personal income is generated in the rest of the economy. The jobs multiplier of 1.5 means that for every job in air transportation industries in the county, 50/100^{ths} of a job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$32,510. In the indirect sector, earnings averaged \$36,220, and induced earnings averaged \$29,831. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 327 jobs were attributable to the air transportation industry, and 352 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 142 jobs; transportation, communications, and public utilities; 160 jobs, manufacturing, 59 jobs; government, 16.5 jobs; and construction, 19.3 jobs.

Wapello County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	9,432,625	2,497,548	3,055,616	14,985,789	1.59
Total Personal Income	3,525,255	816,831	1,105,397	5,447,482	1.55
Value Added	4,973,988	1,324,493	1,746,421	8,044,902	1.62
Jobs	95.3	32.0	54.0	181.3	1.90

Effects Summary by Category and Industry	Total Personal			
	Industrial Output	Income	Value Added	Jobs
Agriculture	39,196	14,992	28,484	0.6
Mining	1,039	86	647	0.0
Construction	99,783	37,610	40,399	1.1
Manufacturing	843,409	136,917	205,603	3.1
Trans., Commun., & Public Util.	1,245,289	331,175	737,165	8.7
Air Transportation	9,501,206	3,550,885	5,010,152	96.0
Trade	845,635	363,859	580,594	24.4
Finance, Ins., & Real Estate	546,065	91,409	410,098	4.0
Services	1,760,110	841,509	945,694	40.5
Government	101,105	77,519	83,120	2.6
Other	2,952	1,521	2,944	0.2
Total	14,985,789	5,447,482	8,044,902	181.3

Wapello County produced an estimated \$9.43 million in industrial output in its air transportation industries in 1999. This required \$2.5 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$3.525 million in personal incomes, generated \$4.974 million in direct value added, and accounted for 95 jobs. When these direct values and the demands for indirect goods and services worked their way through the Wapello County economy, they supported \$14.99 million in total industrial output, \$5.5 million in total personal income, \$8.0 million in value added, and 181 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.59 means that for every dollar of direct output in the air transportation industry, \$.59 of output is sustained in the remainder of the economy. The personal income multiplier of 1.55 means that for every \$1.00 in personal income paid in the industry, \$.55 in personal income is generated in the rest of the economy. The jobs multiplier of 1.9 means that for every job in air transportation industries in the county, 9/10^{ths} of a job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$36,990. In the indirect sector, earnings averaged \$25,525, and induced earnings averaged \$20,470. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 41 jobs were attributable to the air transportation industry, and 24 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 4 jobs; transportation, communications, and public utilities, 9 jobs; manufacturing, 3 jobs; government, 2.6 jobs; and construction, 1.1 jobs.

Webster County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	6,825,907	1,921,563	2,582,587	11,330,056	1.66
Total Personal Income	2,557,732	658,287	975,199	4,191,219	1.64
Value Added	3,608,854	923,287	1,473,307	6,005,447	1.66
Jobs	68.7	25.3	43.8	137.8	2.01

Effects Summary by Category and Industry	Industrial Output	Total Personal		
		Income	Value Added	Jobs
Agriculture	35,562	7,421	14,242	0.3
Mining	761	62	472	0.0
Construction	86,781	32,511	34,920	1.0
Manufacturing	564,247	89,697	137,940	2.1
Trans., Commun., & Public Util.	979,043	281,483	412,937	8.5
Air Transportation	6,872,998	2,575,378	3,633,751	69.1
Trade	812,134	344,681	558,478	20.1
Finance, Ins., & Real Estate	507,586	120,482	380,802	4.6
Services	1,413,657	695,156	783,077	30.6
Government	55,881	43,971	47,424	1.4
Other	1,406	375	1,404	0.1
Total	11,330,056	4,191,219	6,005,447	137.8

Webster County produced an estimated \$6.83 million in industrial output in its air transportation industries in 1999. This required \$1.92 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$2.6 million in personal incomes, generated \$3.6 million in direct value added, and accounted for 69 jobs. When these direct values and the demands for indirect goods and services worked their way through the Webster County economy, they supported \$11.33 million in total industrial output, \$4.2 million in total personal income, \$6.0 million in value added, and 138 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.66 means that for every dollar of direct output in the air transportation industry, \$.66 of output is sustained in the remainder of the economy. The personal income multiplier of 1.64 means that for every \$1.00 in personal income paid in the industry, \$.64 in personal income is generated in the rest of the economy. The jobs multiplier of 2.01 means that for every job in air transportation industries in the county, slightly more than another job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$37,230. In the indirect sector, earnings averaged \$26,020 and induced earnings averaged \$22,265. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 31 jobs were attributable to the air transportation industry, and 20 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 4.6 jobs; transportation, communications, and public utilities, 8.5 jobs; manufacturing, 2 jobs; government, 1.4 jobs; and construction, 1.0 job.

Woodbury County Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	41,723,273	11,935,750	15,346,929	69,005,952	1.65
Total Personal Income	14,975,860	3,947,406	5,573,445	24,496,710	1.64
Value Added	21,130,500	6,808,655	9,277,976	37,217,129	1.76
Jobs	450.0	141.4	238.6	830.0	1.84

Effects Summary by Category and Industry	Total			
	Industrial Output	Personal Income	Value Added	Jobs
Agriculture	152,157	35,721	63,717	1.6
Mining	134	57	96	-
Construction	478,526	186,123	199,930	5.2
Manufacturing	3,285,005	454,723	659,297	12.2
Trans., Commun., & Public Util.	5,612,548	1,493,569	3,720,889	35.6
Air Transportation	42,043,835	15,090,920	21,292,846	453.4
Trade	4,761,451	2,026,521	3,298,162	112.4
Finance, Ins., & Real Estate	3,847,000	761,952	2,836,299	27.1
Services	8,418,143	4,124,467	4,774,024	173.1
Government	395,581	318,364	360,277	8.7
Other	11,572	4,294	11,594	0.5
Total	69,005,952	24,496,710	37,217,129	830.0

Woodbury County produced an estimated \$41.7 million in industrial output in its air transportation industries in 1999. This required \$11.9 million in purchases from local suppliers (indirect industrial output). The air transportation industry paid \$14.98 million in personal incomes, generated \$21.1 million in direct value added, and accounted for 450 jobs. When these direct values and the demands for indirect goods and services worked their way through the Woodbury County economy, they supported \$69.0 million in total industrial output, \$24.5 million in total personal income, \$37.2 million in value added, and 830 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.65 means that for every dollar of direct output in the air transportation industry, \$.65 of output is sustained in the remainder of the economy. The personal income multiplier of 1.64 means that for every \$1.00 in personal income paid in the industry, \$.64 in personal income is generated in the rest of the economy. The jobs multiplier of 1.84 means that for every job in air transportation industries in the county, 84/100^{ths} of a job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$33,280. In the indirect sector, earnings averaged \$27,920 and induced earnings averaged \$23,360. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 173 jobs were attributable to the air transportation industry, and 112 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 27 jobs; transportation, communications, and public utilities, 36 jobs; manufacturing, 12 jobs; government, 8.7 jobs; and construction, 5.2 jobs.

Air Transportation Economic Values for the Remaining Iowa Counties

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	109,610,120	32,262,226	34,130,439	176,002,785	1.61
Total Personal Income	37,339,980	10,354,215	11,846,957	59,541,152	1.59
Value Added	52,686,216	16,477,475	19,662,536	88,826,229	1.69
Jobs	1,274.0	412.5	563.7	2,250.2	1.77

Effects Summary by Category and Industry	Total			
	Industrial Output	Personal Income	Value Added	Jobs
Agriculture	632,584	141,521	255,177	6.0
Mining	84,876	26,900	53,561	0.8
Construction	1,296,690	472,175	507,137	15.1
Manufacturing	10,281,004	1,944,285	2,897,434	48.3
Trans., Commun., & Public Util.	14,809,854	4,093,265	7,761,928	113.7
Air Transportation	110,359,296	37,595,196	53,046,324	1,282.7
Trade	10,188,338	4,353,799	7,068,453	254.3
Finance, Ins., & Real Estate	8,506,500	1,550,386	6,305,118	61.1
Services	18,668,360	8,443,736	9,886,213	437.5
Government	1,147,564	909,008	1,017,212	29.4
Other	27,720	10,882	27,673	1.5
Total	176,002,785	59,541,152	88,826,229	2,250.2

The remaining Iowa counties for which we could discern air transportation industry data produced an estimated \$109.6 million in direct industrial output in 1999. This required \$32.3 million in purchases from local suppliers (indirect industrial output). The air transportation industry in the remainder of the state paid \$37.4 million in personal incomes, generated \$52.7 million in direct value added, and accounted for 1,274 jobs. When these direct values and the demands for indirect goods and services worked their way through the remaining county economies, they supported \$176.0 million in total industrial output, \$59.5 million in total personal income, \$88.8 million in value added, and 2,250 jobs. The Type II multipliers indicate how much the total economy is dependent on each unit of direct value. The industrial output multiplier of 1.61 means that for every dollar of direct output in the air transportation industry, \$.61 of output is sustained in the remainder of the economy. The personal income multiplier of 1.59 means that for every \$1.00 in personal income paid in the industry, \$.59 in personal income is generated in the rest of the economy. The jobs multiplier of 1.7 means that for every job in air transportation industries in the county, 77/100^{ths} of a job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector in these counties were \$29,310. In the indirect sector, earnings averaged \$25,101 and induced earnings averaged \$21,020. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 438 jobs were attributable to the air transportation industry, and 254 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 61 jobs; transportation, communications, and public utilities, 114 jobs; manufacturing, 48 jobs; government, 29.4 jobs; and construction, 15.1 jobs. The economic effects are allocated among the counties in the accompanying table in proportion to their direct values as determined in the I-O model.

Air Transportation Direct and Total Economic Effects for the Top 10 Level II and III Counties (Excluding Level I Counties)

COUNTY	Direct Economic Effects				Total Economic Effects			
	Industrial Output	Total Personal Income	Value Added	Jobs	Industrial Output	Total Personal Income	Value Added	Jobs
Scott	37,465,768	11,655,074	16,445,504	488	60,159,404	18,584,813	27,726,266	863
Story	16,601,593	5,913,292	8,343,495	181	26,657,452	9,429,149	14,066,700	320
Johnson	11,136,677	4,043,757	5,705,608	119	17,882,347	6,448,048	9,619,360	210
Mahaska	6,216,417	2,285,625	3,224,935	65	9,981,804	3,644,586	5,437,073	114
Union	4,260,254	1,679,943	2,370,305	39	6,840,760	2,678,784	3,996,211	69
Emmet	3,594,514	1,085,355	1,531,466	48	5,771,770	1,730,673	2,581,972	85
Guthrie	2,939,779	1,274,368	1,798,032	22	4,720,452	2,032,067	3,031,389	39
Marshall	2,656,240	1,095,123	1,545,146	22	4,265,169	1,746,249	2,605,036	39
Montgomery	2,185,048	899,650	1,269,346	18	3,508,567	1,434,553	2,140,052	32
Pottawattamie	2,076,670	683,758	964,780	25	3,334,543	1,090,299	1,626,570	44
All Other Level II & III Counties	20,477,161	6,724,034	9,487,600	247	32,880,517	10,721,932	15,995,601	437
Total Level II & III Counties	109,610,120	37,339,980	52,686,216	1,274	176,002,785	59,541,152	88,826,229	2,250

Among the remaining counties, Scott County has the largest air transportation sector. In 1999, its direct industrial output was \$37.5 million. These air transportation sales exceed those in seven of the Level I counties. Only Polk, Linn, and Woodbury Counties posted greater air transportation sales than Scott County. At distant seconds and thirds among the Level II and III counties were Story County, \$16.6 million in direct output, and Johnson County, \$11.36 million. These top three counties account for 60 percent of the air transportation industrial output in the remaining Iowa counties. The top ten counties, which are listed in the table above, account for 81 percent of air transportation economic output among the Level II and III counties.

Readers are reminded that the multipliers in the summary table for all other counties have been applied to the direct values for these counties to obtain the total economic effects by county. These multipliers are, essentially, weighted averages considering counties that range in size from Iowa's smallest to two metropolitan areas. These multipliers are biased, therefore, towards the larger counties (Johnson, Story, and Scott) as these counties account for a very large fraction of the remaining air transportation economic values and they generally have more developed regional economies. As a result, the economic effects of air transportation for the smaller counties may have slightly smaller multipliers.

State of Iowa Air Transportation Economic Values

Effects Summary by Kind and Category	Direct	Indirect	Induced	Total	Type II Multiplier
Industrial Output	528,230,608	133,202,568	172,660,726	834,093,899	1.58
Total Personal Income	188,369,729	43,235,434	64,568,150	296,173,314	1.57
Value Added	265,784,533	71,738,409	104,389,974	441,912,924	1.66
Jobs	5,753.3	1,500.1	2,611.9	9,865.2	1.71

Effects Summary by Category and Industry	Industrial Output	Total Personal Income	Value Added	Jobs
Agriculture	1,625,807	420,882	744,195	18.7
Mining	224,065	75,962	145,072	1.8
Construction	5,650,369	2,158,851	2,318,548	63.1
Manufacturing	41,081,196	8,413,792	12,495,888	194.9
TCPU	67,463,996	18,423,227	37,494,869	469.9
Air Transportation	532,141,892	189,765,597	267,754,072	5,795.8
Trade	55,314,753	23,622,688	38,576,853	1,190.1
FIRE	48,103,254	11,815,390	34,669,654	359.3
Services	78,215,622	38,122,912	43,782,011	1,670.1
Government	4,100,523	3,295,222	3,759,106	94.8
Other	172,421	58,791	172,655	6.6
Total	834,093,899	296,173,314	441,912,924	9,865.2

The state of Iowa produced an estimated \$528.2 million in industrial output in its air transportation industries in 1999. This required \$133.2 million in purchases from state suppliers (indirect industrial output). The air transportation industry paid \$188.4 million in personal incomes, generated \$265.8 million in direct value added, and accounted for 5,753 jobs. When these direct values and the demands for indirect goods and services worked their way through the entire state economy, they supported \$834.1 million in total industrial output, \$296.2 million in total personal income, \$441.9 million in value added, and 9,865 jobs. The Type II multipliers indicate how much the state economy is dependent on each unit of direct value. The industrial output multiplier of 1.58 means that for every dollar of direct output in the air transportation industry, \$.58 of output is sustained in the remainder of the state economy. The personal income multiplier of 1.57 means that for every \$1.00 in personal income paid in the industry, \$.57 in personal income is generated in the rest of the economy. The jobs multiplier of 1.71 means that for every job in air transportation industries in the county, 71/100^{ths} of a job is sustained in the rest of the economy.

Average earnings per job in the air transportation sector were \$32,725. In the indirect sector, earnings averaged \$28,825 and induced earnings averaged \$24,720. Economic values by industry indicated that the service sector and the retail sector receive most of the income and job indirect and induced effects. In the service sector, 1,670 jobs were attributable to the air transportation industry, and 1,190 jobs in retail trade. The remaining estimated meaningful job effects are found in finance, insurance and real estate, 359 jobs, transportation, communications, and public utilities, 470 jobs, manufacturing, 195 jobs, government, 95 jobs, and construction, 63 jobs.

Iowa Industrial Dependence on Air Transportation

The previous discussion focused on the overall economic effects of the air transportation industry in Iowa. We can look at the preceding table and isolate which industries are indirectly stimulated by air transportation transactions in the state. The following table, however, isolates the extent to which industries in Iowa purchase air transportation services as industrial inputs (or a tangible cost of production).

Industrial Air Transportation Demands in Iowa

	Air Transportation Industrial Inputs	Percent of Industrial
Agriculture	6,004,468	5.7%
Mining	69,892	0.1%
Construction	4,446,093	4.2%
Manufacturing	50,623,132	48.1%
TCPU	5,322,132	5.1%
Air Transportation	3,470,464	3.3%
Trade	10,089,710	9.6%
FIRE	4,405,192	4.2%
Services	16,654,670	15.8%
Government Enterprises	4,085,621	3.9%
Total Industrial	\$ 105,171,374	100.0%

Manufacturing industries purchased 48 percent of industrial air transportation service inputs in Iowa, an estimated \$50.6 million. Service industries purchased nearly 16 percent, at \$16.7 million, and wholesale and retail trade purchased nearly 10 percent, at \$10.1 million. These values represent actual purchases of passenger, freight, or other air transportation services by industries. They do not represent the margined value of air transportation (and delivery) services associated with the purchase of and the price paid for, for example, supplies or other industrial production goods. The remaining purchases for air transportation services are direct household spending for air transportation (\$65.99 million) spending by federal, local, and state government general operations (\$12.3 million), direct purchases by nonresidents or outside industries (\$147.5 million), and the margined value of all industrial, household, and institutional goods and services for which the purchase price of a good or service reflects some air transportation costs that were provided in Iowa (\$195.5 million).

State Revenues Attributable to Air Transportation Economic Effects

Estimates of state government general receipts are estimated in the following table. These receipts are estimated from total personal income. In 1999, we estimate that the total economic values attributable to Iowa's air transportation industries supported \$20.7 million in state government tax receipts. The personal income tax accounted for \$10.35 million, 50 percent, sales taxes amounted to \$6.03 million, 29 percent, corporation income taxes were \$1.4 million, 7 percent, use taxes were just over \$1.01 million, 5 percent, and all other taxes were \$1.84 million, or just under 9 percent.

Total Iowa State Government General Tax Revenues Attributable to Air Transportation Economic Effects		Percent of
	Amount	Total
Personal Income	\$ 10,346,30	50.1
Sales	6,029,59	29.2
Use	1,012,90	4.9
Corporation Income	1,424,77	6.9
All Other	1,844,14	8.9
Total Income, Sales, Use, & Other Taxes	\$ 20,657,72	100.0

Conclusions

Iowa's air transportation industries stimulated \$834.1 million in total industrial output in the state and just a shade under 10,000 jobs in 1999. The ten counties housing the state's ten commercial, Level I, airports account for 79 percent of total estimated economic activity associated with Iowa air transportation industries. Polk County alone accounts for 36 percent of all air transportation activity in the state.

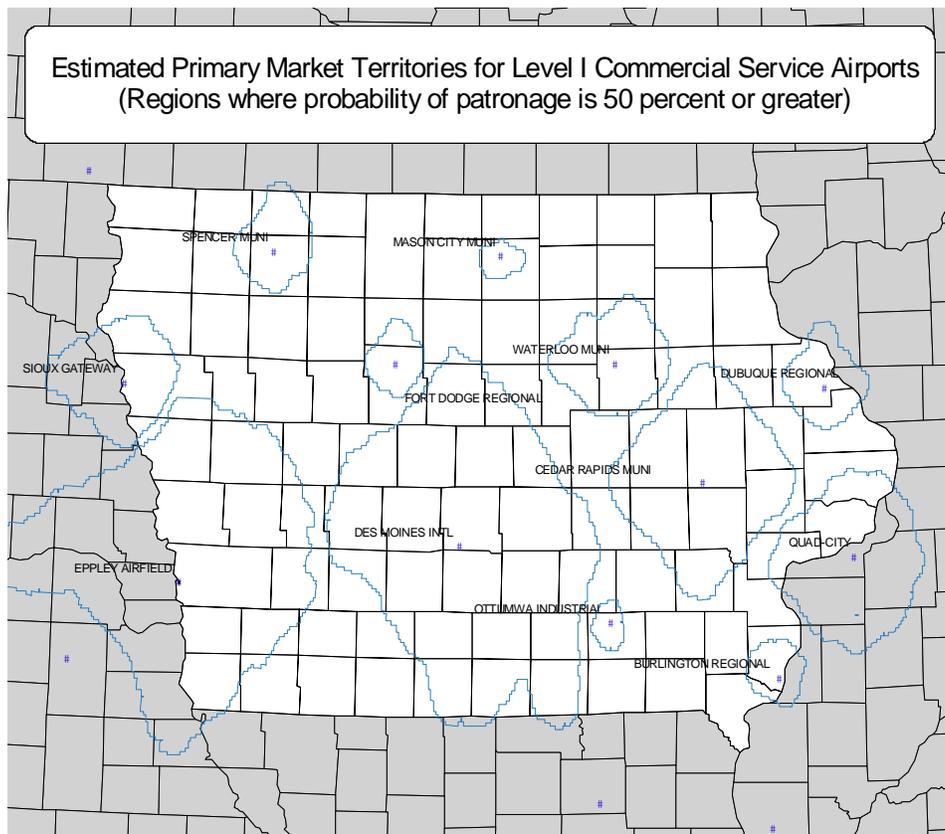
It is difficult to estimate true economic impacts for regional transportation facilities, like airports. Theories of urbanization demonstrate that larger places provide higher levels of goods and services that serve large territories. Regional air transportation capacities are, therefore, a function of the size of the host community and density of demand found in its surrounding territory. They serve a local demand and significant portions of air transportation demands by residents near the facility.

Most air transportation facilities in Iowa serve, primarily, local general aviation demand. For the commercial air transportation centers, a substantial portion of area demand comes from residents of surrounding counties. The following map displays estimated market territories for Iowa's ten Level I commercial facilities and for Omaha, Nebraska, and Moline, Illinois, two bordering airports that exert a strong influence on Iowans. The service territories are estimated using Geographic Information Service (GIS) software given aggregate demand for services at an airport (enplanements and itinerant services) and the spatial distribution of all commercial facilities in and around the state of Iowa.

The territories are estimated using a gravity model. This merely means that the likelihood of using a particular airport increases exponentially the closer the airport is to you (given the distribution of all other commercial airport choices available to you). In other words, price of airline fares notwithstanding, consumers explicitly factor in travel time and travel costs when choosing an airport.

The map delineates regions in which the probability of a resident using the central airport is expected to be 50 percent or more. Persons residing in portions of the state outside of a market territory may be equally drawn to two or more nearby airports. While it is generally conceded that regional centers like Omaha and Kansas City offer significantly lower fares than, for example, the Sioux City Gateway Airport or Des Moines International Airport, this map represents the expected service territories

given all recorded emplanements and itinerant services recorded by the FAA for this region considering the distribution of these facilities.



Appendix 1: Major Air Transportation Categories

SIC 4512 Air Transportation, Scheduled

Establishments primarily engaged in furnishing air transportation over regular routes and on regular schedules. This industry includes Alaskan carriers operating over regular or irregular routes.

- Air cargo carriers, scheduled
- Air passenger carriers, scheduled

SIC 4513 Air Courier Services

Establishments primarily engaged in furnishing air delivery of individually addressed letters, parcels, and packages (generally under 100 pounds), except by the U.S. Postal Service. While these establishments deliver letters, parcels, and packages by air, the initial pick-up and the final delivery are often made by other modes of transportation, such as by truck, bicycle, or motorcycle. Separate establishments of air courier companies engaged in providing pick-up and delivery only; "drop-off points"; or distribution centers are all classified in this industry. Establishments of the U.S. Postal Service are classified in Industry 4311; and establishments furnishing delivery of individually addressed letters, parcels, or packages (generally under 100 pounds) other than by air are classified in Industry 4215. Establishments primarily engaged in undertaking the transportation of goods from shippers to receivers for charges covering the entire transportation, but making use of other transportation establishments to effect the entire delivery, are classified in Industry 4731.

- Courier services, air
- Letter delivery, private: air
- Package delivery, private: air
- Parcel delivery, private: air

SIC 4522 Air Transportation, Nonscheduled

Establishments primarily engaged in furnishing nonscheduled air transportation. Also included in this industry are establishments primarily engaged in furnishing airplane sight-seeing services, air taxi services and helicopter passenger transportation services to, from, or between local airports, whether or not scheduled.

- Air cargo carriers, nonscheduled
- Air passenger carriers, nonscheduled
- Air taxi services
- Ambulance services, air
- Flying charter services
- Helicopter carriers

SIC 4581 Airports, Flying Fields, and Airport Terminal Services

Establishments primarily engaged in operating and maintaining airports and flying fields; in servicing, repairing (except on a factory basis), maintaining, and storing aircraft; and in furnishing coordinated handling services for airfreight or passengers at airports. This industry also includes private establishments primarily engaged in air traffic control operations. Government air traffic control operations are classified in Public Administration, Industry 9621. Aircraft modification centers and establishments primarily engaged in factory type overhaul of aircraft are classified in Manufacturing, Major Group 37, and flying fields maintained by aviation clubs are classified in Services, Industry 7997.

- Air traffic control, except government
- Aircraft cleaning and janitorial service
- Aircraft servicing and repairing, except on a factory basis
- Aircraft storage at airports
- Aircraft upholstery repair
- Airfreight handling at airports
- Airport hangar rental
- Airport leasing, if operating airport
- Airport terminal services
- Airports
- Flying fields, except those maintained by aviation clubs
- Hangar operation

Other operations that were excluded from this analysis

Commercial establishments with a physical presence at the airport are sometimes included in an analysis of airport operations versus the overall air transportation industry. Examples of these added firms or activities sometimes include

- Gift shops
- Fuel vendors
- Dining, drinking, and snack facilities
- Automobile rentals
- Parking & parking shuttles
- Advertising
- The Iowa Air National Guard
- All government air traffic control

None of these kinds of establishments, services, or activities are included in this study.

Appendix 2: Input-Output Modeling Methods and Limits to the Analysis

Economic effects studies are usually conducted with input-output (I-O) econometric models of a regional economy. I-O models are highly detailed accounts of inter-industrial transactions in a region. Any industry's output (its gross sales) requires employees, materials, capital investments, financing, maintenance, equipment, and service inputs. The probability that a firm purchases its inputs locally is estimated in the I-O model. These estimates are based on national and regional industrial surveys to identify the overall production "recipe" for the firm. Once we know the kinds of inputs that a firm requires and the availability of those inputs within the region that we are studying, we are able to identify the expected transactions that the firm has with the remainder of the economy in the area. When these industrial linkages are identified and the model is constructed, we can simulate how the region responds to or otherwise demonstrates dependence on the industry that we are studying.

There are up-front limitations to these studies that must be acknowledged. First and foremost, absent highly detailed and costly local industry surveys we normally rely on national and regional averages for determining major input categories and the likelihood of a local purchase of inputs for the industries that we are studying. The model that we employ contains detailed information for up to 537 industrial, governmental, and household sectors. This detail is regionally adjusted to reflect actual production and payroll characteristics in the county of study. The data are updated annually and rely on U.S. Bureau of Economic Analysis, County Business Patterns, and U.S. Department of Labor ES 202 data on quarterly employee withholdings to zero-in on characteristics of local production, wages, and industry types. The I-O program that we use, along with the annual data sets for the states and counties that we study, has a historically respectable research and production foundation along with an equally respectable client base nationwide*. Whenever possible, we modify the data in the model based on information that is provided to us by our clients or based on our own more detailed research of economic activity in a region.

* The system that we use for studying Iowa is called IMPLAN Pro, published by the Minnesota IMPLAN Group, Inc.

Other limits in these types of models include

- difficulties in capturing economies of scale (the current input values or production functions are, therefore, initially constant),
- an inability to identify input substitutes – especially new technologies,
- the models occasionally contain dated data on industrial performance and purchases (To this we can add an absence of detailed information on emerging industries, especially those associated with communications, software, and computer industries),
- in-state and out-of-state purchases of commodities are fixed (unless we manually adjust regional purchasing coefficients), and
- an implicit assumption that input commodity supply is infinite and perfectly elastic.

These considerations duly noted, carefully conducted I-O studies give us a good simulation of the current industrial inter-dependencies in the economy. I-O models are useful for simulating how an economy is currently performing rather than how an economy is expected to perform in the future. They help to define the relative linkages of an institution under study with the industries and households in the region at the present time. It is important to remember that these models give us localized or regionalized estimates of economic interactions, and that as the scope of analysis changes, i.e., statewide or nationwide, the kinds and extents of economic interactions change.