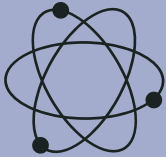


Research, Development and Information Technology

Research, Development and Information Technology



DeKalb County Indicators

Employment (2015) = **344**
 Employment Trend (2009–2015) = **-14.4%**
 Location Quotient (2015) = **0.9**
 Average Annual Earnings per Job (2015) = **\$58,574**

DeKalb County Region Indicators

Employment (2015) = **8,634**
 Employment Trend (2009–2015) = **-6.5%**
 Location Quotient (2015) = **0.9**
 Average Annual Earnings per Job (2015) = **\$71,893**

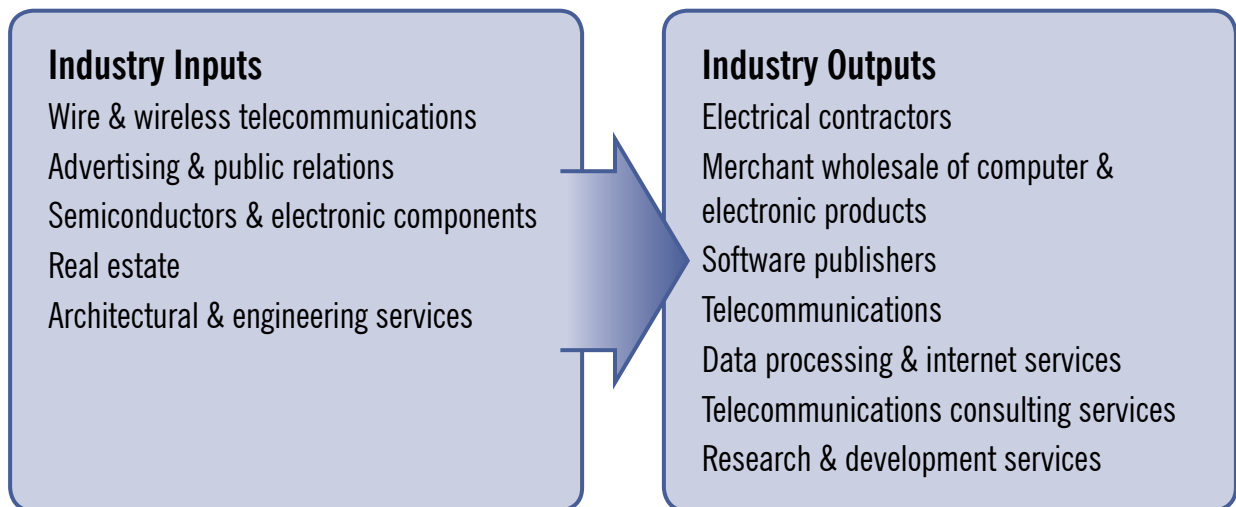
CLUSTER SUMMARY

The research, development, and information technology (RDIT) cluster contains all businesses related to the application of information technology and development of new products and services, including consulting and telecommunications (Figure 1). This cluster includes software publishers, data processing, internet service providers, and wholesale merchants of computer and electronic products.

The RDIT cluster is part of an Information Technology and Telecommunications cluster defined by the Purdue Center for Regional Competitiveness, which also includes computer and electronic products manufacturing. The manufacturing side of this cluster is discussed in a separate industry cluster profile for this report.

Related to the RDIT cluster are several supplier industries which provide materials, products and services necessary for production. According to IMPLAN data, 16.6% of production costs are in wired telecommunications such as fiber optic internet. About 10.4% of input costs are advertising and public relations services, and another 10.0% is in semiconductors and related electronic components. Telecommunications appears as both an input and an output in the cluster because internet services supplied by the IT sector are used in the Research and Development (R&D) sector.

Figure 1: RDIT Cluster Input and Output Examples



Source: Adapted from 2015 IMPLAN data and U.S. Bureau of Labor Statistics, *Industries at a Glance*, 2017.

REGIONAL OVERVIEW

The private RDIT cluster in the DeKalb County region, which includes DeKalb and adjoining counties, had 1,724 establishments in 2015 and employed 8,634 people at an average wage of \$71,893 (Figure 2). The cluster has a lower than average concentration of economic activity in the region according to BLS data, but this data excludes R&D activities at public universities such as NIU.

Location Quotients (LQs) are used to evaluate local business development opportunities. LQs are the ratio of the employment percentage represented by a given industry in the county to the percentage that industry represents in the nation. A ratio greater than 1.0 = higher local concentration and a likelihood of exports from the county; a ratio less than 1.0 may suggest goods or services are imported into the region.

Figure 2: Summary Characteristics of the RDIT Cluster

Indicator	DeKalb County	Reference Region
Number of Firms (2015)	95	1,724
Firm Change (2009-2015)	0.0%	-2.9%
Firm Location Quotient (2015)	0.2	0.4
Employment (2015)	344	8,634
Employment Change (2009-2015)	-14.4%	-6.5%
Employment Location Quotient (2015)	0.9	0.9
Average Annual Earnings* per Job (2015)	\$58,574	\$71,893

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2015.

* Note: Although the words “wages” and “earnings” are often used interchangeably they are different. Wages refers to compensation paid by an employer on an hourly, weekly or monthly basis. Earnings can include wages paid by an employer but also other sources such as interest, dividends, and contractor or business income.

Employment in the private RDIT cluster declined 14.4% in DeKalb County but the employment location quotient remained constant since 2009, suggesting that declines in the region were consistent with national trends. Sub-sectors in the private RDIT cluster represented in DeKalb County include electrical/wiring contractors, telecommunications, computer systems design services, and others (Figure 3).

Figure 3: RDIT Sub-Sectors Based on Employment Concentration in DeKalb County

Sub-sector Description	Establishments LQ	Employment LQ
Cluster Total	0.2	0.9
Electrical & wiring contractors (residential & nonresidential)	2.3	0.7
Telecommunications	1.8	0.4
Data processing, hosting & related services	0.2	Disclosure
Computer systems design & related services, i.e., custom programming	0.5	0.2
Other management consulting services, i.e., environmental impact analysis	0.6	Disclosure
Scientific research & development services	0.6	0.1

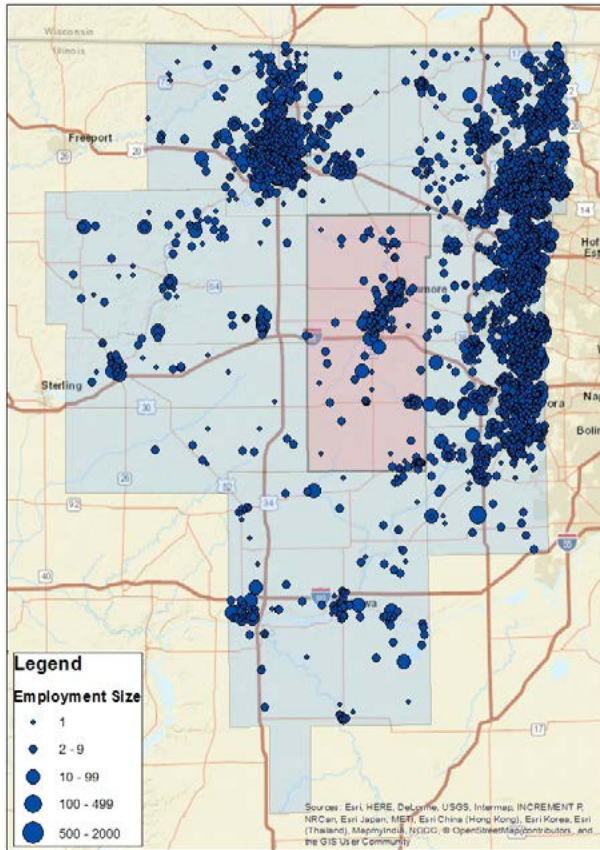
Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2015.

Data for employment in some RDIT sub-sectors is suppressed due to having a small number of firms, but the two largest sub-sectors with published employment data in DeKalb County are electrical contractors and computer systems design service. Of the 344 RDIT cluster jobs in DeKalb County, 155 jobs (45.1%) are in electrician services and 93 jobs (27.0%) are in computer systems design services, such as custom programming.

The private RDIT cluster in DeKalb County and the region is represented by several mid-size and larger employers, with the largest company employing 2,000 (Figure 4). RDIT companies are densely concentrated in many cities along the Fox River to the east of DeKalb County. In DeKalb County, most of the RDIT companies are located within DeKalb and Sycamore.

INDUSTRY CLUSTER PROFILE

Figure 4. Research, Development, and Information Technology Cluster, Firms by Employment Size, DeKalb County and Reference Region



Source: Decisiondata.net, 2017.

The largest R&D firm in the region is Fermilab in Batavia with 2,000 employees. Fermilab is managed by the federal Department of Energy to conduct research on particle physics, including the development of particle accelerators. Another major R&D firm in the region is OMRON Automotive Electronics Inc. with 565 employees in St. Charles. OMRON designs electronic equipment for automobiles, including power steering controls, on-board electronics charging stations, and keyless entry systems.

Several mid-sized research/development/IT firms are located in DeKalb County (Figure 5). The Monsanto Company has a 216-employee laboratory in Waterman where biologists develop new seeds for agriculture sectors such as corn farming. The Cellco Partnership, which manages the DeKalb offices of Verizon Wireless, has 76 employees. After sustained success in the design of precision attachments for agricultural planters, Dawn Equipment Company, 50 employees, was named the Most Innovative Company in the Chicago Area this year by Crain's Chicago Business. Virgil Cook & Son Inc. is an electrical services company with 25 employees involved in the installation of IT equipment. Encap Inc. in DeKalb, employs 20 and offers environmental consulting services for land improvement projects, such as converting a portion of land in the Sycamore Park District into a prairie. In addition, Frontier Communications Corporation, Sundog IT, OC Creative, Transware, and CMJ Technologies provide services in the RDIT cluster with 15, 13, 12, 10, and 6 employees, respectively.

Figure 5: Major Employers in the RDIT Cluster, DeKalb County

Business Name	Employees	City	Industry Description
Monsanto Company	216	Waterman	Research & Development in Physical, Engineering, & Life Sciences
Cellco Partnership (Verizon)	76	DeKalb	Wireless Telecommunication Carriers
Dawn Equipment Company	40	Sycamore	Agricultural Attachments, Planters
Virgil Cook & Son Inc.	25	DeKalb	Electrical Contractors & Other Wiring Installation Contractors
Encap Inc.	20	DeKalb	Administrative Management & General Management Consulting Services
Frontier Communications Corp.	15	Sycamore	All Other Telecommunications
Sundog IT	13	DeKalb	IT Consulting and Management
OC Creative	12	DeKalb	Marketing Agency and Video Production Company
Transware	10	Sycamore	Engineering Services for Nuclear and Computing Industries
CMJ Technologies	6	Sycamore	IT Consulting and Management

Source: DeKalb County Economic Development Corporation and Dun & Bradstreet Inc., 2017.

INDUSTRY TRENDS¹

State and federal government agencies rely heavily on basic and applied research and are often the primary consumers of R&D firms. Because R&D companies depend heavily on government contracts, they are often more vulnerable to economic downturns. Government funding for research shifts with policy priorities, such as healthcare, defense, and renewable energy. Economic downturns also limit demand for these services in the private sector as companies may opt to reduce risks until economic conditions improve.

Information technology and engineering positions are among the most difficult to fill and many organizations choose to fill them with guest workers or international students. Reliance on H-1B visas for labor in the RDIT cluster may prove controversial in cases where qualified local workers are available. Concerted effort may be needed to encourage young adults to pursue education in the fields of research and IT if the talent pipeline is to be filled by local employees. Adding to the challenge of a skilled local workforce for IT, math and science scores on standardized tests have declined in high schools nationwide. However, the number of NIU graduates with bachelor's degrees in engineering and engineering technology has increased between 2010 and 2015, while the number of graduates in math, chemistry, biology, and physics has remained relatively unchanged.²

An ongoing challenge for RDIT companies is intellectual property management. Patent rights on new products are essential for attracting development partners and avoiding infringement lawsuits from designers of similar products. Conversely, RDIT firms must take steps to prevent infringement of their own patents by competitors.

Several opportunities exist within the RDIT cluster. Automation is revolutionizing the broad manufacturing sector in areas such as machinery, metal products, and electronic products. Manufacturers are increasingly adopting computerized "smart machines" that can perform complex tasks which previously required manual labor. The RDIT cluster will be critical for designing advanced manufacturing equipment used in other sectors.

Environmental regulations and a growing public awareness of climate issues are increasing demand for alternative energy across a range of business sectors. Transportation and logistics companies are being pressured to reduce their fossil fuel use via new vehicles designed with improved fuel efficiency. The manufacturers of these vehicles require R&D services to meet the challenge of designing marketable vehicles that use alternative energy.

¹ Summarized from industry reports by Hoovers' Inc., a Dun & Bradstreet Company.

² Northern Illinois University, Department of Institutional Research. Data Book 2015-2016, Table D-3.

As healthcare costs continuously increase, investment in technology may offer a way to contain and eventually reduce costs. Healthcare IT, improved medical devices, and telemedicine are all areas with growing demand for R&D services.

SUPPLY CHAIN

This analysis examines three aspects of supply chain: the value of supply chain inputs; the amount of inputs being produced outside DeKalb County for the industry segments studied (represented in most cases by the gap between total input purchases and inputs purchased within the region); and stages along the supply chain that are areas of competitive advantage or that provide an opportunity to attract businesses.

Supply Chain

An essential component for an industry sector is the local supply chain. While not all inputs (goods or services) that an industry sector needs can be produced in the local economy, it is desirable to meet as many of the sector's needs locally as possible. This analysis reveals the source and amount of purchases among the unique niches within an industry. Identifying total industry economic outputs and areas outside the region from which goods and services are being purchased helps determine which areas of the industry supply chains are strongest. It also assists in identifying the best growth opportunities for DeKalb County.

Areas with large gaps in the RDIT supply chain represent opportunities for DeKalb County to capture the most value from a specific stage in the production or delivery of products and services. This may inform strategy by indicating where along the value chain an investment will have the highest impact on the regional economy and may indicate opportunities for business retention or expansion. Additionally, stages along the supply chain that are underperforming also offer opportunities for business attraction and/or entrepreneurship. It is important when reviewing data relating to industry inputs to compare both the supply gap as well as the total value of inputs, as certain services or components that maintain a high percentage may be of low value to the regional economy. Similarly, certain inputs, regardless of the total value purchased outside the region, may be of high strategic importance to the region in efforts to build a stronger industry cluster.

Regional Inputs

The dollar value of production inputs that are purchased from businesses within the DeKalb County region.

Gross Inputs

Total dollar amount of inputs used by the industry within each sector.

Regional Supply Gap

Difference between gross and county inputs: a sizeable gap value indicates that a large amount of inputs are imported into the region, rather than produced within.

The supply chain information provided shows the flows of trade both within DeKalb County and from outside the region that support IT-related industries. The key sectors that may be appropriate targets for expansion appear as imports (gaps) from outside the county, but still within the industry cluster (Figure 6). These gaps are then analyzed in terms of county strengths and potential areas for targeting and support and are placed into a supply chain framework to determine the stages of the supply chain with the strongest presence in DeKalb County. To fully develop the RDIT cluster, economic developers in DeKalb County should consider focusing on those sectors that currently lack a strong regional presence but have significant potential to develop.

Figure 6: DeKalb County Key Supply Chain Gaps, RDIT (\$ Millions)

Industry Description	Regional Supply Gap	Regional Inputs	Gross Inputs	Percent Purchased Outside of County
Semiconductors & related devices	-\$223.9	\$0.6	\$224.5	99.8%
Wired telecommunications	-127.4	247.8	375.2	34.0
Advertising, public relations, & related services	-108.2	126.3	234.5	46.1
Real estate buying & selling, leasing, managing, & related services	-92	89.8	181.8	50.6
Cable & other subscription programming	-50.8	12.9	63.7	79.8
Architectural, engineering, & related services	-44.7	49.6	94.3	47.4
Motion pictures & videos	-42.1	16.1	58.2	72.3
Accounting, tax preparation, bookkeeping, & payroll services	-19.3	13.8	33.1	58.3
Broadcast & wireless communications equipment	-15.6	0	15.6	99.9
Telephone apparatus manufacturing	-15.0	0.3	15.3	99.3

Source: IMPLAN, 2015.

For example, the RDIT cluster requires \$224.5 million in inputs (i.e., the products or services required to create a finished product) from semiconductors and related devices. However, nearly all of this material is produced outside the region. Another supply gap in the region exists in wired telecommunications, such as fiber optic internet. The RDIT cluster requires \$247.8 million in telecommunications inputs, of which only \$127.4 was produced in the DeKalb County region.

WORKFORCE REQUIREMENT, SUPPLY AND DEMAND

Retaining a skilled local workforce has been an ongoing issue for employers across most industry sectors. The challenge of hiring and retaining a skilled workforce has stemmed from the impending retirement of experienced workers in the Baby Boom generation. The largest employee age group in the RDIT cluster is prime working age adults, ages 25-44 (51.8%, Figure 7). This age group includes Millennials beginning their careers after postsecondary education. About 5.0% of RDIT workers are currently of retirement age, and 32.9% are of pre-retirement ages 45-64.

Semiconductor and Related Device Manufacturing

(NAICS Sector 334413)

This industry comprises establishments engaged primarily in manufacturing semiconductors and related electronic components. Related products include infrared sensors, fuel cells, transistors, and silicon wafers.

INDUSTRY CLUSTER PROFILE

Figure 7: RDIT Cluster Employment and Wages by Age Group, DeKalb County

Age Group	Percent of Total Employment	Average Annual Earnings*
Under 25 Years	10.5%	\$38,202
25 to 44 Years	51.8	71,521
45 to 64 Years	32.9	79,019
65 Years & Older	4.9	45,389

Source: U.S. Census Bureau, Quarterly Workforce Indicators, 2015.

Approximately 45.5% of employment in the cluster is in computer and mathematical occupations (Figure 8). The next largest employment category is management occupations, with 10.6% of employment. Both occupation types generally pay higher-than-average for the county and the region. Ensuring that appropriately skilled computer/mathematics workers are available at competitive compensation rates will be critical to maintaining the R&D cluster in the region.

Figure 8: National Research and Development Cluster Staffing Patterns

Occupation Type	Percent of Cluster Employment	County Median Wage All Industries	Region Median Wage
Computer & mathematical occupations	45.5%	\$56,701	\$67,658
Management occupations	10.6	81,756	81,279
Office & administrative support occupations	10.2	31,712	32,235
Business & financial operations occupations	9.4	51,504	55,661
Life, physical, & social science occupations	7.3	51,046	61,169
Architecture & engineering occupations	6.0	66,903	72,646
Sales & related occupations	5.0	23,246	23,692
Arts, design, entertainment, sports, & media occupations	1.6	38,525	30,326
All other industries, i.e., maintenance, material moving	4.4	41,521	40,448

Source: U.S. Bureau of Labor Statistics and Illinois Department of Employment Security, Occupational Employment Statistics, 2016.

A challenge for employers is the looming demand for replacement workers as older workers retire. The Illinois Department of Employment Security projects that 277 openings for computer and mathematics workers will become available per year between 2012 and 2022, with a majority coming from new positions being created, rather than replacements (Figure 9). In addition, there is expected to be 159 annual openings in architectural and engineering occupations and 72 annual openings in life/physical/social science occupations.

Figure 9: Occupational Employment, Projected Demand by Selected Worker Classification, Workforce Investment Board Region 5*

Occupation Type	Employment		Employment Change 2012-2022		Average Annual Job Openings		
	2012	2022	Number	Percent	Growth	Replacements	Total
Total, All Occupations	282,136	333,489	51,353	18.2%	5,215	6,645	11,860
Office & Administrative Support	38,831	44,430	5,599	14.4	585	876	1,461
Sales & Related	29,095	34,025	4,930	16.9	494	896	1,390
Management	18,935	21,456	2,521	13.3	271	380	651
Business & Financial Operations	10,482	12,916	2,434	23.2	244	203	447
Computer & Mathematical	5,015	6,450	1,435	28.6	144	83	227
Architecture & Engineering	3,983	4,644	661	16.6	66	93	159
Arts/Design/Entertainment, Sports/Media	3,806	4,358	552	14.5	56	92	148
Life, Physical & Social Science	1,641	1,909	268	16.3	27	45	72

Source: Illinois Department of Employment Security, 2012-2022 Employment Projections.

*Workforce Investment Area 5 includes the counties of DeKalb, Kane, and Kendall. Items do not sum to total because not all occupations are shown.

INDUSTRY CLUSTER PROFILE

Because of the competition with surrounding metro areas for workers with specific skills or experience, compensation levels are a concern for local businesses. The estimated average annual wage for computer/mathematics workers is \$56,701 in DeKalb County, or 16.2% less than the average salary of \$67,658 for the same position in the larger region. This could put local employers at a competitive disadvantage relative to other areas offering similar jobs at higher wages. Given the intense competition for skilled workers, companies will need to monitor compensation trends to recruit and retain qualified employees.

ECONOMIC IMPACT

For every 100 jobs created in the research, development and information technology cluster in DeKalb County, an additional 90 jobs are supported or created in other industry sectors. This also results in the generation of another \$11.7 million in value-added, as well as an additional \$7.3 million in employee compensation (Figure 10).

For every 100 jobs created in the research, development and information technology cluster in Reference Region, an additional 111 jobs are supported or created in other industry sectors. This also results in the generation of another \$17.0 million in value-added, as well as an additional \$11.1 million in employee compensation.

Figure 10. Economic Impact of RDIT Cluster in DeKalb County (\$ Millions)

Indicator	Direct Effect	Indirect Effect	Induced Effect	Total Effect	Multiplier
Employment (DeKalb County only)	100	54	35	190	1.90
Value-Added (DeKalb County only)	\$6,858,157	\$2,636,677	\$2,161,063	\$11,655,897	1.70
Employee Compensation (DeKalb County only)	\$5,032,413	\$1,285,169	\$984,703	\$7,302,285	1.45
Employment (Reference Region)	100	61	50	211	2.11
Value-Added (Reference Region)	\$9,707,936	\$3,606,737	\$3,658,118	\$16,972,792	1.75
Employee Compensation (Reference Region)	\$7,445,375	\$1,964,542	\$1,678,461	\$11,088,378	1.49

Source: IMPLAN, 2015.

The industries most affected by job creation in the research, development and information technology cluster in DeKalb County include employment services, real estate, and restaurants, as well as many types of business services (Figure 11). These job impacts are the result of business-to-business purchases by companies within the cluster, as well as by the household spending of their employees.

Figure 11. Employment Impacts of 100 New Jobs Created in the Research, Development and Information Technology Cluster on Other Industries, DeKalb County

Industry Impacted in DeKalb County	Jobs
Total, All Affected Industries	90
Employment services	20
Real estate	7
Marketing research and all other miscellaneous professional, scientific, and technical services	3
Full-service restaurants	3
Limited-service restaurants	3
Management consulting services	3
Legal services	3
Office administrative services	3
All other industries	43

Source: IMPLAN, 2015.

Similar impacts can be measured in the Reference Region where the industries most affected by job creation in the research, development and information technology cluster also includes hospitals, though the number of jobs created or supported differs somewhat (Figure 12).

INDUSTRY CLUSTER PROFILE

Figure 12. Employment Impacts of 100 New Jobs Created in the Research, Development and Information Technology Cluster in Other Industries, Reference Region

Industry Impacted in Reference Region	Job
Total, All Affected Industries	111
Employment services	19
Real estate	9
Management consulting services	7
Marketing research and all other miscellaneous professional, scientific, and technical services	4
Full-service restaurants	4
Limited-service restaurants	4
Hospitals	3
Legal services	3
All other industries	59

Source: IMPLAN, 2015

KEY TAKEAWAYS

- » The private RDIT cluster in DeKalb County has an employment concentration slightly below the national average. The surrounding region also ranks below the national average in concentration of business establishments, although these figures exclude R&D activities at public universities. Employment in the RDIT cluster has decreased slightly in DeKalb and surrounding counties since 2009.
- » Most private RDIT employment in DeKalb County is in electrical contractors and computer design services such as custom programming.
- » The county RDIT cluster has the potential for further development based on its supply chain relationships to other industries in the region or the surrounding metro areas, especially in the computer and electronic products manufacturing sector, due to demand for electronic components.
- » Opportunities likely exist for providers of semiconductors and other electronic components to work with RDIT companies to develop new locally-sourced products. However, more work will be needed to identify and develop those opportunities.
- » The emergence of autonomous, computerized “smart machines” presents an opportunity for RDIT, but especially in DeKalb County with potential technology transfer from the engineering department and other scientific fields at NIU. This would require further research to determine the viability of such opportunities.
- » The expected wave of retiring baby boomers will create most of the demand for new workers. Since other industries will experience the same challenges, competition for skilled workers will be brisk given the relatively limited number of available younger workers.
- » The research, development and information technology cluster in DeKalb County supports 344 jobs and contributes for \$44.1 million to the county’s economy. In the Reference Region, the cluster supports 8,634 jobs and contributes for \$1.1 billion to the regional economy.



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