Potential Impact of a

Data Center Incentive in Illinois

Prepared For: The Illinois Chamber of Commerce Foundation

Appendix

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NOVEMBER 2018

Supported by: Illinois Chamber Foundation · Equinix · Digital Realty · QTS · Chicagoland Chamber of Commerce Foundation

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Acknowledgements

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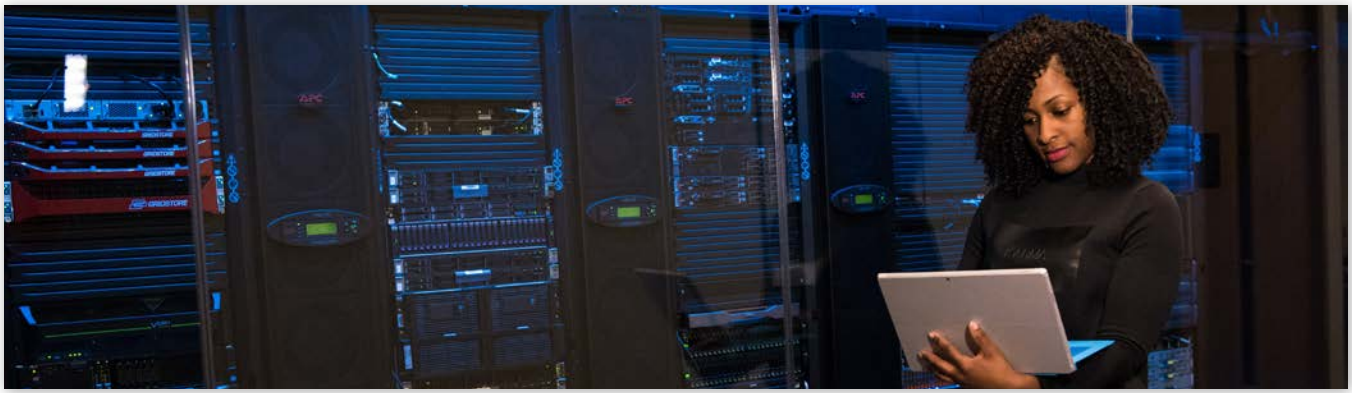
This appendix is not a stand-alone report but provides additional background information for the report entitled ***"Potential Impact of a Data Center Incentive in Illinois"****.*



Executive Summary

This report compares the disparity of data center capital investment growth and jobs created between Illinois and neighboring and competitive states and examines the state tax policies used to attract and grow the industry.

In an increasingly digitally-connected world, data centers are critical infrastructure facilities providing for the storage and transmission of data related to financial services, health care, retail, transportation, telecommunications, academia, entertainment, and almost every industry. Additionally, data centers are essential to the functioning of all networked, computer-centric devices, such as smart phones and tablets, and GPS systems. Data centers are part of the core infrastructure that supports the technology sector and constitute the backbone of the modern economy. Nearly every business operates a data center, either in-house or as a contracted service. Data centers are special real estate assets that require multimillion-dollar, up-front capital investments and on-going operating and maintenance costs, as the computer equipment is refreshed on a two- to three-year cycle. As the world's economy continues its reliance upon digital information, the need for facilities to store and transmit the ever-expanding universe of data will continue to grow.

The area around Chicago accounted for 93 percent of employment in Illinois' data center industry. According to CBRE, the Greater Chicago area is the third largest data center market in the United States, but the rest of the state of Illinois has very few data centers. While the Chicago market is large, it is 40 percent smaller than the size of the Northern Virginia market. And it is growing much more slowly than other major markets. According to CBRE, from June 2017 to June 2018, the Chicago data center market grew at a rate of 7 percent. At the same time, the Atlanta market grew 12 percent, the Northern Virginia market grew 16 percent, and the Phoenix market grew 26 percent.

The data center industry's total 2017 economic impact on Illinois was approximately 31,500 jobs, $2.4 billion in labor income, and $7.1 billion in economic output. Illinois data centers generated a total of approximately $877.5 million in tax revenue in 2017, of which $321.7 million was state and local tax revenue.[1] Construction expenditures for new data centers in Illinois were $122.3 million in 2017, including $54.1 million in labor income for 820 construction workers.

[1] It is important to realize that this $321.7 million estimate of state and local taxes paid by the data center industry in 2017 is comprised of all state and local taxes paid by the industry. As such, it would include all government revenue from property taxes, sales taxes, corporate income taxes, electricity excise taxes, license fees, and all other applicable taxes at both the state and the local levels. Data to disaggregate this overall state and local tax estimate is not available.

Illinois showed significantly weaker growth in data center markets than any of the surrounding states that have data center incentives. The data center markets in the state of Illinois beyond the Chicago area have not been doing as well as the markets in surrounding states that have data center incentives.

The data center industry in Illinois under-performs the nationwide trends for the data center industry in terms of growth in employment and wages.

In addition to providing capital improvements that add to Illinois' tax base, this capital investment also fuels an on-going demand for data center construction which often uses union labor. This has particular relevance for Illinois, where employment growth in the state's construction sector has lagged behind the national norm in recent years.

Today, 30 states (from Washington to Florida, New York to Arizona) have incentives that are specifically targeted at attracting data centers as part of expanded economic development efforts. However, 24 of these states have enacted legislation since 2012 in an effort to capture a greater percentage of the growth. Illinois is surrounded by states that offer data center incentives.

If a large data center were to be located in Illinois like the one that Apple is building in Waukee, Iowa, the potential total economic impact on the Illinois' statewide economy would be approximately 3,360 jobs, $203.9 million in labor income, and $521.7 million in economic output. That much economic activity would generate approximately $66.7 million in tax revenue, of which $20.2 million would be state and local tax revenue.

Hammond, Indiana was selected as the site for a new data center because of its proximity to Chicago and the "tax-friendliness" of Indiana. It could be a harbinger of more data center development on the significant amount of underutilized property in Hammond, East Chicago, and Gary, Indiana. Significant data center development in the Indiana suburbs of Chicago would likely slow growth in Illinois, especially in the Chicago suburbs.

Industry Trends

Change in Number of Data Processing Establishments from 2004 to 2017 in Select Midwestern Metropolitan Statistical Areas[1]

Illinois MSAs	Change in Data Processing Establishments 2004-2017
Champaign-Urbana, IL MSA	89%
Springfield, IL MSA	43%
Rockford, IL MSA	-33%
Peoria, IL MSA	-50%
Decatur, IL MSA	-67%
Missouri MSAs	**Change in Data Processing Establishments 2004-2017**
Columbia, MO MSA	100%
Kansas City, MO-KS MSA	35%
Springfield, MO MSA	23%
St. Joseph, MO-KS MSA	0%
St. Louis, MO-IL MSA	-12%
Joplin, MO MSA	-33%
Iowa MSAs	**Change in Data Processing Establishments 2004-2017**
Ames, IA MSA	700%
Dubuque, IA MSA	200%
Waterloo-Cedar Falls, IA MSA	60%
Des Moines-West Des Moines, IA MSA	49%
Cedar Rapids, IA MSA	-4%
Davenport-Moline-Rock Island, IA-IL MSA	-15%
Iowa City, IA MSA	-17%
Sioux City, IA-NE-SD MSA	-25%
Wisconsin MSAs	**Change in Data Processing Establishments 2004-2017**
Racine, WI MSA	200%
Madison, WI MSA	163%
La Crosse-Onalaska, WI-MN MSA	80%
Green Bay, WI MSA	17%
Milwaukee-Waukesha-West Allis, WI MSA	3%
Appleton, WI MSA	0%
Fond du Lac, WI MSA	0%
Janesville-Beloit, WI MSA	0%
Wausau, WI MSA	0%
Oshkosh-Neenah, WI MSA	-33%
Indiana MSAs	**Change in Data Processing Establishments 2004-2017**
Elkhart-Goshen, IN MSA	700%
Bloomington, IN MSA	150%
Indianapolis-Carmel-Anderson, IN MSA	102%
South Bend-Mishawaka, IN-MI MSA	50%
Fort Wayne, IN MSA	10%
Evansville, IN-KY MSA	0%
Michigan City-La Porte, IN MSA	0%
Muncie, IN MSA	0%

[1] Source: Bureau of Labor Statistics. Some metropolitan statistical areas did not have enough establishments during the period for BLS to release statistics.

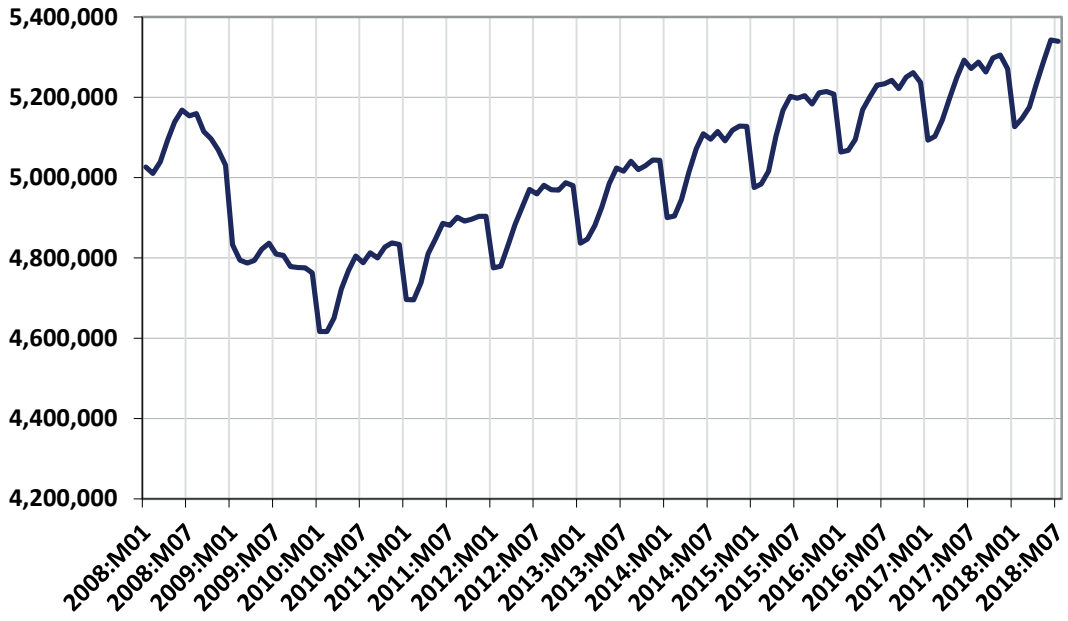
The Data Center Industry's Current Contribution to Illinois

GENERAL ECONOMIC TRENDS IN ILLINOIS

To provide a context for the industry-specific analyses to follow, in this portion of the section, we provide a brief review of overall economic trends in Illinois.

Total Employment

Appendix Figure A depicts the trend in total private sector employment in Illinois from January 2008 to July 2018. Reflecting the impact of the Great Recession, statewide employment trended downward in the first part of this period and hit a low of 4,617,100 jobs in early 2010. Since then, it has trended gradually upward. As of July 2018, employment in Illinois stood at 5,340,000 jobs. This represents a 313,900 job, or 6.2 percent, increase in total private sector employment over the period as a whole. To put that number in perspective, over this same period total private employment increased by 12.1 percent nationally.[2]



Appendix Figure A: Illinois Statewide Total Private Employment – January 2008 to July 2018[3]

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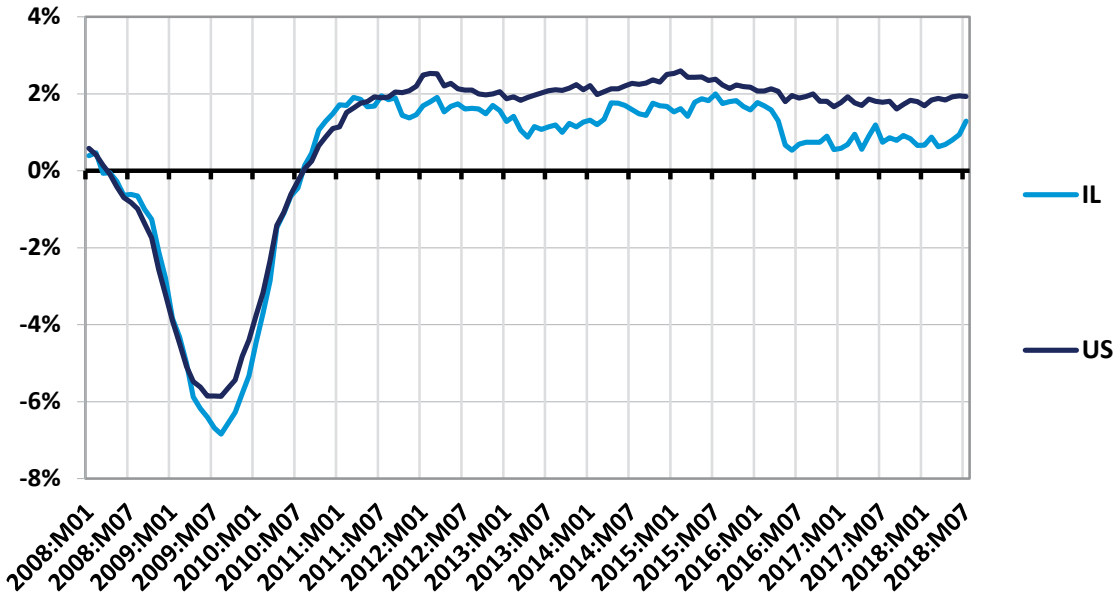
[2] Source: U.S. Bureau of Labor Statistics.
[3] Source: U.S. Bureau of Labor Statistics.

To control for seasonality and provide a point of reference, Appendix Figure B compares the year-over-year change in total private sector employment in Illinois to that of the U.S. as a whole over the same period as Appendix Figure A. Any point above the zero line in this graph indicates a year-over-year increase in employment, while any point below the zero line indicates a year-over-year decline in employment.

As these data indicate, the Great Recession impacted Illinois somewhat more heavily than the U.S. as a whole, with the state's year-over-year change in total private sector employment bottoming out at minus 6.8 percent in August 2009 as compared to minus 5.9 percent at the national level. Moreover, except for a nine-month period between 2010 and 2011, year-over-year changes in total private employment in Illinois have since under-performed the national average and that gap widened in mid-2016. As of July 2018, year-over-year growth in total private sector employment was 1.3 percent in Illinois as compared to 1.9 percent nationally.



Appendix Figure B: Year-Over-Year Change in Total Private Employment – January 2008 to July 2018[4]

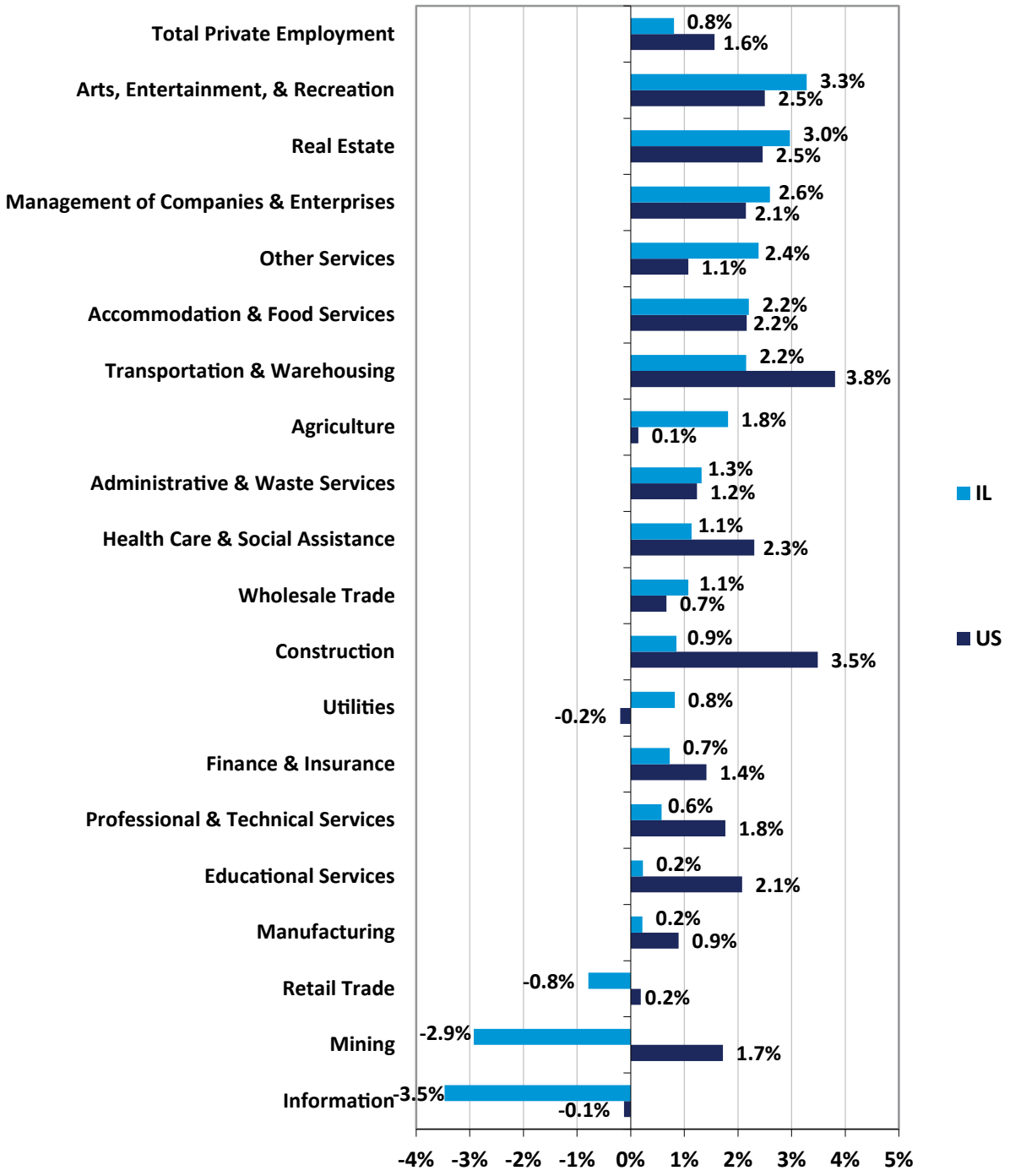
Employment Growth by Major Industry Sector

To provide a better understanding of the underlying factors motivating these trends in total private sector employment, Appendix Figures C and D provide data on private sector employment growth by major industry sector in Illinois and benchmark those data against the national average.

Appendix Figure C depicts the most recent one-year (2016 to 2017) growth rates. Out of the 19 major industry sectors shown, Illinois out-performed the national average in eight, under-performed the national average in ten, and was consistent with the national average in one. Relative to the nation as a whole, Illinois' highest performing sectors over this period were: 1) Agriculture (1.7 percent above the national average), 2) Other Services (1.3 percent above the national average), and 3) Utilities (1 percent above the national average). While at

[4] Source: U.S. Bureau of Labor Statistics.

the other end of the spectrum, the state's lowest performing industry sectors were: 1) Mining (4.6 percent below the national average), 2) Information (3.4 percent below the national average), and 3) Construction (2.6 percent below the national average).



Appendix Figure C: One-Year Growth in Private Employment by Major Industry Sector – 2016 to 2017[5]

Appendix Figure D provides a similar comparison for the most recent five-year (2012 to 2017) growth rates. In this case, out of the 19 major industry sectors shown Illinois out-performed the national average in four and under-performed the national average in 15. Relative to the nation

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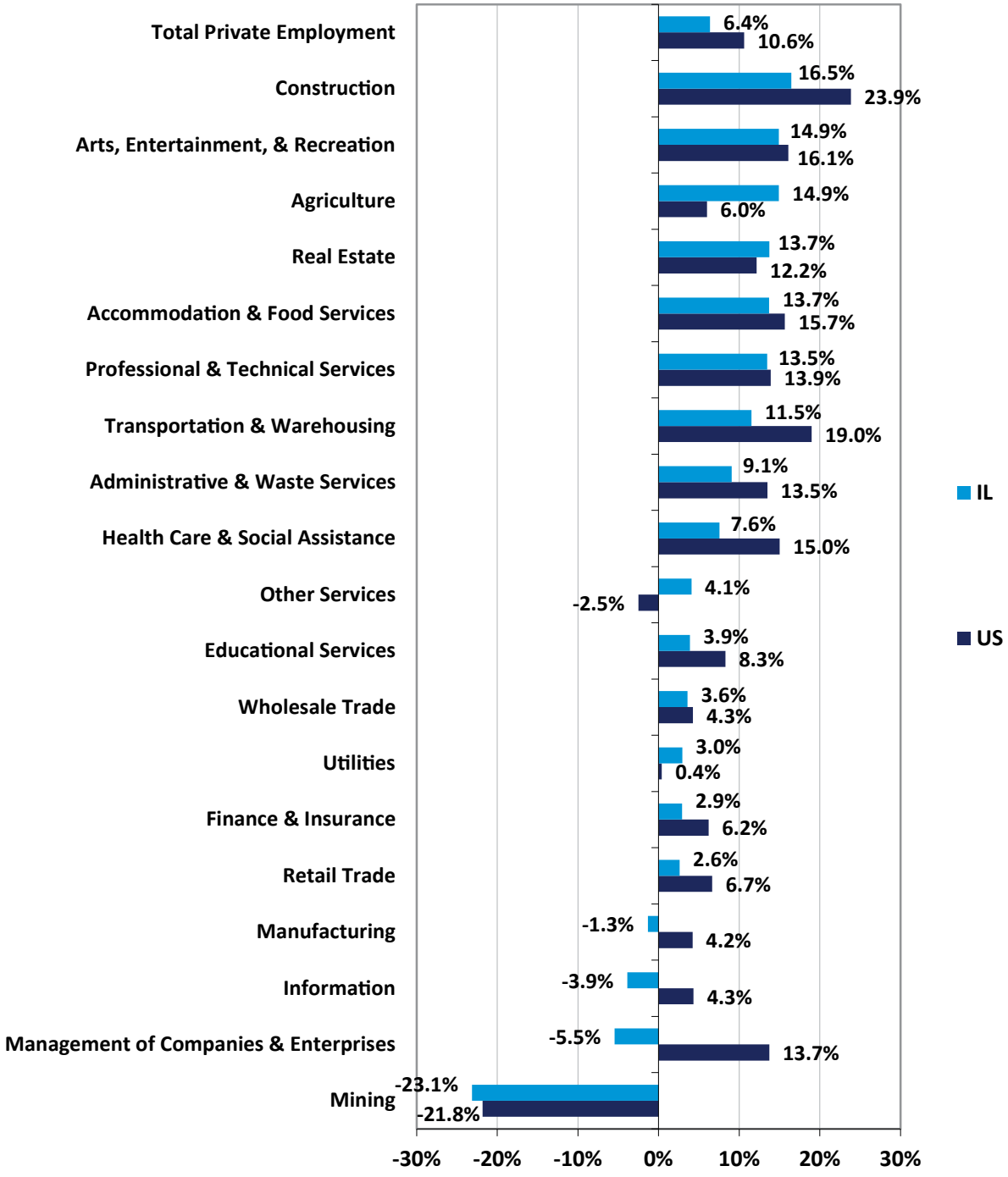
[5] Source: U.S. Bureau of Labor Statistics.

as a whole, Illinois' highest performing sectors over this period were: 1) Agriculture (8.9 percent above the national average), 2) Other Services (6.6 percent above the national average), and 3) Utilities (2.6 percent above the national average). While at the other end of the spectrum, the state's lowest performing industry sectors were: 1) Management of Companies and Enterprises (19.2 percent below the national average), 2) Information (8.2 percent below the national average), and 3) Transportation and Warehousing (7.5 percent below the national average).



Appendix Figure D: Five-Year Growth in Private Sector Employment by Major Industry Sector – 2012 to 2017[6]

[6] Source: U.S. Bureau of Labor Statistics.

DATA CENTER INDUSTRY PROFILE IN ILLINOIS

The data used to create the data center industry profile are from the U.S. Bureau of Labor Statistics and reflect private employment and wages in the Data Processing, Hosting, and Related Services industry. Data Processing, Hosting, and Related Services (NAICS code 518210) is an industry classification within the NAICS code taxonomy that the Bureau of Labor Statistics uses to categorize industry data. Although it is the most narrowly defined classification within the NAICS code taxonomy that encompasses data centers, the reader should be aware that it is not a perfect measure.

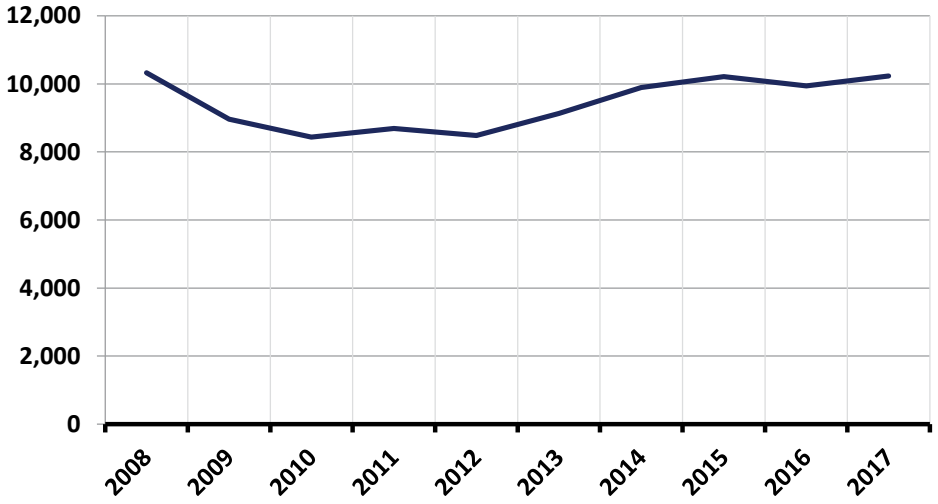
While the Data Processing, Hosting, and Related Services industry classification includes industries that would properly be considered data centers (e.g., Application Hosting, Automated Data Processing Services, Computer Data Storage Services, Data Processing Computer Services, etc.), it also includes a number of industries that would not properly be considered data centers (e.g., Data Entry Services). Moreover, it is known that some data centers do not report their data under the Data Processing, Hosting, and Related Services industry classification.

In addition, to ensure confidentiality, the Bureau of Labor Statistics is required to suppress the public release of data when such release might enable third parties to identify employment and wages in an individual business. Typically, this occurs in smaller or more rural geographies where there are a limited number of businesses in the industry in question.

For these reasons, the industry data presented should correctly be viewed as the best available approximation of data center employment and wages in Illinois, rather than a precise measure of those data. The number of establishments counted in this data most closely approximates the number of tenants of enterprise and colocation data centers.

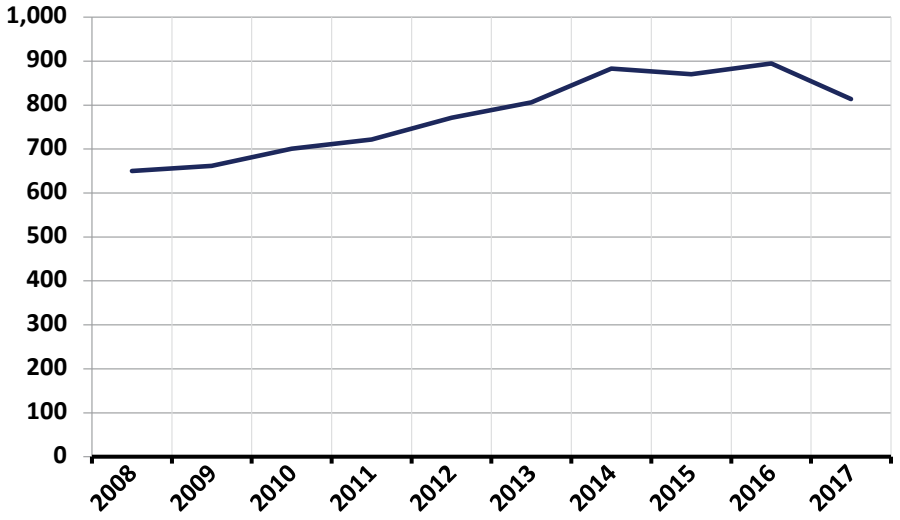
STATEWIDE DATA CENTER TRENDS

Appendix Figure E depicts statewide private sector employment in Illinois' data center industry over the ten-year period from 2008 through 2017. As these data show, employment dipped slightly in 2009 through 2012 and recovered in 2014. Over the period as a whole, data center employment remained essentially flat, declining from 10,327 jobs in 2008 to 10,229 jobs in 2017 (a net loss of 98 jobs, or a 0.9 percent decline in employment, over the period).



Appendix Figure E: Private Sector Employment in the Data Center Industry in Illinois – 2008 to 2017[7]

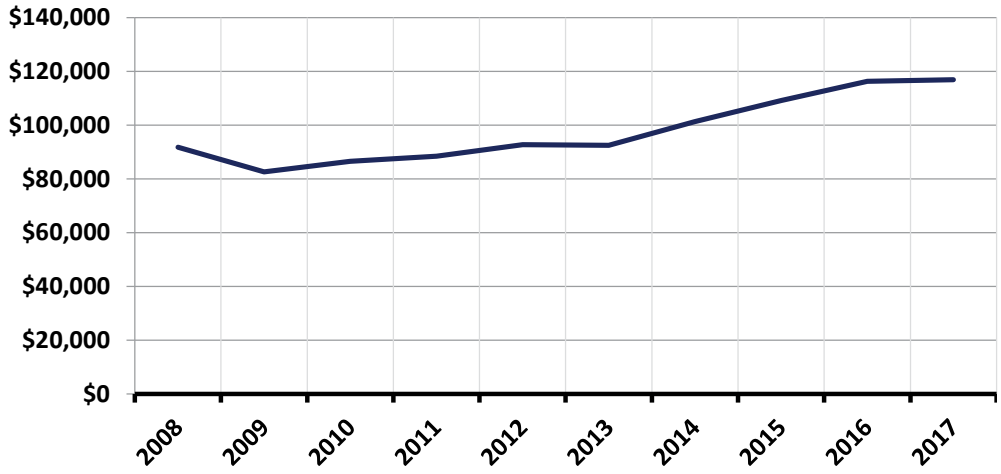
Appendix Figure F provides a comparable look at the trend in private sector establishments in Illinois' data center industry over the same period. Importantly, this data tells a somewhat different story than the employment data in Appendix Figure E. As shown in Appendix Figure F, the number of data center establishments increased from 650 in 2008 to 895 in 2016, and then slipped to 814 in 2017 (a net gain of 164, or a 25.2 percent increase in establishments, over the period).



Appendix Figure F: Private Sector Establishments in the Data Center Industry in Illinois – 2008 to 2017[8]

[7] Source: U.S. Bureau of Labor Statistics.
[8] Source: U.S. Bureau of Labor Statistics.

Appendix Figure G provides a comparable look at the trend in private sector wages in Illinois' data center industry from 2008 through 2017. As shown in this graph, over the period as a whole, average annual wages in the data center industry rose from $91,774 in 2008 to $116,948 in 2017 (a nominal increase of $25,173 or 27.4 percent).



Appendix Figure G: Private Sector Average Annual Wages in the Data Center Industry in Illinois – 2008 to 2017[9]

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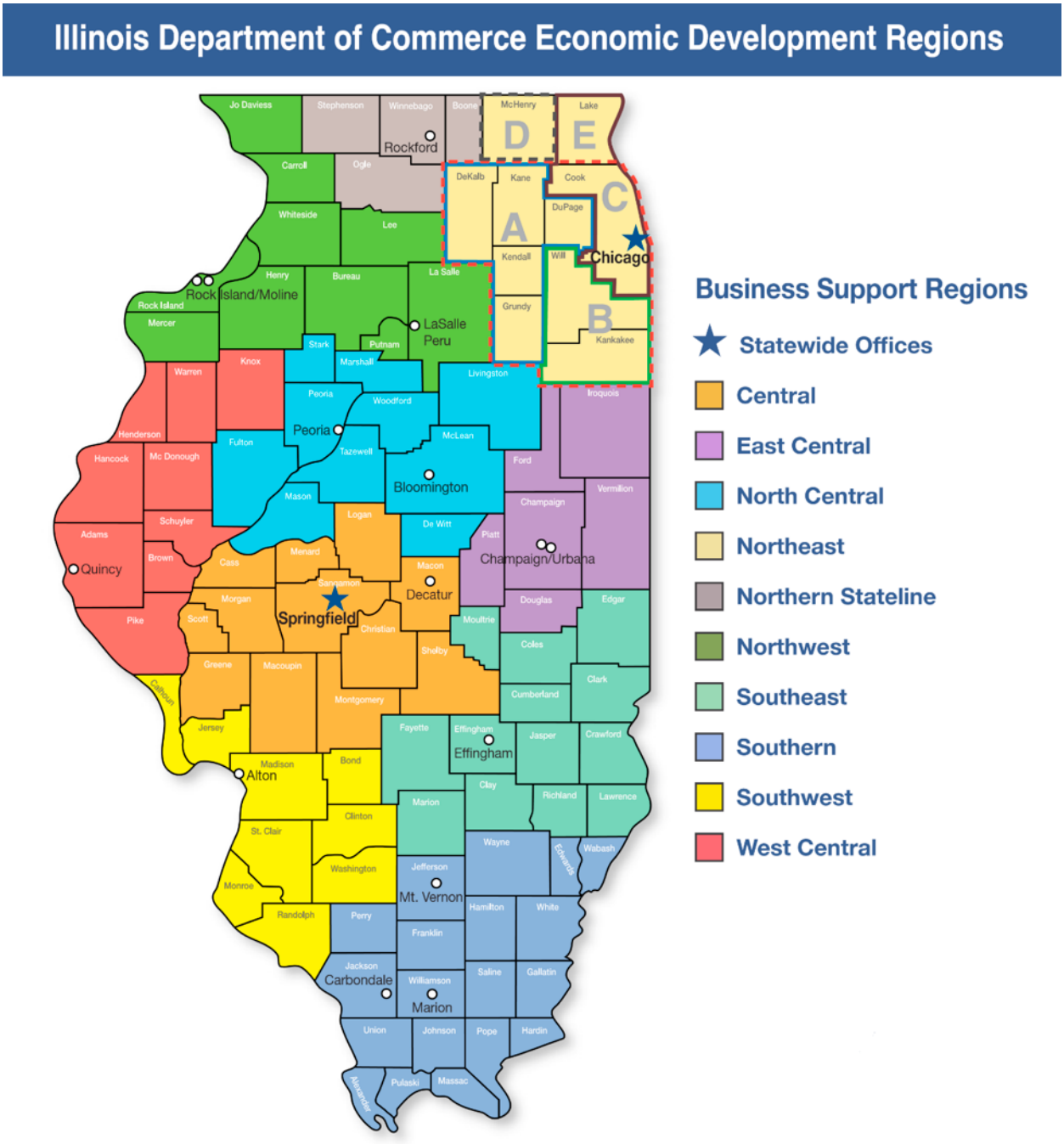
[9] Source: U.S. Bureau of Labor Statistics.

REGIONAL DATA CENTER TRENDS

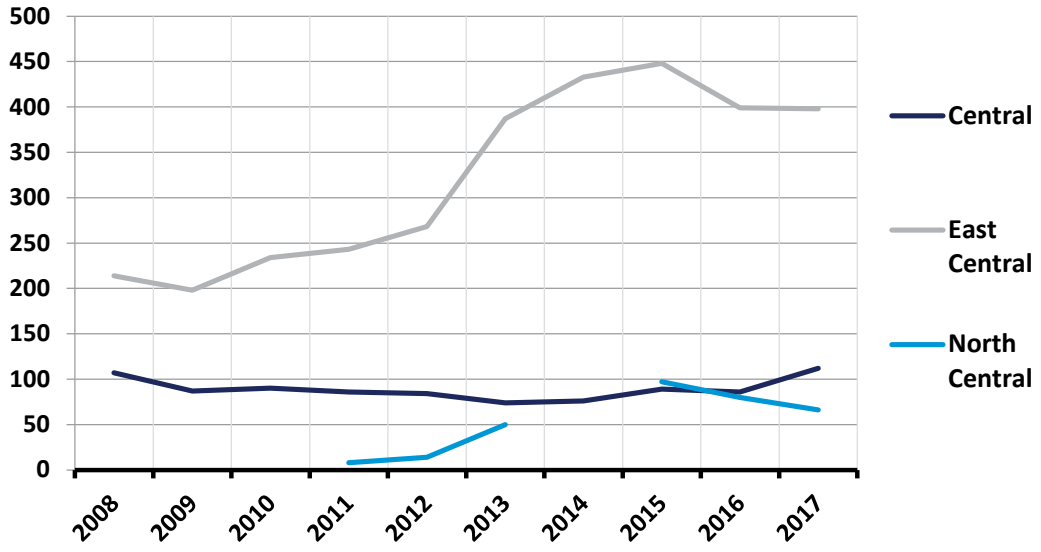
The ten Economic Development Regions used by the Illinois Department of Employment Security and the Illinois Department of Commerce and Economic Opportunity (DCEO) are geographically depicted in the Illinois state map shown in Figure H.



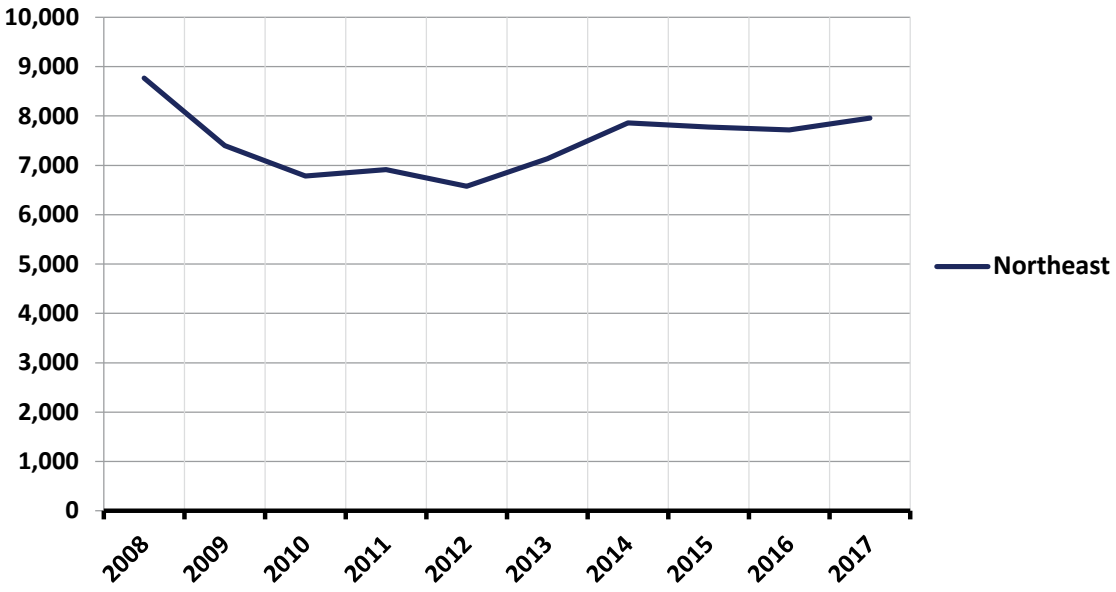
Appendix Figure H: Illinois Department of Commerce Economic Development Regions

The Bureau of Labor Statistics is not allowed to report employment and wages in those instances where public release of those data might enable third parties to identify employment and wages

in an individual business. For that reason, of the 10,229 private sector data center industry jobs that the Bureau of Labor Statistics reported statewide in Illinois in 2017, sub-state data are only available for 8,536 of those jobs.



Appendix Figure I: Regional Private Sector Employment in the Data Center Industry – 2008 to 2017[10]



Appendix Figure J: Regional Private Sector Employment in the Data Center Industry – 2008 to 2017[11]

Appendix Figure K provides comparable data for trends in the number of private sector data center establishments at the regional level from 2008 through 2017. As shown in Appendix Figure K, the number of data center establishments in the Central Region increased from 11 in 2008 to 13 in 2017 (a net gain of two, or 18.2 percent). While in the East Central Region, the number rose from nine in 2008 to 18 in 2017 (a net gain of nine, or 100 percent). And in the

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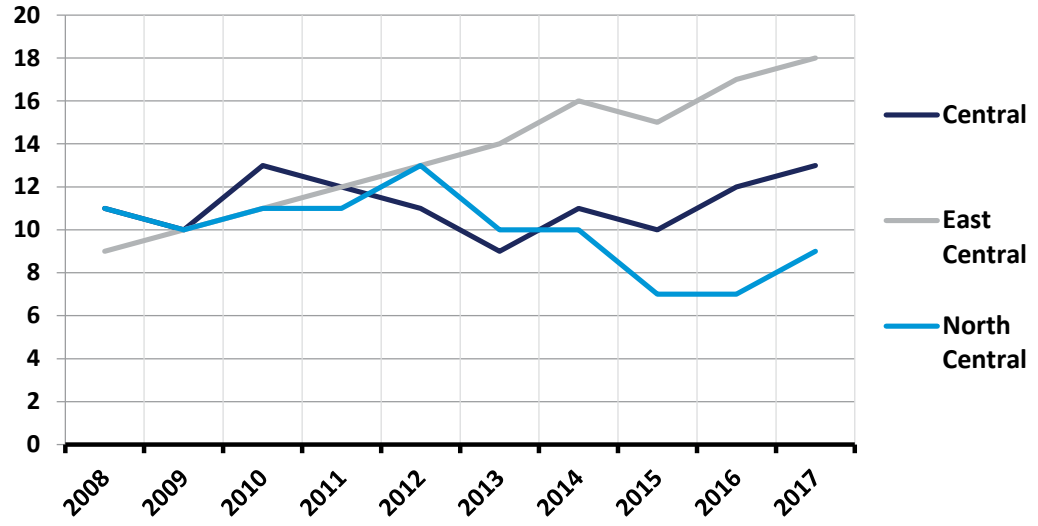
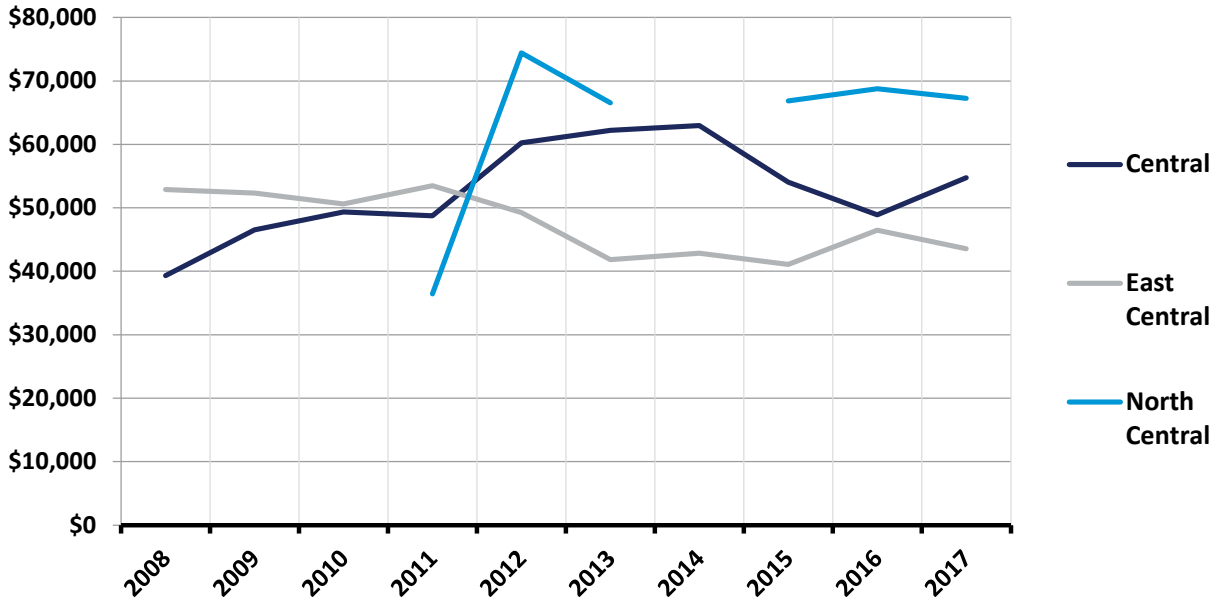
[10] Source: U.S. Bureau of Labor Statistics.
[11] Source: U.S. Bureau of Labor Statistics.

North Central Region, the number of data center establishments declined from 11 in 2008 to nine in 2017 (a net loss of two, or minus 18.2 percent).



Appendix Figure K: Regional Private Sector Data Center Industry Establishments – 2008 to 2017[12]

Finally, Appendix Figure L shows the regional change in average annual private sector wages in the data center industry over the ten-year period from 2008 through 2017. As shown in Appendix Figure L, average annual wages in the data center industry in the Central Region increased from $39,322 in 2008 to $54,764 in 2017 (a nominal increase of $15,442 or 39.3 percent). Average annual wages in the East Central Region declined from $52,871 in 2008 to $43,558 in 2017 (a nominal decline of $9,313 or minus 17.6 percent). Where average annual wages in the North Central Region were not reported in four years of the period and came in at $67,276 in 2017.



Appendix Figure L: Regional Private Sector Employment in the Data Center Industry – 2008 to 2017[13]

[12] Source: U.S. Bureau of Labor Statistics.
[13] Source: U.S. Bureau of Labor Statistics.

Economic and Fiscal Impact Contribution

METHOD

To empirically evaluate the statewide and regional economic and fiscal impact attributable to the data center industry, we employ a commonly used regional economic impact model called IMPLAN.[14] The IMPLAN model uses regional and national production and trade flow data to construct region- and industry-specific economic multipliers and uses these multipliers to quantify economic impact. For purposes of this analysis, we have further customized these internal IMPLAN assumptions based on confidential data provided by a subset of data center firms to ensure that the specific model specifications we use reflect as closely as possible actual conditions within the data center industry. These confidential data are not published in nor otherwise used in this report.

Economic multipliers measure the ripple effects that an expenditure has as it makes its way through the economy. For example, when data centers purchase goods and services and data center employees use their salaries and wages to make household purchases that generates income for someone else, which is in turn spent, generating income for someone else, and so on, and so on. Through this process, one dollar in expenditures generates multiple dollars of income. The mathematical relationship between the initial expenditure and the total income generated is the economic multiplier.

The economic result of these ripple effects is called indirect impact when it refers to business to business transactions and induced impact when it refers to employee to business transactions. In the analysis that follows, we also provide estimates for four categories of impact. The first is employment - the number of jobs that are created. The second is labor income - the salaries and wages associated with those jobs. The third is economic output - the total amount of economic activity that is created in the economy. The fourth is fiscal impact - the total tax dollars that are generated by that economic activity.

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[14] IMPLAN Pro is produced by IMPLAN Group, LLC. The IMPLAN model is the widely used for economic impact analyses.

Illinois

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	10,229	$1,165,204,010	$3,068,709,137
Total 2nd Round Indirect and Induced Economic Activity*	21,269	$1,205,604,453	$4,071,949,055
Operations	19,848	$1,120,047,679	$3,854,958,668
Construction	1,421	$85,556,774	$216,990,387
TOTAL Economic Activity*	**31,498**	**$2,370,808,463**	**$7,140,658,192**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact*	**$321,678,072**	**$555,799,910**	**$877,477,982**

**May not sum due to rounding.*

Appendix Table 1: Estimated Economic and Fiscal Impact of the Data Center Industry on Illinois in 2017 (2018 dollars)

Appendix Table 2 details the top 10 industries within Illinois that received the largest economic benefit from this economic activity in 2017.

Industry	FTE Employment	Labor Income	Output
Data processing, hosting, and related services	10,288	$1,171,944,047	$3,086,459,859
Real estate	2,266	$78,569,427	$546,063,387
Investigation and security services	1,738	$61,275,506	$94,682,730
Business and professional associations	984	$94,825,400	$236,312,461
Employment services	931	$36,119,766	$71,141,194
Construction of new power and communication structures	848	$53,302,366	$122,356,257
Full-service restaurants	804	$20,708,574	$42,546,496
Hospitals	630	$48,367,851	$101,114,354
Limited-service restaurants	610	$13,035,386	$55,291,135
Electric power transmission and distribution	404	$67,616,993	$589,342,765

Appendix Table 2: Top 10 Industries Affected by the Data Center Industry in Illinois in 2017 (2018 dollars)

Central Economic Development Region[15]

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	112	$5,052,624	$25,628,062
Total 2nd Round Indirect and Induced Economic Activity	120	$5,396,617	$21,593,202
Operations	120	$5,396,617	$21,593,202
Construction	N/A	N/A	N/A
TOTAL Economic Activity	**232**	**$10,449,241**	**$47,221,264**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact	**$2,101,409**	**$2,431,562**	**$4,532,971**

Appendix Table 3: Estimated Economic and Fiscal Impact of the Data Center Industry on the Central Economic Development Region in 2017 (2018 dollars)

Industry	FTE Employment	Labor Income	Output
Data processing, hosting, and related services	112	$5,071,767	$25,725,160
Employment services	12	$366,942	$770,481
Real estate	10	$218,564	$1,557,361
Business and professional associations	10	$816,636	$2,113,295
Full-service restaurants	6	$109,117	$271,269
Investigation and security services	5	$119,474	$207,995
Electric power transmission and distribution	4	$476,618	$5,383,752
Limited-service restaurants	4	$59,275	$291,017
Hospitals	3	$216,003	$496,755
Monetary authorities and depository credit intermediation	2	$138,563	$551,986

Appendix Table 4: Top 10 Industries Affected by the Data Center Industry in the Central Economic Development Region in 2017 (2018 dollars)

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[15] The Central Region is comprised of the counties of the counties of Cass, Christian, Greene, Logan, Macon, Macoupin, Menard, Montgomery, Morgan, Sangamon, Scott, and Shelby.

East Central Economic Development Region[16]

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	398	$25,455,289	$98,863,289
Total 2nd Round Indirect and Induced Economic Activity*	430	$20,065,257	$76,308,052
Operations	430	$20,065,257	$76,308,052
Construction	N/A	N/A	N/A
TOTAL Economic Activity*	**828**	**$45,520,546**	**$175,171,341**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact*	**$6,673,197**	**$10,238,696**	**$16,911,893**

*May not sum due to rounding.

Appendix Table 5: Estimated Economic and Fiscal Impact of the Data Center Industry on the East Central Economic Development Region in 2017 (2018 dollars)

Industry	FTE Employment	Labor Income	Output
Data processing, hosting, and related services	402	$25,693,111	$99,786,941
Real estate	49	$1,372,401	$9,980,409
Business and professional associations	38	$2,231,733	$6,175,475
Investigation and security services	29	$1,607,602	$2,222,889
Full-service restaurants	23	$458,016	$1,085,692
Employment services	22	$629,583	$1,345,716
Limited-service restaurants	14	$280,431	$1,188,436
Hospitals	13	$693,858	$1,696,779
Electric power transmission and distribution	10	$1,313,350	$13,661,611
Wholesale trade	8	$548,834	$1,820,542

Appendix Table 6: Top 10 Industries Affected by the Data Center Industry in the East Central Economic Development Region in 2017 (2018 dollars)

[16] The East Central Region is comprised of the counties of Champaign, Douglas, Ford, Iroquois, Piatt, and Vermillion.

North Central Economic Development Region[17]

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	66	$4,230,496	$16,394,556
Total 2nd Round Indirect and Induced Economic Activity*	86	$4,059,627	$15,158,853
Operations	86	$4,059,627	$15,158,853
Construction	N/A	N/A	N/A
TOTAL Economic Activity*	**152**	**$8,290,123**	**$31,553,409**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact*	**$1,358,256**	**$1,902,867**	**$3,261,123**

*May not sum due to rounding.

Appendix Table 7: Estimated Economic and Fiscal Impact of the Data Center Industry on the North Central Economic Development in 2017 (2018 dollars)

Industry	FTE Employment	Labor Income	Output
Data processing, hosting, and related services	66	$4,244,939	$16,450,530
Real estate	8	$141,801	$1,283,556
Investigation and security services	7	$269,109	$410,359
Business and professional associations	6	$436,604	$1,167,806
Full-service restaurants	5	$88,844	$211,604
Employment services	4	$247,590	$448,776
Limited-service restaurants	3	$47,643	$226,784
Hospitals	3	$178,842	$400,959
Electric power transmission and distribution	2	$351,434	$3,424,013
Services to buildings	2	$36,638	$74,014

Appendix Table 8: Top 10 Industries Affected by the Data Center Industry in the North Central Economic Development Region in 2017 (2018 dollars)

MANGUM economics

[17] The North Central Region is comprised of the counties of DeWitt, Fulton, Livingston, McLean, Marshall, Mason, Peoria, Stark, Tazewell, and Woodford

Northeast Economic Development[18]

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	7,960	$961,117,197	$2,444,243,128
Total 2nd Round Indirect and Induced Economic Activity*	16,887	$1,001,616,565	$3,233,608,894
Operations	15,513	$914,210,880	$3,017,150,404
Construction	1,374	$87,405,685	$216,458,490
TOTAL Economic Activity*	**24,847**	**$1,962,733,762**	**$5,677,852,022**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact*	**$246,423,101**	**$455,903,035**	**$702,326,136**

*May not sum due to rounding.

Appendix Table 9: Estimated Economic and Fiscal Impact of the Data Center Industry on the Northeast Economic Development Region in 2017 (2018 dollars)

Industry	FTE Employment	Labor Income	Output
Data processing, hosting, and related services	8,010	$967,189,284	$2,459,685,218
Real estate	1,906	$72,993,941	$494,741,070
Investigation and security services	1,555	$55,171,320	$85,102,698
Construction of new power and communication structures	820	$54,110,709	$122,356,257
Business and professional associations	723	$73,054,852	$180,655,609
Employment services	711	$28,104,686	$55,080,440
Full-service restaurants	626	$17,738,462	$34,732,840
Hospitals	496	$40,673,750	$82,626,403
Limited-service restaurants	456	$10,693,490	$43,283,278
Services to buildings	292	$7,576,546	$13,020,594

Appendix Table 10: Top 10 Industries Affected by the Data Center Industry in the Northeast Economic Development Region in 2017 (2018 dollars)

[18] The Northeast Region is comprised of the counties of Cook, DeKalb, DuPage, Grundy, Kane, Kankakee, Kendall, Lake, McHenry, and Will

Other Contributions

CLUSTER DEVELOPMENT

In the modern economy, one of the key resources that drives economic location decisions is access to a skilled workforce. This is particularly true of technology firms for which human capital is often their most critical resource need. As a result, technology industries with similar workforce requirements tend to cluster together to take advantage of the same pool of highly-skilled workers, in the same way that manufacturers have traditionally clustered together to take advantage of a common natural resource.

Appendix Table 11 lists the top ten key occupations in the data center industry that collectively account for almost two-fifths of all employment in that industry. These data are taken from a national industry staffing matrix produced by the U.S. Bureau of Labor Statistics and reflect estimated industry-level staffing patterns in 2016.

Occupation	Typical Degree Level	% of Industry Employment
Software developers, applications	BA	7.9%
Computer user support specialists	Some College	6.6%
Computer systems analysts	BA	5.9%
Software developers, systems software	BA	4.5%
Computer network support specialists	Associate's	3.0%
Computer and information systems managers	BA	2.9%
Network and computer systems administrators	BA	2.6%
Computer programmers	BA	2.3%
Web developers	Associate's	1.7%
Computer network architects	BA	1.7%

Appendix Table 11: Top Ten Key Occupations in the Data Center Industry[19]

MANGUM economics

[19] Source: U.S. Bureau of Labor Statistics. We define the data center industry as Data Processing, Hosting, and Related Services (NAICS 518210).

Based on that same staffing matrix, Appendix Table 12 lists the top industries nationally, that employ a large proportion of individuals in these ten key occupations. In addition, the table also lists the average annual private sector wage for each of these industries in 2017 in the Northeast Economic Development Region for which the Bureau of Labor Statistics reported non-trivial employment levels in the Region that year. Appendix Table 12 also compares each industry wage to the average wage across all private sector industries in the region that year. As these data show, the industries that most heavily draw from the same pool of skilled workers as data centers are, like that industry, very high paying industries. More specifically, they pay wages that on average are 180 percent above the prevailing private sector wage in the Northeast Region.

Industry	Avg. Private Sector Annual Wage in 2017	As a % of the Avg. Private Sector Annual Wage Across all Industries in 2017
Activities related to credit intermediation	$80,609	129%
Audio and video equipment manufacturing	$115,551	185%
Communications equipment manufacturing	$96,010	154%
Computer and peripheral equipment manufacturing	$96,567	154%
Computer systems design and related services	$110,753	177%
Data processing, hosting, and related services	$123,391	197%
Insurance Carriers	$115,630	185%
Management of companies and enterprises	$132,916	213%
Manufacturing and reproducing magnetic and optical media	$114,540	183%
Navigational, measuring, electromedical, and control instruments manufacturing	$93,296	149%
Other information services	$118,001	189%
Other telecommunications	$105,251	168%
Professional and commercial equipment and supplies merchant wholesalers	$102,548	164%
Research and development in the physical, engineering, and life sciences	$123,154	197%
Securities and commodity exchanges	$206,853	331%
Software publishers	$111,157	178%
Wired telecommunications carriers	$85,310	140%
Wireless telecommunications carriers (except satellite)	$89,747	148%

Appendix Table 12: Top Industries in the Northeast Region Employing the Occupations listed in Table 12

The question remains, however, whether these industries actually do cluster together to take advantage of a common workforce pool. Appendix Table 13 provides the answer to that question.

Focusing again on the Northeast Economic Development Region, Appendix Table 13 lists the regional employment location quotient for each of the 18 industries listed in Appendix Table 12 for which the Bureau of Labor Statistics reported non-trivial employment in the Northeast Region in 2017.

A location quotient measures the size of an industry's employment footprint in an area relative to what one would otherwise expect based on the nationwide norm. If the location quotient is greater than 1.0, that indicates that the industry's employment footprint is larger than would be expected, and if it is less than 1.0 that indicates it is smaller than would be expected.

As the data presented in Appendix Table 13 indicate, seven of the 18 industries for which location quotients can be computed have an employment footprint in the Northeast Economic Development Region that is larger than one would expect based on the nationwide norm. In short, these data are consistent with the hypothesis that the data center industry is a high paying industry that makes a region more attractive to other high paying industries that must draw from the same pool of highly-skilled workers.

Industry	Location Quotient in Region 4
Activities related to credit intermediation	**1.1**
Audio and video equipment manufacturing	**1.6**
Communications equipment manufacturing	1.0
Computer and peripheral equipment manufacturing	0.2
Computer systems design and related services	1.0
Data processing, hosting, and related services	0.8
Insurance Carriers	1.0
Management of companies and enterprises	**1.1**
Manufacturing and reproducing magnetic and optical media	0.4
Monetary authorities-central bank	N/A
Navigational, measuring, electromedical, and control instruments manufacturing	0.8
Other information services	**1.2**
Other telecommunications	0.7
Professional and commercial equipment and supplies merchant wholesalers	**1.3**
Research and development in the physical, engineering, and life sciences	0.7
Satellite telecommunications	N/A
Securities and commodity exchanges	**16.4**
Software publishers	0.3
Wired telecommunications carriers	0.9
Wireless telecommunications carriers (except satellite)	**1.2**

Appendix Table 13: Northeast Region Employment Location Quotients for the Top Industries listed in Appendix Table 12

Policy Considerations

SITING CONSIDERATIONS

Data center location choices generally depend on several main factors: the availability and price of electricity, fiber optic networks, and real estate; the availability of water; the lack of exposure to environmental risks (earthquakes, hurricanes, etc.); and business climate, including the availability of skilled labor and taxes.[20] In the short run, it is difficult for a locality to change most of those factors. However, taxes are the easiest to affect as a matter of policy, and the enactment and updating of state tax policies and incentives often has a significant impact on data center location decisions.

INCENTIVES VARY AMONG STATES

Appendix Table 14 provides additional details on the data center incentives offered by each state.[21] The most obvious take away from this lengthy table is that although the majority of states in the U.S. have enacted data center tax incentives, there is remarkable variation in the exact specifications and requirements to secure the incentive in each state. The laws are lengthy legal documents and more complex than the table can accommodate. Therefore, the table should only be considered as an initial aid to learning about the state tax incentives. Readers will need to consult the details of the incentive in any state of interest.

[20] Washington State Department of Commerce, State of the Data Center Industry: An Analysis of Washington's Competitiveness In This Fast-Growing High-Tech Field, January 2018.

[21] States that only offer general business incentives for which data centers could qualify for are not included in this list.

State	Year Enacted or Revised	Latest Version of Incentive	Minimum Jobs	Minimum Investment
Alabama[22]	2012	Sales and use tax abatement for construction and data center equipment for 10-30 years depending on investment level.	20 new jobs in each category, paying at least $40,000 annually.	*10 year exemption:* Up to $200 million within 10 years; *20 year exemption:* $200-$400 million within 10 years; *30 year exemption:* >$400 million within 20 years.
Arizona[23]	2013	Sales and use tax exemption on equipment for up to 10 years (20 years if qualified as Sustainable Redevelopment Project).	n/a	$50 million within 5 years in the 2 largest counties; $25 million within 5 years in the other counties.
Florida[24]	2017	Sales and use tax exemption on infrastructure, equipment, personal property, software, and electricity used for new facilities with total critical IT load of 15MW or higher and at least 1MW or higher dedicated power capacity (IT load) for each tenant.	n/a	$150 million
Georgia[25]	2018	Sales and use tax exemption for single-tenant data centers or clients on purchase of data center equipment and software.	n/a	$15 million in any year.
		Tiered sales and use tax exemption on equipment used in colocation high-tech data centers.	n/a	*Over 7 years:* $250 million in counties with more than 50,000 people $150 million in counties with 30,000 to 50,000 people $100 million in counties with less than 30,000 people

Appendix Table 14 (Part 1 of 5): State Incentives Specifically for Data Centers

[22] Data Processing Center Economic Incentive Act. Alabama Taxes and Incentives.
[23] Arizona Commerce Authority. Computer Data Center Program.
[24] Florida House of Representatives. HB 7109, 2017 Legislature.
[25] Georgia Rules and Regulations. Rule 560-12-2-.107. Computer Equipment and Amendment to Code Section 48-8-3 of the Official Code of Georgia Annotated.

State	Year Enacted or Revised	Latest Version of Incentive	Minimum Jobs	Minimum Investment
Indiana[26]	2012	Property tax exemptions in designated high technology district areas.	125% of average county wage.	$10 million investment
Iowa[27]	2007	50 or 100% refund on sales and use taxes paid on equipment and/or power based on level of investment. State has no property tax on equipment.	n/a	*100% refund:* $200 million in 6 years, 5,000sf building. *50% refund:* <$200 million.
Kentucky[28]	2009	Refund of sales and use taxes paid on purchase and operation of equipment. General state incentives with lower investment limits exist for smaller scale data centers.	n/a	$100 million.
Michigan[29]	2015	Sales and use tax exemption on data center equipment, software, and certain power equipment from 2016 potentially* through 2035.	*To extend the exemption past January 1, 2022, the data center industry in Michigan as a whole must add 400 new jobs by 2022, and a total of 1,000 new jobs by 2026.	n/a
Minnesota[30]	2012	Sales tax exemption for 20 years on equipment, energy use and software.	n/a	$30 million investment in four years on 25,000 sq. ft
Mississippi[31]	2010	Sales tax exemption on computing equipment (new and replacement), software, and construction materials.	50 new jobs paying 150% of the average state wage.	$50 million.
Missouri[32]	2015	State and local sales tax exemption on utilities, machinery, equipment, and construction materials for a max. amount of 10 years (existing) or 15 years (new facility).	*Existing facility:* 5 new jobs within 2 years. *New facility:* 10 new jobs within three years. Both require average wages of at least 150% of county average.	*Existing facility:* $5 million within one year. *New facility:* $25 million within 3 years.

Appendix Table 14 (Part 2 of 5): State Incentives Specifically for Data Centers

[26] Indiana Code. Enterprise information technology equipment. (IC 6-1.1-10-44)
[27] Iowa Streamlined Sales and Use Tax Act 423.3 and Iowa Economic Development Data Center Fact Sheet.
[28] Kentucky Legislature. Sales and Use Tax Refund, 139.534
[29] State of Michigan Department of Treasury. Notice Regarding Data Center Exemption.
[30] Minnesota Employment & Economic Development - Data Center Sales Tax Incentive.
[31] Mississippi Incentives. Data Centers.
[32] Data Storage Center Exemption Guidelines. Missouri Department of Economic Development.

State	Year Enacted or Revised	Latest Version of Incentive	Minimum Jobs	Minimum Investment
Montana[33]	2017	Data center facilities of at least 300,000 square feet classified as Class seventeen properties are taxed at 0.9 percent of their market value, for a period of 15 years from the start of construction (after June 30, 2017, and before July 1, 2027). Montana also has no state sales tax.	n/a	$150 million in land and infrastructure.
Nebraska[34]	2012	A complex tiered scheme of incentives including a sales tax refund and investment and compensation credits tied to job creation and investment levels.	30 new jobs paying 60% of the average state wage.	*Lowest tier:* $3 million *Large data center tier:* $200 million
Nevada[35]	2015	Partial property tax reduction of up to 75% and reduction of sales and use tax on purchase of eligible machinery and equipment to 2% (equals a near 75% reduction in most jurisdictions). For 10 or 20 years.	*10 year reduction:* 10 new jobs paying average state wage, created within five years and maintained for 10 years. *20 year reduction:* 50 jobs, maintained for 20 years	*10 year reduction:* $25 million *20 year reduction:* $100 million.
New Mexico[36]	2011	Receipts from web hosting service may be deducted from gross receipts.	n/a	n/a
New York[37]	2000	Sales and compensating use tax exemption on data center equipment, software, cooling and power equipment and select services provided for high-security facilities offering uninterrupted access and continuous traffic management for web pages.	n/a	n/a
North Carolina[38]	2015	Sales tax exemption for data center equipment and electricity for use at a qualifying data center.	Must meet wage and health insurance requirements that are recalculated annually.	$75 million.
North Dakota[39]	2015	Sales tax exemption on equipment and software for the first four data centers of 16,000 sq. ft. approved by the state before 2020.	10 new jobs with averages wages of at least 150% of county average within three years.	$25 million (within three years).
Ohio[40]	2013	Partial or full sales-tax exemption on the purchase of eligible data center equipment.	At least $1.5 million per year in payroll for 3 years.	$100 million investment within 3 years.

Appendix Table 14 (Part 3 of 5): State Incentives Specifically for Data Centers

[33] Montana SB 359. Property Tax Incentives for Qualified Data Centers.
[34] Nebraska Advantage Act.
[35] Data Center Tax Abatement - Nevada Governor's Office of Economic Development.
[36] New Mexico Statutes. Gross Receipts Tax. Section 7-9-56.2.
[37] New York Sales and Use Tax Exemption for Operators of Internet Data Centers. TSB-M-00(7)S.
[38] North Carolina Data Center Sales and Use Tax Exemptions.
[39] Sales Tax Summary (Chapter 57-39.2). North Dakota Office of State Tax Commissioner.
[40] Ohio Administrative Code. Data Center Sales and Use Tax Exemption – 122.175.

State	Year Enacted or Revised	Latest Version of Incentive	Minimum Jobs	Minimum Investment
Oklahoma[41]	1993	Sales tax exemption on computer equipment used by establishments with 80% annual gross revenue from outside of the state.	n/a	n/a
Oregon[42]	2015	Exemption from property tax law's "central assessment" structure (taxing properties based on brand value). State has no sales tax.	n/a	Tangible property of all of company's data centers in state is at least $200 million.
Pennsylvania[43]	2016	Sales and use tax refunds for capital investments in data center equipment for up to 10 years (tenant) or up to 15 years (owner). Total refund approved for all applicants is limited to $5 million annually; if exceeded, total is allocated among all applicants.	$1 million in annual employee compensation	$25 million or $50 million depending on county population.
South Carolina[44]	2012	Sales and use tax exemption on purchases including data center equipment, software, and electricity.	25 new jobs paying 150% of the average wage.	$50 million investment within 5 years
Tennessee[45]	2016	Sales tax exemption for computer, software, peripheral devices, cooling equipment, and backup power infrastructure. Plus a reduced electricity tax rate set at 1.5%.	15 new full-time permanent jobs paying at least 150% of the average state wage with minimal health care.	$100 million.
Texas[46]	2013	Sales and use tax exemption on purchases including data center equipment, software, and electricity for 10-20 years depending on investment level.	*10-15 year exemption:* 20 jobs *20-year exemption:* 40 jobs Both require at least 120% of the average local wage.	*10-year exemption:* $200-250 million, 100,000 sf within 5 years; *15-year exemption:* >$250 million; *20-year exemption:* >500 million and 250,000 sf facility.
Utah[47]	2016	Sales tax exemption for data center machinery, equipment and replacementparts with one year or more of economic life.	n/a	n/a

Appendix Table 14 (Part 4 of 5): State Incentives Specifically for Data Centers

[41] Oklahoma Business Incentives and Tax Guide.
[42] Oregon Legislative Assembly. Senate Bill 611.
[43] Computer Data Center Equipment Incentive Program Guidelines. Commonwealth of Pennsylvania.
[44] South Carolina Tax Incentives for Economic Development. SC Department of Revenue.
[45] Changes in Requirements for a Qualified Data Center. Tennessee Department of Revenue, July 2016.
[46] Texas Statutes. Property Used in Certain Data Centers. Sec. 151.359 and State Sales Tax Exemption, Texas Comptroller.
[47] Utah Code Section 59-12-104. Sales and Use Tax Exemptions.

State	Year Enacted or Revised	Latest Version of Incentive	Minimum Jobs	Minimum Investment
Virginia[48]	2018	Sales and use tax exemption on data center equipment, software, cooling and power equipment. Data center computer equipment and peripherals have a special classification allowing for special method of valuation by localities for personal property tax valuation.	50 jobs paying 150 percent of average local wage. (25 jobs in rural or high unemployment areas). n/a	$150 million. n/a
Washington[49]	2015	Sales and use tax exemption in rural counties only for server equipment and labor to install in an eligible data center as well as power infrastructure, and labor and services to construct, install, repair, alter, or improve eligible power infrastructure and survey building.	n/a	100,000 sq. ft. building.
West Virginia[50]	2009	Sales and use tax exemption for data center equipment, software, and construction costs. Personal property (equipment and tangible personal property) valued at 5% of original cost.	n/a	n/a
Wisconsin[51]	1999	Property tax exemption on computer equipment.	n/a	n/a
Wyoming[52]	2011	Sales and use tax exemption on data center equipment purchases. Cooling and power equipment also eligible for exemption with $50 million investment threshold. Data Center Permit Exemption for mega data center. Managed Data Center Cost Reduction Program – grant of up to $2.25 million to reimburse utility expenses for power/ broadband over 3 years; tied to investment, job creation and wage levels.	*Managed Data Center Cost Reduction Program:* Business must create a match of at least 125% of the grant amount in payroll (at least 50% of match) and capital expenditure. Payroll to be greater than 150% of the county's median wage.	*Sales and use tax exemption:* $5 million in infrastructure plus at least $2 million in data center equipment in one year. $50 million in infrastructure plus at least $2 million in equipment.

Appendix Table 14 (Part 5 of 5): State Incentives Specifically for Data Centers

[48] Virginia Data Center Sales and Use Tax Exemption and Virginia Acts of Assembly – 2018 Session, Chapter 292. Approved March 9, 2018.
[49] Washington State Department of Revenue Tax Incentives Overview.
[50] West Virginia Data Center Incentives and High-Technology Business Property Valuation Act.
[51] Guide to Wisconsin Assessment of Personal Property Located at But Not Owned by a Manufacturer.
[52] Wyoming Business Council. Built for Data Centers.

BUSINESS CLIMATE AND TAXES

After being downgraded by Moody's to a credit rating of Baa3 in June 2017, Illinois now has the lowest rating ever for a U.S. state, "most of which are rated at least eight notches higher".[53]

State	Credit Rating
Illinois	BBB/Baa3/BBB-
Indiana	AAA/Aaa/AAA
Iowa	AAA/Aaa/AAA
Missouri	AAA/Aaa/AAA
Wisconsin	AA+/Aa1/AA

Appendix Table 15: Credit Ratings[54]

Electricity Costs

One of Illinois' greatest strengths is access to competitively priced energy and an abundance of renewable energy resources, which are important considerations for data centers. As of the second Quarter 2018, Illinois ranked number 19 in terms of energy affordability, with an average industrial electricity rate of 6.46 cents per kWh. For comparison, competitor states Iowa, Indiana, Missouri, and Wisconsin ranked 20th, 28th, 32nd, and 35th respectively. Illinois' rate is also below the average rates in the East North Central region (6.96 cents/kWh) and the U.S. average (6.86 cents/kWh).[55]

	Rate (cents per kWh)	Rank
United States	6.86	-
East North Central	6.96	-
Illinois	6.46	19
Iowa	6.58	20
Indiana	7.14	28
Missouri	7.37	32
Wisconsin	7.61	35

Appendix Table 16: Average Electric Industrial Rates, 2nd Quarter 2018[56]

[53] Forbes 2018 Best State for Business. Illinois Profile.
[54] General Obligation Bond Ratings. Fitch Ratings, Moody's Investors Service, and Standard & Poor's.
[55] Source: U.S. Energy Information Administration.
[56] Source: U.S. Energy Information Administration.

Illustrations of the Development Potential of Data Centers

It is worth considering what the potential economic impact could be if Illinois were to enact a data center incentive that put the areas of the state beyond the Chicago area on par with similar areas in Missouri, Iowa, Wisconsin, and Indiana. Some of the special features of Chicago, like its large population, the high-speed financial trading businesses, and other businesses that need very low latency between data storage and data users, will always provide some demand for data centers in Cook County. But, except for the tax considerations, other locations in Illinois are extremely comparable to areas in Iowa, for example, where large data centers have been located.

THE ECONOMIC AND FISCAL IMPACT IN BOND COUNTY

Appendix Table 17 details the potential effect of a large data center being constructed in Bond County in 2018.

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	2,580	$118,866,357	$286,317,259
Operations	50	$2,318,442	$11,491,752
Construction	2,530	$116,547,915	$274,825,507
Total 2nd Round Indirect and Induced Economic Activity	689	$19,831,868	$82,507,678
Operations	33	$954,635	$3,491,564
Construction	656	$18,877,233	$79,016,114
TOTAL Economic Activity	**3,270**	**$138,698,224**	**$368,824,937**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact	**$13,437,708**	**$25,508,500**	**$38,946,208**

Appendix Table 17: Estimated Economic and Fiscal Impact of a Potential New Large Data Center on Bond County

THE ECONOMIC AND FISCAL IMPACT IN KANE COUNTY

Appendix Table 18 details the potential effect of a large data center being constructed in Kane County in 2018.

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	1,848	$123,517,425	$287,617,889
Operations	50	$3,469,110	$12,691,457
Construction	1,798	$120,048,315	$274,926,432
Total 2nd Round Indirect and Induced Economic Activity	896	$42,050,674	$132,572,856
Operations	51	$2,218,549	$7,194,884
Construction	844	$39,832,125	$125,377,972
TOTAL Economic Activity	**2,744**	**$165,568,099**	**$420,190,744**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact	**$15,680,006**	**$38,150,979**	**$53,830,985**

Appendix Table 18: Estimated Economic and Fiscal Impact of a Potential New Large Data Center on Kane County

THE ECONOMIC AND FISCAL IMPACT IN MCLEAN COUNTY

Appendix Table 19 details the potential effect of a large data center being constructed in McLean County in 2018.

Economic Impact	Employment	Labor Income	Output
Total 1st Round Direct Economic Activity	2,138	$121,880,400	$286,507,143
Operations	50	$3,498,434	$12,728,314
Construction	2,088	$118,381,966	$273,778,829
Total 2nd Round Indirect and Induced Economic Activity	994	$43,273,477	$131,020,723
Operations	67	$3,002,506	$10,399,291
Construction	928	$40,270,971	$120,621,432
TOTAL Economic Activity	**3,132**	**$165,153,878**	**$417,527,867**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact	**$15,038,260**	**$34,260,392**	**$49,298,652**

Appendix Table 19: Estimated Economic and Fiscal Impact of a Potential New Large Data Center on McLean County

THE STATEWIDE ECONOMIC AND FISCAL IMPACT IN ILLINOIS

Appendix Table 20 details the potential effect of a large data center being constructed in Illinois in 2018.

Economic Impact	Employment	Labor Income	Output
TOTAL Economic Activity*	**3,360**	**$203,911,505**	**$521,728,008**
Fiscal Impact	**State and Local**	**Federal**	**Total**
TOTAL Fiscal Impact*	**$20,178,969**	**$46,486,558**	**$66,665,527**

*May not sum due to rounding.

Appendix Table 20: Estimated Economic and Fiscal Impact of a Potential New Large Data Center on Illinois Statewide (2018 dollars)