Region 1 Emerging Industry Cluster Analysis

Appendices

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PREPARED FOR:

Region 1 Planning Council
127 North Wyman St. Suite 100
Rockford, IL 61101

camoin associates

www.camoinassociates.com

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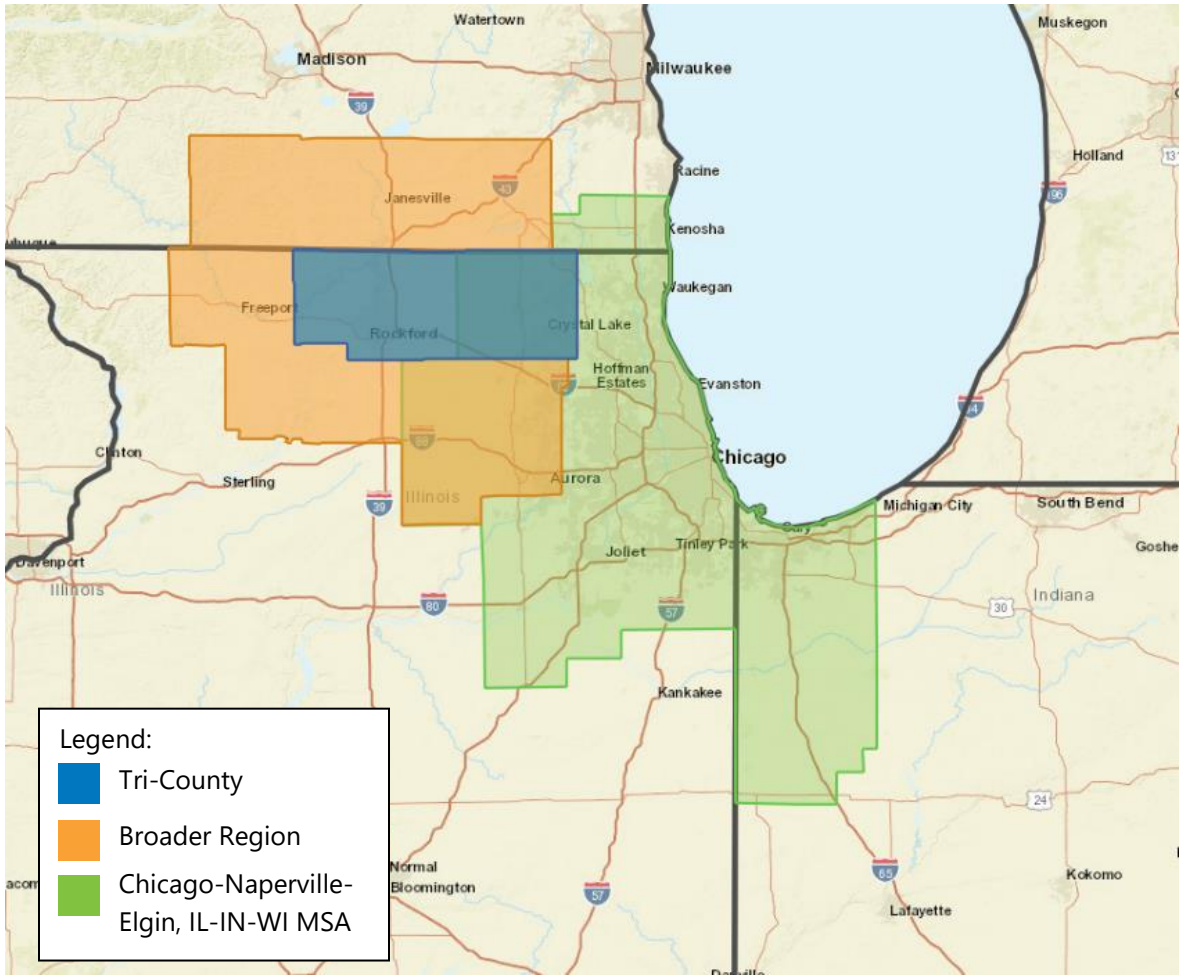
CONTENTS

Deliverable Description

This document contains the appendices for the Region 1 Emerging Industry Cluster Analysis. These appendices provide the in-depth information, data, figures, soruces, assets, and more that support the findings and strategies.

APPENDIX A: REGION AND ECONOMY OVERVIEW

The following analysis compares the Tri-County Region to a Broader Region (which includes the Tri-County Region), as well as the Chicago-Naperville-Elgin, IL-IN-WI MSA (Chicago MSA). Each of these regions is composed of a group of counties, detailed in the map and text below.



Tri-County Region
Illinois: Boone, McHenry, and Winnebago

Broader Region
Illinois: Boone, DeKalb, Kane, McHenry, Ogle, Stephenson, Winnebago

Wisconsin: Green, Rock, Walworth

Chicago MSA
Illinois: Cook, DeKalb, DuPage, Grundy, Kane, Kendall, Lake, McHenry, Will

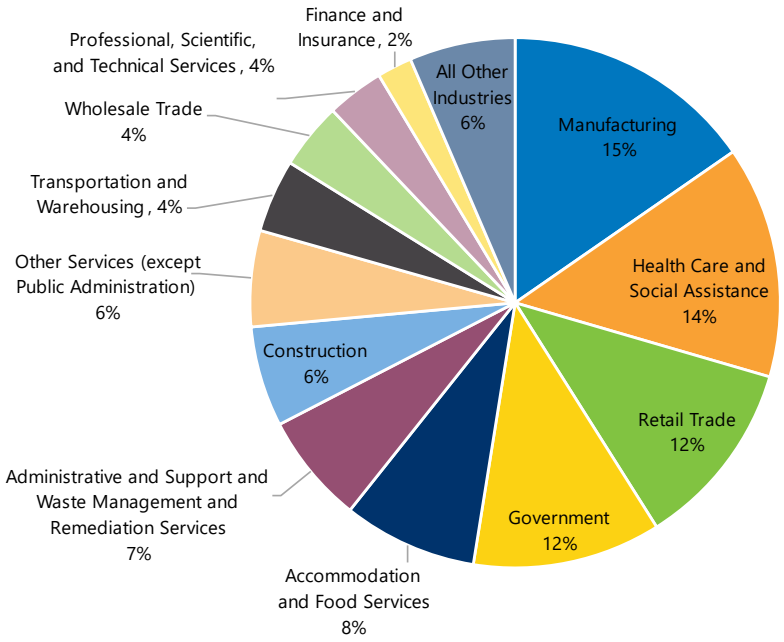
Indiana: Jasper, Lake, Newton, Porter

Wisconsin: Kenosha

Economic Composition

- In 2022, the three largest industries in the Tri-County Region employment were Manufacturing (39,425), Health Care and Social Assistance (36,340), and Retail Trade (29,605)
- Together, these three industries account for 39% of the Tri-County Region's jobs.

2022 Job Distribution of Tri-County Region



Source: Lightcast

Key Industry Metrics by Sector, Tri-County Region

NAICS	Description	2022 Jobs
11	Agriculture, Forestry, Fishing and Hunting	2,254
21	Mining, Quarrying, and Oil and Gas Extraction	86
22	Utilities	1,134
23	Construction	15,737
31	Manufacturing	39,425
42	Wholesale Trade	10,425
44	Retail Trade	29,605
48	Transportation and Warehousing	11,433
51	Information	1,909
52	Finance and Insurance	5,464
53	Real Estate and Rental and Leasing	2,409
54	Professional, Scientific, and Technical Services	8,975
55	Management of Companies and Enterprises	772
56	Administrative and Support and Waste Management and Remediation Services	17,235
61	Educational Services	3,352
62	Health Care and Social Assistance	36,340
71	Arts, Entertainment, and Recreation	4,672
72	Accommodation and Food Services	20,993
81	Other Services (except Public Administration)	15,041
90	Government	29,491
	Total	**256,759**

Source: Lightcast

Job Growth

- The Tri-County Region saw the largest increase from 2017-2022 in Transportation and Warehousing and Mining, Quarrying, and Oil and Gas Extraction
- The Tri-County Region is projected to see the largest increase from 2022-2027 in Utilities and Transportation & Warehousing
- The Tri-County Region, the Broader Region, and the Chicago MSA all saw overall employment decline from 2017-2022, though the Tri-County Region declined the most at –3%.
- While all comparison geographies are projected to grow between 2022-2027, the Tri-County Region's growth rate is the least, while all local geographies (Broader Region, Chicago MSA) lag the overall US growth rate for total jobs

Percent Job Change by Sector and Region, Historic and Projected

		Tri-County Region		Broader Region		Chicago MSA		US	
		2017 - 2022	2022 - 2027	2017 - 2022	2022 - 2027	2017 - 2022	2022 - 2027	2017 - 2022	2022 - 2027
NAICS	Description	% Change	% Change	% Change	% Change	% Change	% Change	% Change	% Change
11	Agriculture, Forestry, Fishing and Hunting	-12%	-3%	-3%	1%	8%	6%	-1%	5%
21	Mining, Quarrying, and Oil and Gas Extraction	26%	8%	0%	3%	0%	17%	-11%	8%
22	Utilities	5%	13%	-18%	1%	-9%	5%	1%	4%
23	Construction	6%	2%	8%	4%	3%	1%	10%	6%
31	Manufacturing	-13%	-3%	-6%	2%	-2%	-3%	3%	6%
42	Wholesale Trade	7%	7%	1%	6%	-4%	0%	1%	5%
44	Retail Trade	-2%	1%	-2%	1%	-7%	-3%	-2%	1%
48	Transportation and Warehousing	39%	12%	33%	11%	23%	9%	27%	11%
51	Information	-24%	1%	-34%	0%	-8%	-3%	9%	10%
52	Finance and Insurance	-14%	-9%	-10%	-2%	2%	0%	7%	7%
53	Real Estate and Rental and Leasing	-1%	2%	-2%	3%	1%	1%	8%	6%
54	Professional, Scientific, and Technical Services	0%	5%	2%	7%	5%	5%	16%	11%
55	Management of Companies and Enterprises	-30%	-6%	13%	11%	-16%	-7%	10%	7%
56	Administrative and Support and Waste Management and Remediation Services	-16%	-1%	-2%	6%	-1%	3%	5%	7%
61	Educational Services	-11%	2%	-10%	3%	-1%	5%	2%	11%
62	Health Care and Social Assistance	6%	9%	2%	7%	1%	7%	5%	11%
71	Arts, Entertainment, and Recreation	2%	12%	-11%	4%	-11%	5%	-1%	12%
72	Accommodation and Food Services	-3%	8%	-1%	8%	-7%	9%	-1%	11%
81	Other Services (except Public Administration)	-7%	4%	-2%	6%	-4%	3%	-4%	6%
90	Government	-5%	1%	-5%	2%	-4%	1%	-1%	3%
	Total	**-3%**	**3%**	**-2%**	**4%**	**-1%**	**3%**	**4%**	**7%**

Source: Lightcast

Location Quotient and Competitive Effect: Both the location quotient and the competitive effect help to illustrate what makes a region unique.

Location quotient (LQ) is a measure of industry concentration within a region. An LQ of 1.0 means that an industry is as concentrated within the region as it is on a national level. An LQ greater than 1.0 indicates that an industry is more concentrated in a region than at the national level.

The **competitive effect** illustrates how much change in an industry is not explained by national economic or industry trends and represents the number of jobs that a region gained or lost due to unique regional factors. A positive competitive effect means that the region has unique characteristics that give it a competitive advantage in that respective industry, while a negative result indicates that the region performed worse in this industry than expected given overall national economic and industry

Sector Characteristics Comparison, 2022

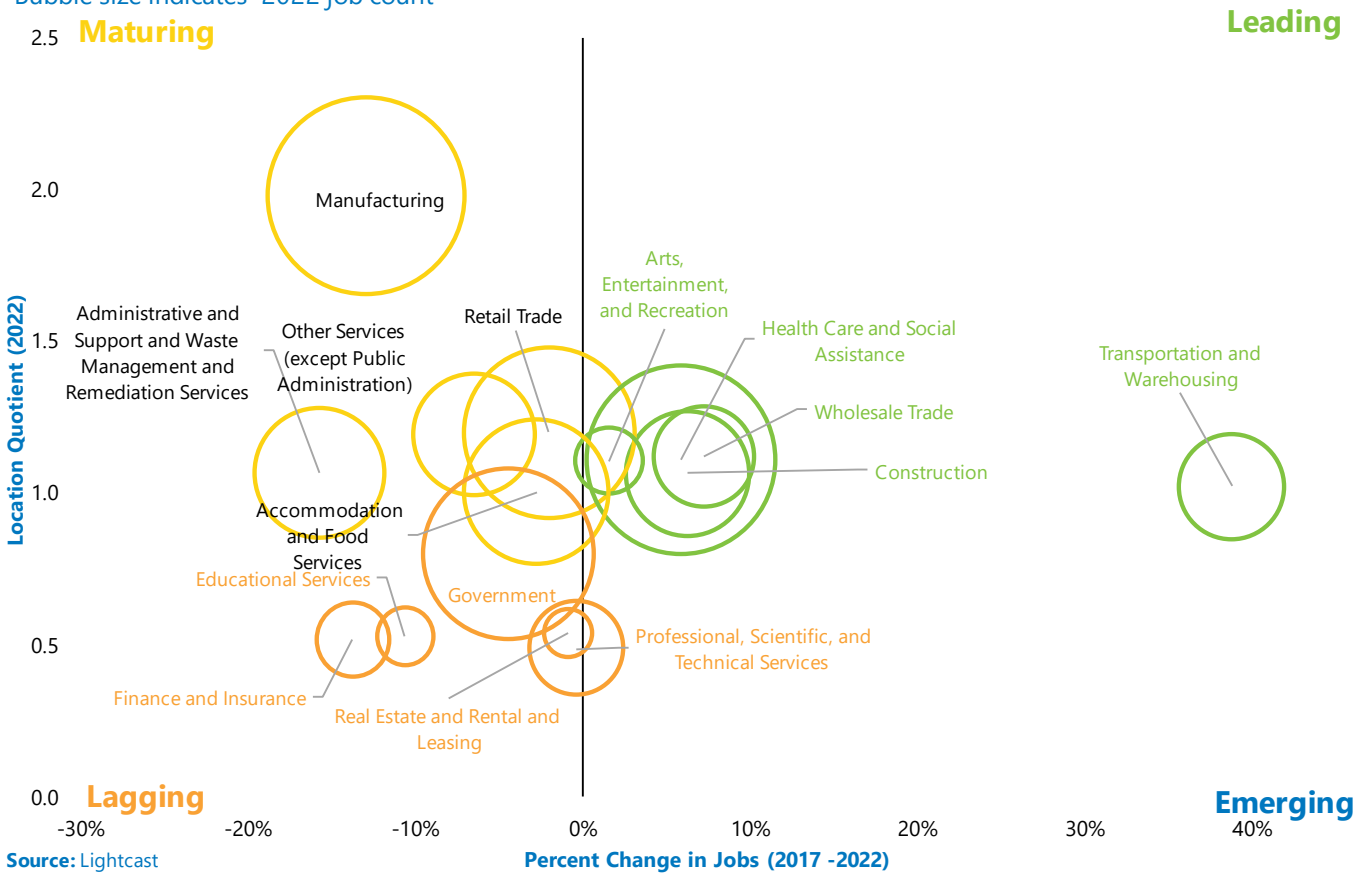
		Tri-County Region		Broader Region		Chicago MSA	
NAICS	Description	LQ	Competitive Effect	LQ	Competitive Effect	LQ	Competitive Effect
11	Agriculture, Forestry, Fishing and Hunting	0.74	(289)	1.12	(230)	0.24	1,109
21	Mining, Quarrying, and Oil and Gas Extraction	0.10	25	0.17	43	0.09	162
22	Utilities	1.32	45	0.95	(504)	0.87	(1,515)
23	Construction	1.07	(507)	1.05	(789)	0.77	(14,441)
31	Manufacturing	1.98	(7,266)	1.92	(9,665)	1.08	(21,764)
42	Wholesale Trade	1.12	613	1.34	94	1.27	(11,514)
44	Retail Trade	1.20	(15)	1.12	(188)	0.94	(21,822)
48	Transportation and Warehousing	1.02	993	0.89	1,225	1.39	(9,934)
51	Information	0.39	(815)	0.44	(3,703)	0.78	(12,901)
52	Finance and Insurance	0.52	(1,294)	0.60	(3,169)	1.20	(11,606)
53	Real Estate and Rental and Leasing	0.54	(217)	0.57	(692)	0.95	(5,725)
54	Professional, Scientific, and Technical Services	0.49	(1,480)	0.52	(3,702)	1.14	(41,946)
55	Management of Companies and Enterprises	0.20	(444)	0.48	133	0.97	(21,781)
56	Administrative and Support and Waste Management and Remediation Services	1.07	(4,266)	1.16	(3,458)	1.21	(21,537)
61	Educational Services	0.53	(476)	0.59	(1,306)	1.28	(4,745)
62	Health Care and Social Assistance	1.11	150	0.96	(3,140)	0.99	(24,409)
71	Arts, Entertainment, and Recreation	1.11	114	1.06	(1,370)	1.01	(9,402)
72	Accommodation and Food Services	1.01	(291)	1.00	73	0.95	(22,871)
81	Other Services (except Public Administration)	1.19	(415)	1.02	725	1.03	(623)
90	Government	0.80	(992)	0.93	(3,797)	0.79	(15,450)
	Total, All Industries		**(16,956)**		**(33,705)**		**(276,056)**

Source: Lightcast

Note: The government sector (NAICS 90) includes Federal, State, and Local government, including hospitals and public education. Private educational institutions are included in the Educational Services sector.

Key Metrics by Sector, Tri-County Region

Bubble size indicates 2022 job count



Source: Lightcast

This chart displays how these sectors compare. Each sector is classified as **leading, emerging, maturing**, or **lagging**.

Leading industries experienced job growth over the last five years and have a location quotient greater than 1.

Emerging industries saw positive job growth over the last five years but have a location quotient of less than 1.

Maturing industries do have a location quotient greater than 1 but had negative job growth over the last five years.

- Five industries (Arts, Entertainment, and Recreation; Health Care & Social Assistance; Wholesale Trade; Construction; Transportation & Warehousing) are classified as leading, with both strong employment concentration and job growth in the last five years
- Two of the three largest industries, Manufacturing and Retail, are classified as Maturing, with strong employment concentration but job decline in the last five years
- None of the major sectors are classified as emerging (low concentration but job growth)

- The Tri-County Region GRP was almost $29 Billion in 2022 and accounted for 36% of the broader region's total GRP in 2022
- The Tri-County Region nominal GRP (i.e. not adjusted for inflation) has grown by 18% between 2017-2022, slower the Broader Region (21%), Chicago MSA (26%), and the US (32%).
- Manufacturing is the sector that accounts for the greatest share of GRP in the Tri-County Region, at over $6.6 billion and accounting for over 23% of total GRP in 2022.

GRP Summary by Sector and Region, 2017-2022

		Tri-County Region		Broader Region		Chicago MSA		US	
NAICS	Description	2022 GRP	% Change, 2017-2022	2022 GRP	% Change, 2017-2022	2022 GRP	% Change, 2017-2022	2022 GRP	% Change, 2017-2022
11	Agriculture, Forestry, Fishing and Hunting	$282,583,893	24%	$1,214,054,234	40%	$1,732,417,639	43%	$247,352,726,924	37%
21	Mining, Quarrying, and Oil and Gas Extraction	$22,366,609	(6%)	$121,874,026	19%	$683,485,282	66%	$363,319,853,839	32%
22	Utilities	$917,722,472	29%	$1,902,069,717	6%	$11,324,288,161	16%	$400,332,563,640	30%
23	Construction	$1,826,302,643	21%	$4,910,311,210	20%	$27,434,939,851	16%	$1,051,833,499,148	32%
31	Manufacturing	$6,653,468,465	(3%)	$16,678,393,671	9%	$99,715,609,415	22%	$2,754,571,287,972	26%
42	Wholesale Trade	$2,384,142,175	41%	$7,618,862,993	33%	$73,539,302,791	32%	$1,607,096,092,167	39%
44	Retail Trade	$2,472,600,864	38%	$6,279,660,330	37%	$41,850,620,385	37%	$1,444,864,578,288	35%
48	Transportation and Warehousing	$983,849,559	44%	$2,594,266,873	46%	$34,399,123,159	16%	$788,940,962,888	30%
51	Information	$480,857,467	3%	$1,648,615,495	(13%)	$33,750,360,564	28%	$1,358,258,614,827	36%
52	Finance and Insurance	$1,634,116,890	14%	$4,700,059,399	20%	$94,157,750,616	33%	$2,223,109,538,161	35%
53	Real Estate and Rental and Leasing	$855,524,427	26%	$2,930,600,763	31%	$30,255,128,750	35%	$944,319,048,882	33%
54	Professional, Scientific, and Technical Services	$1,161,724,925	23%	$3,608,368,205	25%	$81,012,173,038	30%	$2,016,619,528,034	39%
55	Management of Companies and Enterprises	$125,917,152	(19%)	$790,952,383	30%	$14,379,267,626	(4%)	$496,521,936,025	35%
56	Administrative and Support and Waste Management and Remediation Services	$1,257,626,138	23%	$3,593,080,210	44%	$35,298,273,773	41%	$850,166,408,840	42%
61	Educational Services	$136,282,409	5%	$466,789,926	7%	$12,410,491,595	13%	$294,168,395,480	20%
62	Health Care and Social Assistance	$3,242,364,682	25%	$7,538,523,463	22%	$55,826,563,693	23%	$1,903,692,095,616	30%
71	Arts, Entertainment, and Recreation	$270,731,657	60%	$792,560,056	12%	$8,317,761,059	8%	$262,565,567,173	25%
72	Accommodation and Food Services	$964,479,897	51%	$2,691,138,541	51%	$23,943,046,842	39%	$811,710,091,321	45%
81	Other Services (except Public Administration)	$794,556,839	16%	$1,910,910,775	22%	$16,545,148,526	15%	$470,183,607,769	21%
90	Government	$2,418,839,920	15%	$7,951,342,607	14%	$60,550,054,990	19%	$2,671,854,290,011	21%
	Total	**$28,886,059,081**	**18%**	**$79,942,434,878**	**21%**	**$757,125,807,755**	**26%**	**$22,961,480,687,005**	**32%**

Source: Lightcast

- The Tri-County Region has average earnings of $64,889 with the largest earnings by industry being in Utilities and Management of Companies and Enterprises
- The Tri-County Region has the lowest average earnings across the comparison regions, at $64,889. This is $23,450 lower than the Chicago MSA and $15,950 lower than the overall US average.
- The greatest earnings discrepancy is in the Information sector, where average earnings in the Tri-County Region are more than $85,000 below the US Average. Other large earnings discrepancies are present in Finance and Insurance ($51,524 gap), Mining, Quarrying, and Oil and Gas Extraction ($49,965 gap), and Professional, Scientific, and Technical Services ($44,362 gap).

Average Earnings per Job by Sector and Region, 2022

NAICS	Description	Tri-County Region	Broader Region	Chicago MSA	US
11	Agriculture, Forestry, Fishing and Hunting	$58,382	$57,654	$62,005	$51,893
21	Mining, Quarrying, and Oil and Gas Extraction	$89,155	$104,083	$122,912	$139,120
22	Utilities	$181,033	$193,963	$185,363	$170,769
23	Construction	$84,733	$84,963	$92,006	$78,845
31	Manufacturing	$84,855	$81,672	$108,951	$96,883
42	Wholesale Trade	$89,106	$90,608	$120,677	$109,104
44	Retail Trade	$41,662	$42,482	$50,272	$47,706
48	Transportation and Warehousing	$58,691	$63,945	$77,062	$72,319
51	Information	$78,825	$78,704	$150,483	$164,507
52	Finance and Insurance	$97,165	$92,765	$184,027	$148,689
53	Real Estate and Rental and Leasing	$59,905	$66,906	$99,044	$83,308
54	Professional, Scientific, and Technical Services	$82,021	$89,515	$136,723	$126,383
55	Management of Companies and Enterprises	$140,828	$133,322	$172,727	$169,547
56	Administrative and Support and Waste Management and Remediation Services	$48,295	$45,827	$62,498	$60,495
61	Educational Services	$33,837	$38,383	$65,797	$60,452
62	Health Care and Social Assistance	$75,403	$74,598	$74,594	$73,738
71	Arts, Entertainment, and Recreation	$29,652	$33,420	$54,988	$53,203
72	Accommodation and Food Services	$24,954	$25,759	$34,311	$31,702
81	Other Services (except Public Administration)	$36,570	$37,116	$49,923	$41,581
90	Government	$75,783	$78,906	$94,440	$89,844
	Total	**$64,889**	**$66,132**	**$88,337**	**$80,830**
				$23,448	$15,941

Source: Lightcast

Innovation

Patents are an important indicator of innovation and knowledge creation. The National Science Foundation reports patents according to the World Intellectual Property Organization (WIPO) categories, detailed in the table to the right. These patent count represent *ownership* of patents, rather than where *inventors* are located.

Summary of Patents Awarded, 2016-2020

WIPO Category	Tri-County Region	Broader Region
Patents Related To Emerging Clusters	**321**	**1,138**
Handling	59	105
Electrical Machinery, Apparatus, Energy	53	306
Machine Tools	37	80
Transport	31	63
Measurement	19	65
Control	17	48
Other Special Machines	16	86
Thermal Processes and Apparatus	15	42
Telecommunications	9	31
Environmental Technology	9	20
Audio-Visual Technology	8	33
Basic Materials Chemistry	8	50
Computer Technology	8	28
Engines, Pumps, Turbines	6	77
Analysis of Biological Materials	6	9
Digital Communication	5	26
IT Methods for Management	5	12
Optics	4	16
Food Chemistry	4	6
Semiconductors	1	31
Basic Communication Processes	1	4
Other Patent Categories	**238**	**530**
Total, All Patents	**559**	**1,669**

Source: National Science Foundation Invention, Knowledge Transfer, and Innovation Public Use Files

Patents Related to Emerging Clusters

The Tri-County Region has patent activity directly related to as well as potentially related to the specific target clusters including Electrical Machinery, Apparatus, Energy, Transport, Food Chemistry, Environmental Technology and IT Methods for Management, Handling, and Machine Tools.

- From 2016-2020, the Tri-County Region's patents represented 28% of total cluster-related patents in the Broader Region
- The largest patent categories in the Tri-County Region were Handling (59), Electrical Machinery, Apparatus, Energy (53) and Machine Tools (37)
- While the Tri-County Region accounts for 28% of total cluster-related patents in the Broader Region, some patent categories account for a larger share, indicating regional strength. These include Food Chemistry (62% of the Broader Region's patents), Analysis of Biological Materials (60%), Transport (49%), Machine Tools (46%), Environmental Technology (43%), and IT Methods for Management (38%)

Other Patent Categories

- The Tri-County Region's 238 patents in other categories account for 45% of the Broader Region's patents, indicating that its regional strengths in patents are in categories potentially outside of the emerging clusters
- Outside of the emerging clusters' categories, Medical Technology has the most patents awarded in the Tri-County Region (94), accounting for 73% of total patents awarded in this category in the Broader Region.

Small Business Innovation Research and Small Business Technology Transfer

The SBIR and STTR programs are competitive programs that fund small businesses for R&D that has the potential for commercialization. Activity for these awards represents the innovation that occurs in the private sector among commercial entities.

- From 2017-2023, almost $473 million has been awarded to Illinois companies through the SBIR and STTR programs, peaking in 2022 at $98.2 million
- The Department of Health and Human Services and the Department of Defense have issued the most SBIR/STTR funding over this period, indicating Illinois' strengths in categories such as healthcare and aerospace.
- In the Tri-County Region, approximately $4.2 million of SBIR/STTR funding was awarded from 2017-2023, approximately 90% of which was issued via the Department of Defense.

In sum regarding the majority of SBIR/STTR awards in the region pertain to aerospace, defense, and energy which have string relevance to the targeted clusters

SBIR/STTR Funding in the State of Illinois, 2017-2023

Issuing Agency	2017	2018	2019	2020	2021	2022	2023 YTD	Total, 2017-Current
Department of Agriculture	$1,299,725	$198,588	$306,500	$199,986	$706,488	$1,081,500		$3,792,787
Department of Commerce	$92,100	$299,400			$249,585	$500,000		$1,141,085
Department of Defense	$24,015,559	$18,165,168	$18,897,499	$22,835,684	$22,249,836	$40,512,448	$146,474	$146,822,668
Department of Education			$195,506	$890,076	$200,000	$1,000,000		$2,285,582
Department of Energy	$6,705,025	$13,177,962	$14,911,211	$18,200,565	$21,993,021	$14,885,835	$6,711,521	$96,585,140
Department of Health and Human Services	$18,695,366	$23,212,338	$30,502,181	$29,483,212	$21,801,687	$27,095,266		$150,790,050
Department of Homeland Security		$296,802		$149,260	$1,040,271			$1,486,333
Department of Transportation	$271,301			$285,880	$634,743	$499,993		$1,691,917
Environmental Protection Agency					$100,000	$93,370		$193,370
National Aeronautics and Space Administrati	$5,365,020	$5,879,253	$2,754,437	$5,685,152	$3,631,097	$4,056,662		$27,371,621
National Science Foundation	$6,627,262	$5,882,277	$5,044,712	$3,801,128	$6,970,100	$8,527,033	$3,863,523	$40,716,035
Total	**$63,071,358**	**$67,111,788**	**$72,612,046**	**$81,530,943**	**$79,576,828**	**$98,252,107**	**$10,721,518**	**$472,876,588**

Source: SBIR.gov award data

SBIR/STTR Awards in the Tri-County Region, 2017-2023

Company	Award Title	Agency	Phase	Program	Award Year	Award Amount	City
Kaney Aerospace, Inc.	Source Approval Request (SAR) Package and Development Plan for Accelerometer NSN 6610-00-151-6684	Department of Defense	Phase I	SBIR	2022	$ 149,907	Rockford
Kaney Aerospace, Inc.	Auxiliary Power Supply for Aerospace Hydraulic Systems	Department of Defense	Phase II	SBIR	2022	$ 999,994	Rockford
Kaney Aerospace, Inc.	Qualification of Aircraft Current Transformer Assembly	Department of Defense	Phase II	SBIR	2022	$ 774,021	Rockford
Kaney Aerospace, Inc.	Combined Machine and Converter Architecture for Megawatt EMI Control and Weight Savings	National Aeronautics and Space Administration	Phase I	SBIR	2022	$ 149,990	Rockford
Menet Aero LLC	Reusable UAS Atmospheric Sampling Platform	Department of Defense	Phase I	SBIR	2022	$ 49,734	Ringwood
Stochastic Research Technologies LLC	STTR Phase I: Novel Adsorbents for Selective Removal of Naturally Occurring Radionuclide Materials (NORM) from Fracking-Produced Water	National Science Foundation	Phase I	STTR	2022	$ 255,999	Crystal Lake
Kaney Aerospace, Inc.	MAGTORQUE Servos for Flight-Critical ORB Applications	Department of Defense	Phase I	STTR	2021	$ 149,989	Rockford
Kaney Aerospace, Inc.	Predictive Model Based Control System for High-Speed Dynamic Airframe Testing	Department of Defense	Phase I	SBIR	2021	$ 139,903	Rockford
Kaney Aerospace, Inc.	Source Approval Request (SAR) Package and Reverse Engineering (RE) Plan for Current Transformer NSN 5950-00-816-6728	Department of Defense	Phase I	SBIR	2021	$ 199,688	Rockford
Kaney Aerospace, Inc.	MAGTORQUE Servos for High-Speed Unmanned Air Systems	Department of Defense	Phase II	STTR	2021	$ 749,844	Rockford
Kaney Aerospace, Inc.	High Voltage, Low Cost, Low Distortion A Size Sunobouy Power Amplifier	Department of Defense	Phase I	SBIR	2021	$ 139,904	Rockford
Contract Cloud, Inc.	Intelligent Technology for the Acquisition Workforce: Shortening Procurement Timelines while Minimizing Risk	Department of Defense	Phase I	SBIR	2020	$ 50,000	Roscoe
Kaney Aerospace, Inc.	Advanced Flight Control Smart Servo Actuator	Department of Defense	Phase I	SBIR	2020	$ 49,910	Rockford
Kaney Aerospace, Inc.	Advanced Materials and Design of WBG Power Electronics for Rotorcraft Modernization	Department of Defense	Phase I	SBIR	2020	$ 111,388	Rockford
Raptor Engineering, LLC	Open and Secure Systems	Department of Defense	Phase I	SBIR	2020	$ 150,000	Belvidere
Scot Forge Company	Lightweight Track Technology - Scot Forge / Mich Tech	Department of Defense	Phase I	SBIR	2019	$ 124,528	Spring Grove
					Tri-County Region Total	**$ 4,244,799**	

Source: SBIR.gov award data

Top 10 National Science Foundation Awardees in Illinois, 2017-2023

Organization	Total
University of Illinois at Urbana-Champaign	$528,111,662
University of Chicago	$299,590,889
Northwestern University	$260,220,640
University of Illinois at Chicago	$126,681,870
Illinois Institute of Technology	$27,071,859
National Opinion Research Center	$18,783,407
Northern Illinois University	$15,076,615
Loyola University of Chicago	$14,511,829
Southern Illinois University at Carbondale	$11,897,745
Board of Trustees of Illinois State University	$10,563,408
Total, State of Illinois	**$1,445,922,943**

Source: National Science Foundation

National Science Foundation Awards

The NSF is a major funder of research and education in science & engineering, primarily to academic institutions. Award activity from the NSF is an indicator of innovation and R&D that occurs at an institutional level.

- Northern Illinois University, in the Broader Region, was the 7th largest awardee of NSF funding between the years of 2017-2023 YTD
- As the state's flagship land-grant university, the University of Illinois at Urbana-Champaign is a leader in agriculture innovation technologies
- Among NIU's recent NSF awards, eight totaling over $3 million can be flagged as relating to the Tri-County Region's emerging clusters of Renewable Energy, IT, and Electric Vehicles.

NSF Awards to Northern Illinois University: Relevant to Emerging Clusters (2017-2023)

Title	Related Cluster	Start Year	End Date	Awarded Amount
CAS: Superelectrophiles in the Synthesis of Materials for Organic-based Electronics	Renewable Energy, IT	2020	07/31/2024	$350,000
Fundamental Study of Dopants Effect for Stable Hybrid Perovskite Materials	Renewable Energy	2018	06/30/2024	$549,585
Frustration and Crystallization of Vortices in Artificial Spins / Superconductor Hybrids	Renewable Energy	2019	06/30/2024	$410,531
Collaborative Research: FuSe: Spin Gapless Semiconductors and Effective Spin Injection Design for Spin-Orbit Logic	IT	2023	09/30/2026	$239,983
ERI: An Artificial Intelligence-based Computer Aided Manufacturing Framework for Hybrid Manufacturing	IT	2023	07/31/2025	$198,574
Collaborative Research: DMREF: High-Throughput Screening of Electrolytes for the Next Generation of Rechargeable Batteries	EV, Renewable Energy	2023	09/30/2027	$760,000
Collaborative Research: Understanding the Reversible Formation of Sodium Hydrosulfide in Hybrid Electrolytes for High-Energy Density Storage	EV, Renewable Energy	2022	09/30/2025	$282,020
Collaborative Research: Characterization of Transport Properties and Microstructures of Battery Electrolytes via In Situ Spectroscopy	EV, Renewable Energy	2021	08/31/2024	$298,788
Total, Northern Illinois University in Emerging Clusters				**$3,089,481**

Source: National Science Foundation

Northern Illinois University - Research and Technology Transfer Summary

Year	Total Research Expenditures	Patent Applications Filed	Patents Issued	Startups Formed
2017	$9,702,234	6	8	0
2018	$12,212,654	16	8	0
2019	$26,900,000	8	6	1
2020	$25,420,000	3	6	1
2021	$28,000,000	7	7	0
2022	$13,000,000	8	5	0
Total	**$115,234,888**	**48**	**40**	**2**

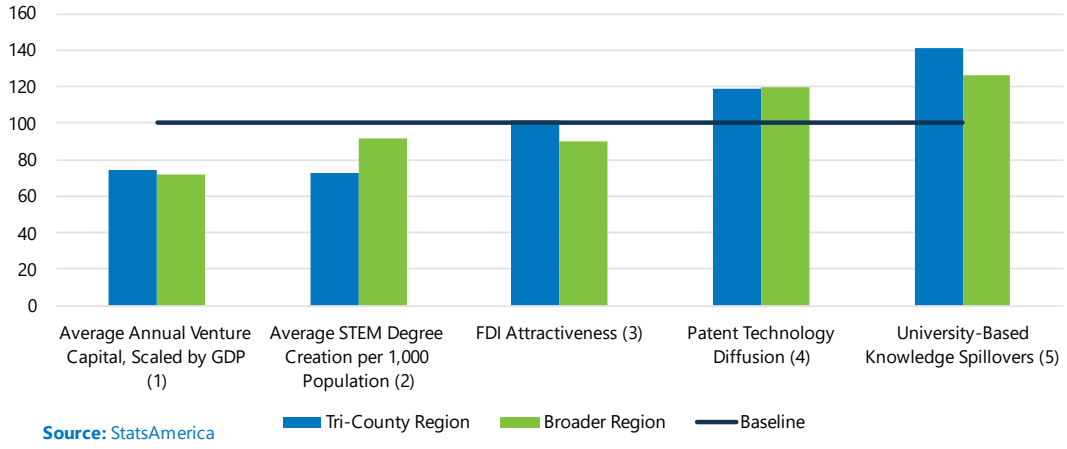
Source: AUTM Statistics Access for Technology Transfer Database

Research and Technology Activity at Northern Illinois University, 2017-2022

- From 2017-2022, NIU has invested over $115 million into research, peaking in 2021 at $28 million. Overall, federal research expenditures accounted for 42% of this spending
- NIU is credited with 40 patents issued since 2017, out of a total 48 applications filed during the same time period.
- 2 startups have been formed out of research that took place at NIU
- Notably, Northen Illinois has NSF funded research specific to the targeted cluster of renewable energy, EV's, and IT

Key Innovation Indicator Indexes

100=US Average



Source: StatsAmerica

Key Innovation Indicator Indexes

	Tri-County Region	Broader Region
Average Annual Venture Capital, Scaled by GDP (1)	74	72
Average STEM Degree Creation per 1,000 Population (2)	72	91
FDI Attractiveness (3)	102	90
Patent Technology Diffusion (4)	119	120
University-Based Knowledge Spillovers (5)	141	126

Source: StatsAmerica Innovation Intelligence Dataset

Note: A value of 100 is equal to the US Baseline. Therefore, values above 100 indicate the region performs better than the nation, while values under 100 indicate the region underperforms the national average.

(1) Venture capital funding, averaged over 5 years and scaled by the region's average GDP

(2) The number of STEM degree graduates (at the bachelor's, master's and doctorate level) per 1,000 individuals from colleges and universities in the region, averaged across the last three years available.

(3) Measures the degree to which foreign or domestic companies are investing in the region relative to the US average.

(4) Measures the degree to which a technology spreads and is adopted. It is based on a region's volume of patents and the technology classes of those patents.

(5) Calculated using university R&D spending and the distance between the university and the region selected. It incorporates R&D spending in engineering, geosciences, life sciences, math and computer science, and physical science. Higher scores indicate regions close to universities with high R&D spending in science and engineering.

Overall Innovation Indexes – All Sectors

Based on Innovation Indices from Stats America:

- The Tri-County Region and the Broader Region both perform slightly below the national baseline in terms of Venture Capital and STEM Degree Creation, with both indexes registering as the Tri-County Region's lowest score among this subset of indexes
- The Tri-County Region's FDI Attractiveness Index indicates that the region sees foreign and domestic investment at a rate similar to the overall US average and rates slightly better than the Broader Region overall.
- Both the Tri-County Region and the Broader Region outperform the national baseline on the Patent Technology Diffusion Index. This indicates that the Tri-County Region and the Broader region have a relatively high volume of high technology patents.
- Both the Tri-County Region and the Broader Region score high on the University-Based Knowledge Spillover index, indicating the regional strength and proximity of research universities with high research expenditures in science and engineering.
- NOTE: Detailed data on venture capital and foreign direct investment is contained and highlighted in the individual targeted industry sections

Workforce

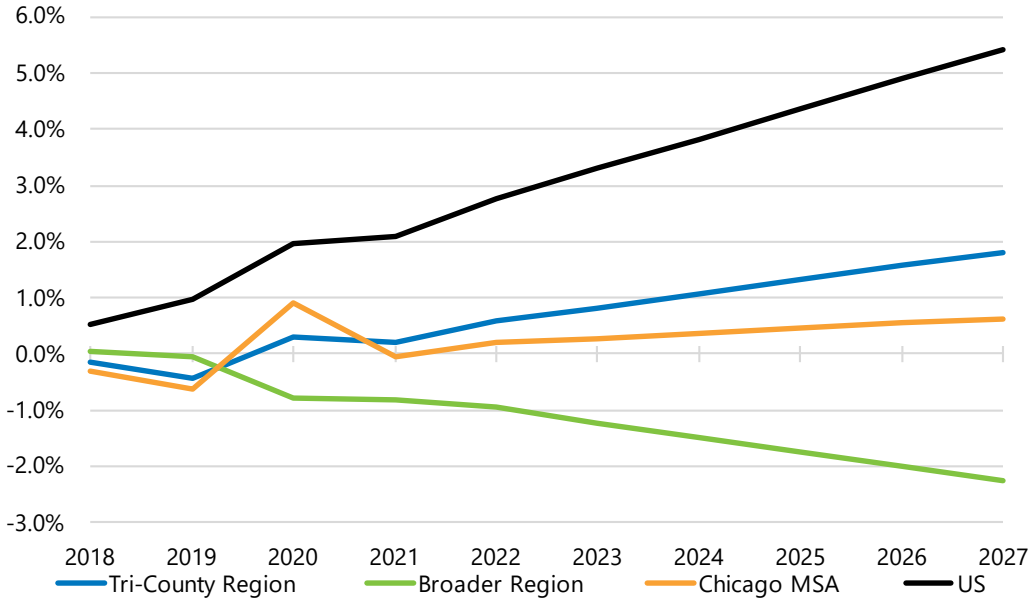
Demographics

Population by Region, 2023

Region	Population
Tri-County Region	649,826
Broader Region	1,664,522
Chicago MSA	9,534,883
US	334,161,482

Source: Lightcast

Annual Population Growth Trends by Region, 2017-2027



Source: Lightcast

The Tri-County Region accounts for about 39% of the Broader Region's total population in 2023, with just below 650,000 people

The Tri-County Region population saw negative growth from 2017-2019 and again from 2020-2021, while increasing all other years. The largest increase from 2019-2020. The Tri-County Region's population is projected to increase every year until 2027

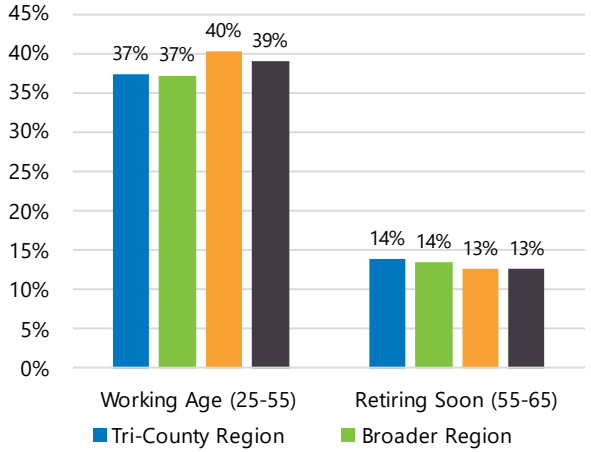
Since 2020, the Broader Region's population has been declining annually. Meanwhile, the Chicago MSA's population has been growing marginally in recent years and is projected to see steady but slow growth through 2027

The Tri-County Region's population growth rate is projected to be greater than both the Broader Region and the Chicago MSA, though all three local regions have lagged and will continue to lag overall US population growth through 2027

Age Distribution

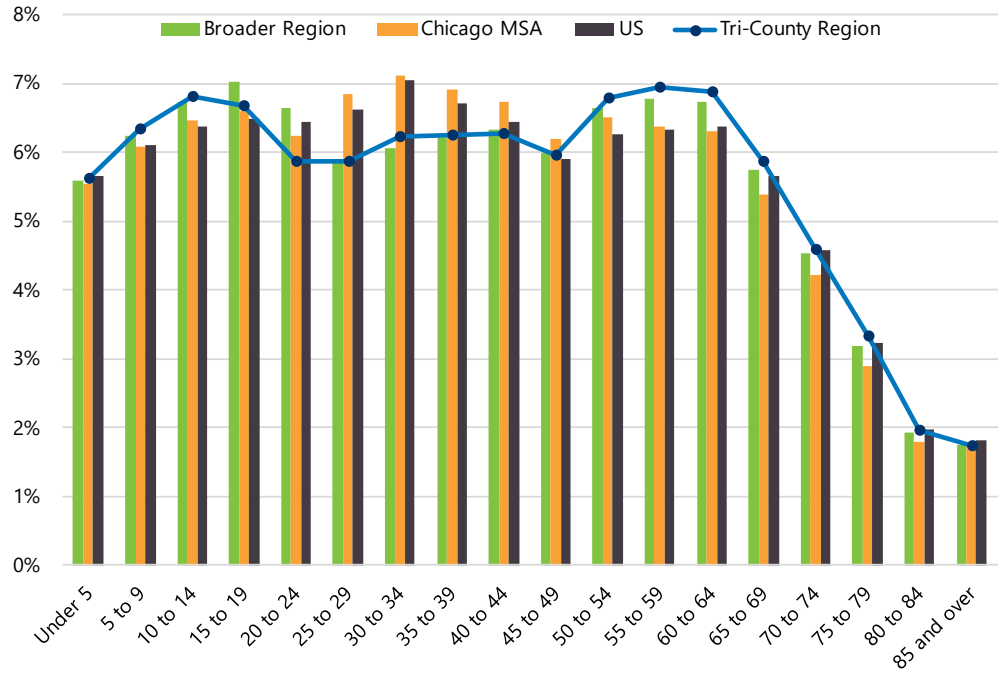
- 37% of the Tri-County Region's population is of prime working age, between 25 and 55 years old. Compared to the other regions, this is slightly lower than the Chicago MSA but on par with the Broader Region and the US.
- Conversely, 14% of the region's population is between the ages of 55-65, likely to retire soon if not already retired. This is a similar share compared to the Broader Region, Chicago MSA, and nation.
- The Tri-County Region's Median age is the highest compared to the other study regions, at 40.3 years in 2023 compared to 39.0 in the Broader Region, 38.1 in the Chicago MSA, and 29.1 in the US.

Working Age and Retiring Soon Population Share by Region, 2022



Source: Lightcast

Age Distribution in Comparison Regions, 2022



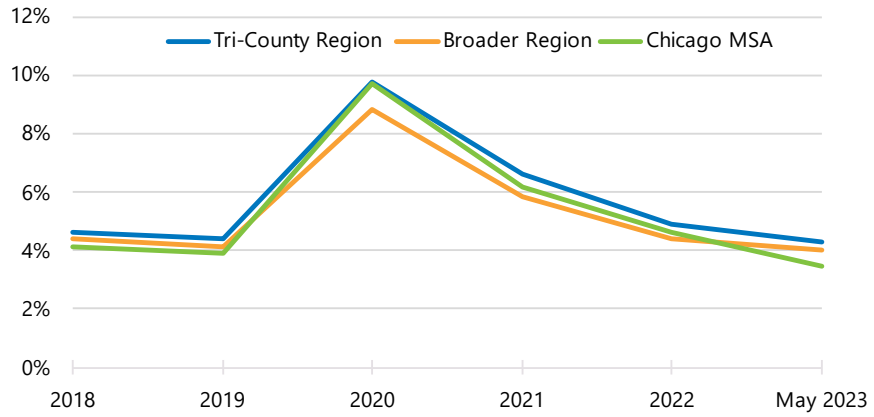
Source: Lightcast

- The Tri-County Region has a comparatively large share population in older age cohorts, particularly those from age 50-74 years old.
- The Tri-County Region also has a comparatively strong share of children aged 5-14 compared to the other study regions.
- Meanwhile, the Tri-County Region has a relatively low share of younger working-aged individuals, particularly in the 20-44 year age cohorts, compared to the Chicago MSA and nation, and has a lower concentration of 20-24 year-olds than all three comparison regions.

Employment and Unemployment

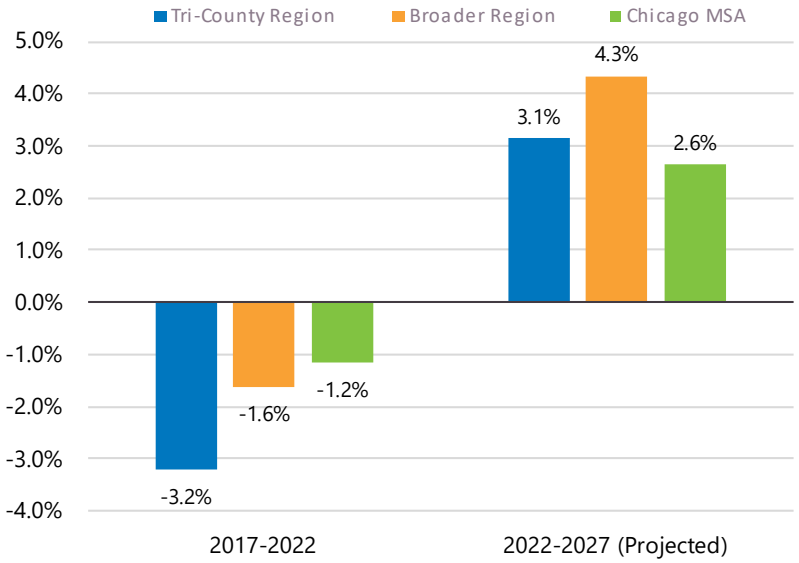
The Tri-County Region tends to have a slightly higher unemployment rate than the Broader Region and Chicago MSA. Its pandemic peak was 9.8% on average in 2020, similar to the Chicago MSA's 9.7%. However, the Tri-County Region's unemployment has been slower to recover than the neighboring regions.

Unemployment Rate Comparison, 20182023



Source: Lightcast

Historic and Projected Job Growth Comparison



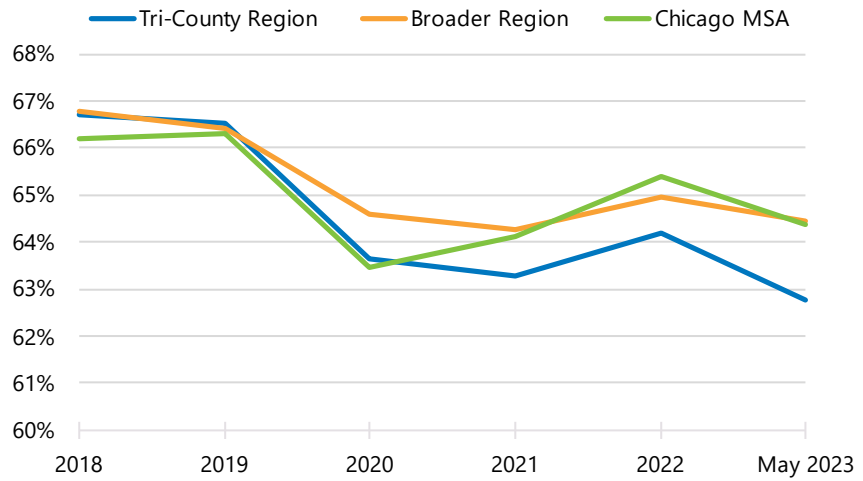
Source: Lightcast

All three comparison regions saw the total number of jobs decline from 2017-2022, though the Tri-County Region saw the steepest drop, at -3.2% compared to -1.6% in the Broader Region and -1.2% in the Chicago MSA. Over the next five years through 2027, the Tri-County Region is projected to see overall job growth of 3.1%, outpacing the Chicago MSA but slightly lower than the Broader Region's growth of 4.3%.

Labor Force Participation

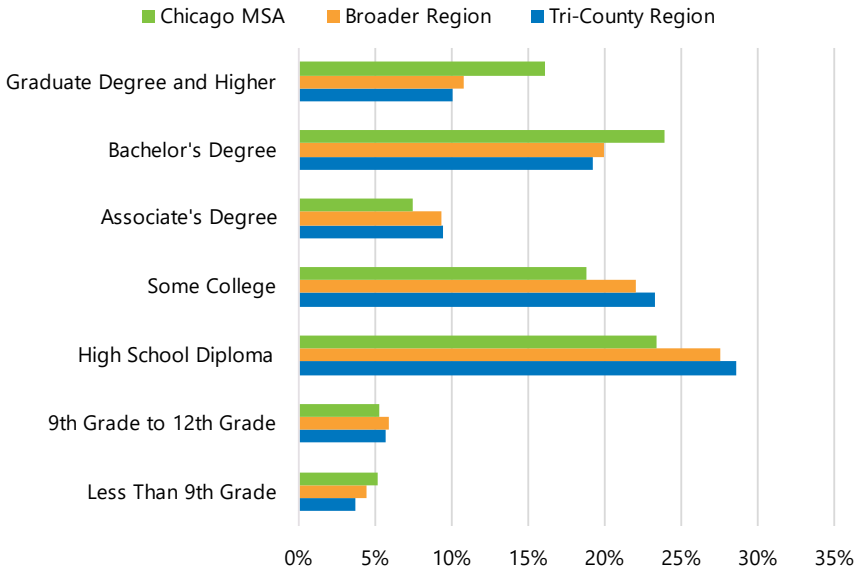
In the past, the Tri-County Region's labor force participation rate was in step with the Broader Region and marginally higher than the Chicago MSA. However, the COVID-19 pandemic saw labor force participation decline more severely in the Tri-County Region and the MSA than in the Broader Region. Since then, it has recovered in the Chicago MSA but declined further in the Tri-County Region, reaching 62.8% in May 2023 compared to 64.5% in the Broader Region and 64.4% in the Chicago MSA.

Labor Force Participation Comparison



Source: Lightcast

Educational Attainment Comparison, 2021



Source: Lightcast

Educational Attainment

Educational attainment in the Tri-County Region is similar to the Broader Region but lower than the Chicago MSA. Overall, 39% of the Tri-County Region's adult population has a college degree (Associate's, Bachelor's, or Graduate Degree), compared to 40% in the Broader Region and 47% in the Chicago MSA.

Top Occupations

Top 10 Detailed Occupations in the Tri-County Region's Emerging Clusters (2022)

SOC	Description	2022 Jobs	Share of Emerging Cluster Jobs	Share Working in Emerging Clusters	Median Hourly Earnings
51-2098	Miscellaneous Assemblers and Fabricators	2,716	10.5%	41.4%	$20.26
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,544	5.9%	17.3%	$15.84
11-9013	Farmers, Ranchers, and Other Agricultural Managers	1,131	4.4%	99.6%	$18.78
47-2152	Plumbers, Pipefitters, and Steamfitters	721	2.8%	76.4%	$44.32
47-2111	Electricians	668	2.6%	70.1%	$37.79
11-1021	General and Operations Managers	666	2.6%	9.7%	$42.69
53-7065	Stockers and Order Fillers	640	2.5%	12.4%	$15.85
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	506	2.0%	24.0%	$18.31
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	472	1.8%	75.2%	$26.83
51-9111	Packaging and Filling Machine Operators and Tenders	472	1.8%	48.6%	$16.40

Source: Lightcast

Top 10 Fastest-Growing Occupations in the Tri-County Region's Emerging Clusters (2022

SOC	Description	2022 Jobs	2027 Jobs	Change	% Change	2022 Median Hourly Earnings
15-1252	Software Developers	427	518	90	21%	$51.25
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,544	1,603	59	4%	$15.84
53-7051	Industrial Truck and Tractor Operators	374	414	41	11%	$18.83
53-7065	Stockers and Order Fillers	640	680	40	6%	$15.85
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	472	511	38	8%	$26.83
47-2152	Plumbers, Pipefitters, and Steamfitters	721	759	38	5%	$44.32
51-3011	Bakers	166	197	31	19%	$14.15
49-9051	Electrical Power-Line Installers and Repairers	270	299	29	11%	$52.13
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	398	422	24	6%	$29.42
53-3032	Heavy and Tractor-Trailer Truck Drivers	280	304	24	9%	$24.76

Source: Lightcast

Among all four emerging clusters combined, several occupations stand out as providing significant staffing support. Miscellaneous Assemblers and Fabricators account for 10.5% of all employment in the four clusters, and 41.4% of workers in these occupations work in the emerging clusters. Other key occupations include Farmers/Ranchers, Plumbers, Electricians, and HVAC Mechanics, of which over 70% (and up to nearly 100%) of all workers in the Tri-County Region are employed in one of the emerging cluster industries.

Over the next five years through 2027, Software Developers are the occupation that is projected to see the most growth, adding 90 net jobs (+21%).

Overall, the fastest-growing occupations within the four emerging clusters fall across the earnings spectrum, ranging from lower-wage occupations such as Bakers ($14.15), Laborers and Freight/Stock/Material Movers ($15.84) to high-earning occupations such as Electrical Power-Line Installers ($52.13).

Educational Assets: When examining workforce training, an analysis of post-high school institutions in the Tri-County Region showed approximately 91 programs related to Electric Vehicles, Renewable Energy, Innovative Agriculture, and IT Innovation. Nearly 70 of these relevant programs are offered by McHenry County College and Rock Valley College. Additionally, we identified more than 250 relevant programs in the broader region.[1] Notably, University of Wisconsin-Whitewater offers more than 60 IT related degrees and certificates, several of which can be completed online. A more detailed overview of relevant programs is included in Attachment B.

Number of Cluster Related Degrees by Institution

	Associate's Degree	Bachelor's Degree	Certificate
Tri-County Region			
McHenry County College	15		24
Rasmussen University	3	5	5
Rock Valley College	15		15
Rockford Career College	1		3
Rockford University		7	
Broader Region			
Aurora University		6	
Beloit College		11	
Blackhawk Technical College	9		10
Elgin Community College	18		29
Highland Community College	17		9
Judson University		6	
Northern Illinois University		16	3
University of Wisconsin-Whitewater		13	69
Waubonsee Community College	21		13

[1] The surrounding area includes select institution in DeKalb County, IL; Kane County, IL; Kendall County, IL; DuPage County, IL; Rock County, WI; Green County, WI; Stephenson County, IL.

Real Estate

The availability of real estate, in the form of both existing structures and developable sites, impacts the region's ability to expand and attract emerging industries.

Most facility needs related to the four emerging industry clusters will require office, flex, or industrial space.

- **Office Space** - The primary intended use of an office building is to house employees of companies that produce a product or support service, such as administration, accounting, marketing, information processing and dissemination, consulting, human resources management, financial and insurance services, educational and medical services, and other professional services.
- **Flex Space** - A type of building designed to be versatile, which may be used in combination with office, research and development, and industrial, warehouse, and distribution uses. Per CoStar's definition, at least half of the rentable area of the building must be used as office space.
- **Industrial Space** - A type of building adapted for a combination of uses such as assemblage, processing, and/or manufacturing products from raw materials or fabricated parts. Additional uses include warehousing, distribution, and maintenance facilities.

Office Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,245	14,614,644	1,382,633	9.5%	$18.89
Broader Region	3,112	37,759,856	4,146,891	11.0%	$19.36
Chicago MSA	15,529	513,364,310	103,534,779	20.1%	$30.95
US	348,936	8,421,890,055	1,421,468,468	16.6%	$28.28

Source: Costar

Flex Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	134	5,344,223	371,458	6.9%	$8.67
Broader Region	418	13,819,089	828,041	6.0%	$9.85
Chicago MSA	2,467	76,158,141	6,775,199	8.8%	$15.43
US	48,132	1,874,999,663	166,874,970	8.9%	$18.16

Source: Costar

Industrial Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,657	77,132,848	4,552,667	5.8%	$6.02
Broader Region	4,568	252,201,183	18,262,473	7.0%	$5.85
Chicago MSA	23,202	1,312,022,207	101,349,209	7.6%	$8.18
US	429,430	16,728,603,964	1,392,251,875	8.3%	$11.04

Source: Costar

The Tri-County Region and the Broader Region have a substantially higher concentration of industrial space, compared to office space. In terms of total square footage, the Tri-County Region has over five times as much industrial space as it does office space. At the national level, industrial space exceeds office space by a ratio of 2-to-1. The availability of all types of space (office, flex, and industrial) is lower in the Tri-County Region than it is in the Chicago MSA and nationally, as is the cost of space in terms of rent per square foot. Office space in the Tri-County Region is leased for an average of about $19 per square foot, nearly 40% lower than rates in the Chicago MSA and 33% lower than the national average. Industrial space in the Tri-County Region goes for about $6 per square foot, more than 25% lower than the Chicago MSA average and 45% lower than the national average.

Space Availability

Offering potential users a wide range of real estate to choose from increases the likelihood of finding a suitable space and securing the user.

Across the Tri-County Region's inventory of 1,245 office properties, there are 144 spaces currently available for occupancy by a user. Available space refers to space that is currently being marketed as available for lease or sale, regardless of whether it is currently vacant, occupied, available for sublease, or available at a future date.

Most available office space is on the smaller side, with 58% of spaces measuring less than 5,000 SF. There are only 15 flex spaces available in the Tri-County Region, ranging from under 5,000 SF up to 100,000 SF. The Tri-County Region has 67 industrial spaces available. Smaller spaces are easier to come by, with about 61% of spaces under 50,000 SF. There are 3 properties over 1 million SF.

Across property types, Boone County accounts for just 6% of all available spaces, with the remaining 94% split almost evenly between McHenry and Winnebago counties.

The Tri-County Region has 169 available sites currently being marketed, with 57% under 5 acres and another 34% between 5 and 50 acres. There are 14 sites over 100 acres, the largest of which is 636 acres.

Office, Flex, and Industrial Spaces Available for Lease or Sale, by Size Range and County

	Office				Flex				Industrial				All Types			
Size Range (SF)	Boone	McHenry	Winnebago	Total	Boone	McHenry	Winnebago	Total	Boone	McHenry	Winnebago	Total	Boone	McHenry	Winnebago	Total
<5,000 SF	6	51	26	**83**		2	4	**6**		7	4	**11**	**6**	**60**	**34**	**100**
5,000 - 9,999 SF	1	12	15	**28**		2		**2**		10	2	**12**	**1**	**24**	**17**	**42**
10,000-19,999 SF	2	3	10	**15**		1		**1**		3	3	**6**	**2**	**7**	**13**	**22**
20,000 - 49,999 SF		6	9	**15**			4	**4**		6	6	**12**		**12**	**19**	**31**
50,000 - 99,999 SF			3	**3**		1	1	**2**	2	3	4	**9**	**2**	**4**	**8**	**14**
100,000 - 199,999 SF									1	1	7	**9**	**1**	**1**	**7**	**9**
200,000 - 399,999 SF											2	**2**			**2**	**2**
400,000 - 999,999 SF									1		2	**3**	**1**		**2**	**3**
1,000,000 - 1,999,999 SF											3	**3**			**3**	**3**
Total	9	72	63	**144**	0	6	9	**15**	4	30	33	**67**	**13**	**108**	**105**	**226**

Source: CoStar

Available Sites by Size Range and County

	Boone		McHenry		Winnebago		Total	
Site Acreage Range	Number of Sites	Total Acreage	Number of Sites	Total Acreage	Number of Sites	Total Acreage	Number of Sites	Total Acreage
<5 acres	6	23	63	228	28	134	**97**	**385**
5-9.9 acres	2	41	5	81	12	152	**19**	**274**
10-19 acres	1	23	5	169	4	88	**10**	**280**
20-49 acres	1	99	12	701	9	550	**22**	**1,350**
50-99 acres	2	408	3	593	2	192	**7**	**1,193**
100-199 acres	3	386	4	885	2	565	**9**	**1,836**
200-399 acres		241		240	4	1,183	**4**	**1,664**
400+ acres			1	636			**1**	**636**
Total	**15**	**1,221**	**93**	**3,532**	**61**	**2,864**	**169**	**7,617**

Source: CoStar

Resources within the Region for information on sites include:

- An inventory of available sites for Belvidere/Boone County is available on the Growth Dimensions EDO website: https://www.growthdimensions.org/site-selection
- An inventory of available sites for Rockford/Winnebago County is available on the Rockford Area EDC website: https://rockfordil.com/sites-and-buildings/sites/
- An inventory of available sites for Crystal Lake is available on the Clearly Crystal Lake website: https://www.clearlycrystallake.com/site-selection

Facility Needs by Emerging Industry Cluster

The 2016-2019 CEDS identified as a weakness a lack of "shovel-ready" sites. The 2021-2025 update of the Comprehensive Economic Development Strategy (CEDS) further confirms this and indicates "Though the Northern Illinois Qualified Sites Program has made six shovel-ready industrial parks in Winnebago and Boone counties more visible to site selectors around the globe, stakeholders expressed a desire to add more QSP sites to the three-county region, especially industrial parks that feature mega-parcels of 500 acres or larger."

The following matrix shows space needs by facility type for various industry activities falling within the four emerging industry clusters. The availability of existing facilities and/or sites on which such facilities could be developed is critical for attracting these kinds of operating activities to the Tri-County Region.

Emerging Industry Cluster	Space Type					
	Agricultural Space	Manufacturing, Assemblage, & Processing Space	Warehousing & Distribution Space	R&D/Lab Space	Office Space	Miscellaneous Space
Electric Vehicles		▪ EV battery mfg. ▪ Battery materials mfg. ▪ EV assembly plants ▪ EV charging infrastructure mfg.	▪ Battery distribution ▪ EV distribution	▪ Energy storage, electric motors, power electronics ▪ Charging infrastructure R&D	▪ Software development ▪ Corporate office	▪ Minerals mining for batteries ▪ Vehicle charging infrastructure sites
Renewable Energy		▪ Battery storage mfg. plants ▪ Solar mfg. ▪ Wind power mfg. ▪ Offshore wind power mfg.	▪ Battery distribution ▪ Solar/wind power equipment distribution ▪ Offshore wind component distribution	▪ Clean energy R&D	▪ Corporate office	▪ Wind farms ▪ Solar farms
Innovative	▪ Greenhouses	▪ Food Processing	▪ Food/Ag	▪ Animal/crop science	▪ Software	

Agriculture	▪ Hydroponics ▪ Vertical farming	▪ Agricultural Instruments and equipment mfg.	Distribution ▪ Instruments/ equipment distribution	/ agribiotech R&D ▪ Instruments, sensors, robotics, satellites R&D	development ▪ Corporate office	
IT Innovation		▪ Semiconductor mfg. (chip fab) ▪ Semiconductor materials mfg. (chemicals, gases, wafers) ▪ Semiconductor equipment mfg.	▪ Semiconductor supply chain distribution	▪ R&D in quantum computing, AI, automation, nanotechnology	▪ Software development ▪ Corporate office	▪ Data centers

Existing Real Estate Development Opportunity

R1PC recently commissioned a feasibility study for a rail-served industrial park near Chicago Rockford International Airport following through on an established goal for the region for economic development. The study, completed in March 2023 and tilted, *Region 1 Planning Council Regional Freight Rail Site Feasibility Study,* was completed by the engineering and environmental firm Fehr Graham and concluded that the site had significant potential for transportation, logistics, utility, and light industrial development. Specifically, it stated:

> "The property demonstrates tremendous potential to attract transportation, logistical, large-scale utility, and light manufacturing industries given the utility readiness of the site. With access to multiple modes of shipping and the spatial flexibility to develop facilities to suit, the site presents a strong opportunity to create cargo-oriented development (COD) to serve both domestic and international customers. The local and regional air, rail, and highway infrastructure provides an exceptional foundation for the development of this Industrial Park. Conceptual land development plans were created to demonstrate potential land use and lot configurations of the 1,475 gross acres. Approximately 1,100 acres are designated as rail-served industrial (775+ acres) or industrial (300+ acres). The remaining 350+ acres are identified as community solar, open, or green space, and stormwater management. The characteristics of the subject site provide options on phasing the development based on initial demand and capital considerations" (Page 3).

The study also estimated the cost to fully develop the site to be $82.1 million, or $55,700 per acre.

In addition to being zoned properly, being near and having access to needed infrastructure, and a strong set of transportation assets, rail, road, and air, the study indicates several direct connections to the emerging targeted sectors, including:

- "Proximity to regional 14.75 MW solar farm could attract industries with solar or renewable energy goals"
- "Winnebago County and Orchard Hills landfills located within two miles of the site provides potential to cogenerate power using landfill gases"
- "ComEd transmission line, located along Edson Road, provided the potential to create a micro-grid within the site"

- "Open space and industrial rooftop solar have the potential to generate between 50-100 MW at full site development. Solar could be designed as a microgrid or simply to reduce the development's demand for traditional power."

Real Estate Site Selection Resources

Site selection requirement for traditional industries, including traditional manufacturing, is primarily focused on proximity for site needs:

- Shovel- ready sites
- Traditional infrastructure – roads, rail, water, sewer, ports
- Energy availability and cost
- Low- and semi-skilled labor

Technology has transformed industries including advanced manufacturing, transportation and warehousing, and logistics into "smart logistics". This technological transformation still has traditional factors for site location needed, but also requires proximity to and availability of:

- Digital infrastructure and digital process
- Ecosystem for innovation in product, process, and business models
- Advanced technical skills

This also applies to almost all aspects of the emerging targeted sectors.

Infrastructure

Transportation Logistics, and Freight

As highlighted in the 2021-2025 CEDS update and consistent with prior CEDS, the Tri-County Region's geographic positioning in the central US and proximity to the Chicago MSA, combined with its transportation logistics infrastructure, are a strength for the region's economy.

In September 2023, R1PC completed a Freight Analysis, titled *Regional Freight Study for the Rockford Region Final Report.* The report provided important information, analysis, and strategies not only for the current regional economy, but for the emerging targeted industries. It confirmed that the Tri-County Region is part of a larger region that is positioned as a leader in transportation and logistics. This region provides the movement of significant product inputs and outputs via rail, air, and roads, serving the region, the state, and the country. Freight infrastructure, processes, and related activity are critical to the success of the region's emerging targeted industry sectors. More specifically, the 2023 report found that:

- In 2019, 48.5% of the region's employment fell within freight-dependent sectors and 57.4% of Boone, Winnebago, and Ogle Counties' gross domestic product (GDP) was directly tied to freight-dependent sectors
- The Chicago Rockford International Airport is currently the 14th largest cargo airport nationally and is one of the fastest growing cargo airports globally, growing by an average of 28.5% annually since 2016.
- The Rockford Region's economy is rooted in manufacturing and agriculture, both of which are largely dependent on freight movement. The top commodities of freight connected to the emerging tarted industries and their supply chains (by all transportation methods) include:
    - Machinery, Electrical, and Precision Instruments
    - Metals
    - Motor Vehicles and Transportation Equipment
    - Waste and Scrap
    - Chemicals, Pharmaceuticals, Plastics, and Rubber
    - Crops, Livestock, and Farm Products
    - Food Products
    - Energy Products

The study grouped recommendations into three primary categories including

- Infrastructure
- Economic development
- Policy and programs

Two specific recommendations stand out as important and related to the emerging targeted sectors. They are:

- Infrastructure improvements for increased weight capacity and creation of highway grade crossings. Both are needed to increase the safety and efficiency of freight movement in the region
- Support in building out "a balanced program of elements for intermodal transportation in Rockford and the Rock River Valley that meet industry's freight service needs, the operating requirements of freight transportation providers, and the City of Rockford's land use and transportation goals."

Additionally, the freight study recommended optimizing "existing and future transportation infrastructure to ensure high levels of mobility and accessibility for freight movement". These advancements will create additional synergies between the transportation and logistics sector and the emerging targeted sectors.

Airport

In addition to being close to Chicago O'Hare Airport, the Chicago Rockford International Airport is currently the 14th largest cargo airport nationally and is one of the fastest growing cargo airports globally, growing by an average of 28.5% annually since 2016. It also provides passenger travel options that, when combined with Chicago O'Hare, make the Tri-County Region well served.

The Greater Rockford Airport Authority oversees a Foreign Trade Zone (FTZ#176) allowing businesses to take advantage of trade and tax incentives.

Roads

The region is well served by its road network for commercial activities, including recently expanded I-90, which crosses the Tri-County Region, connecting it to Chicago; I-39, a significant truck route that covers part of the Tri-County Region through to the middle of Illinois; U.S. 20 a four-lane divided highway through part of the Tri County Region; U.S. 14; and U.S. 12.

Rail

The region includes several Class 1 railroads, a short-line railroad, and a regional railroad, and is in close proximity to major rail hubs in the Chicago MSA. However, the 2016-2019 CEDS as well as the 2021-2025 update point out that several of the rail lines are in need of upgrades to meet cargo needs. As indicated specifically in the latter update,

"Several of the region's freight rail lines need upgrades to handle faster and larger freight loads, particularly the Illinois Railway that passes Chicago Rockford International Airport, and the Union Pacific line that serves the FCA plant in Belvidere and also passes through McHenry and Winnebago counties. Additionally, the region lacks a direct connection to the Union Pacific Global III Intermodal Facility in Rochelle, which would prove beneficial should the intermodal hub be put back into use."

Water and Sewer

Accommodating new factories and manufacturing plants related to the emerging clusters identified in this report will increase the load on sanitation facilities in the Tri-County Region. Currently, wastewater and sewage removal in the Tri-County area is carried out by city and village municipal sewers, as well as multiple town sanitary districts. Four Rivers Sanitation Authority (FRSA), one of the largest providers of wastewater and sewage treatment services in the region, is in their fourth year of a 10-year plan to upgrade their facility. FRSA currently serves more than 290,000 people in the communities of Rockford, Loves Park, Machesney Park, Roscoe, Cherry Valley, New Milford, Rockton, and several unincorporated areas within Winnebago County. They also provide services to a small proportion of Boone County. Through the proposed upgrades, FRSA will increase their capacity from 40 million gallons per day to 60 million gallons per day. According to FRSA, the planned upgrades were designed to accommodate future manufacturing plants, including facilities related to EV manufacturing, which produce large amounts of wastewater. These upgrades align with proposed recommendations in the *City of Rockford 2030 Comprehensive Plan*.

Across the Tri-County Region, the 2016-2020 CEDS indicates "While water was cited as a major strength by local businesses, much of the region is groundwater-dependent and water must be managed sustainably to preserve that strength."

Broadband

According to the 2016-2020 CEDS, "The region has invested in broadband technology in recent years through the IFiber initiative and related efforts. A looped fiber backbone along I-90 and I-39 supports the high speeds that advanced manufacturers, hospitals, and information technology firms need. McHenry County has also pursued expansion of fiber, creating a backbone that links the MCC with the county government center in Woodstock and is planning further expansions to improve connectivity and speed in northern and western parts of the county." Since then, and as indicated in the 2021-2025 update, expansion efforts continue, though like many areas, service gaps within the Tri-County Region remain and will be important for expanding targeted industry, workforce, and entrepreneurship opportunities.

Infrastructure Summary

Overall, the Tri-County region is well serviced by infrastructure. However, it will be important to continue to consistently invest for upgrades and expansions to meet the needs of the Target Industry sectors, most notably those specifically tied to manufacturing and logistics, including rail line upgrades, extension of broadband fiber, and highway grade road crossings. Additionally, it is critical that infrastructure improvement lead to more "shovel-ready sites.

Asset Summary

Number of Cluster Related Degrees by Institution

	Associate's Degree	Bachelor's Degree	Certificate
Tri-County Region			
McHenry County College	15		24
Rasmussen University	3	5	5
Rock Valley College	15		15
Rockford Career College	1		3
Rockford University		7	
Broader Region			
Aurora University		6	
Beloit College		11	
Blackhawk Technical College	9		10
Elgin Community College	18		29
Highland Community College	17		9
Judson University		6	
Northern Illinois University		16	3
University of Wisconsin-Whitewater		13	69
Waubonsee Community College	21		13

The growth and development of the emerging clusters can be supported by a variety of regional, state, and federal assets.

Educational Assets: When examining workforce training, an analysis of post-high school institutions in the Tri-County Region showed approximately 91 programs related to Electric Vehicles, Renewable Energy, Innovative Agriculture, and IT Innovation. Nearly 70 of these relevant programs are offered by McHenry County College and Rock Valley College. Additionally, we identified more than 250 relevant programs in the broader region.[2] Notably, University of Wisconsin-Whitewater offers more than 60 IT-related degrees and certificates, several of which can be completed online. A more detailed overview of relevant programs is included in Attachment B.

Grants and Funding: A review of recent state and federal policy changes revealed a variety of cluster-related incentives for businesses and individuals. A primary focus of recent, state-level initiatives has been to support and grow the Electric Vehicle industry

[2] The surrounding area includes select institution in DeKalb County, IL; Kane County, IL; Kendall County, IL; DuPage County, IL; Rock County, WI; Green County, WI; Stephenson County, IL.

in Illinois. This effort is in line with federal policy trends. We identified approximately 15 state and federal programs designed to support growth and innovation in the Electric Vehicle industry. To review grant and funding opportunities related to the emerging clusters see Attachment C.

Labor Unions: Approximately 24 cluster-related labor union chapters are currently active in the Tri-County Region. Eight of these local chapters are part of the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America or United Auto Worker (UAW) for short. See Attachment D for more information related to labor unions in the Tri-County Region.

Regulation and Policy: Several policy changes at the state and federal level may influence the growth and development of the emerging clusters. Information related to recent, relevant policy changes is included in Attachment E. Regulations specifically related to the agricultural industry may be important to the emerging Innovative Agriculture cluster. An overview of these policies is included in Attachment F.

The CEDS identified several regional assets that are relevant to this analysis and can be leveraged by R1PC to support the emerging clusters.

1. Tax Codes and Policy
    a. While parts of the region have high property tax rates, relative lower land values reduce business costs
2. Transportation
    a. A top asset noted in at least two CEDS reports was the region's "location in the central US at the junction of major highways, rail, and air with proximity to Chicago, Madison and Milwaukee"
        i. I-90 (the Jane Addams Memorial Tollway) runs through the entire region, connecting it to Chicago and the rest of the Midwest
    b. The region is also home to Chicago Rockford International Airport (RFD)
        i. The 28th largest cargo airport in the country (note: now the 14th largest)
        ii. UPS's second-largest air hub in North America
        iii. 10,000-foot runway can land any aircraft flying today
    c. The region has significant rail assets, all of which augment regional freight movement capacity
        i. Several Class 1 railroads
        ii. A short-line railroad
        iii. Union Pacific Global III Intermodal Facility in Rochelle is south of the region, but a key asset
3. Land and Location
    a. The Northern Illinois Region has ample land suited for and zoned for industrial and commercial development
        i. These parcels are near major transportation corridors, and accessible to the region's workforce
        ii. Interviews from our analysis, however, revealed that many of these sites are far from "full-shovel ready"
    b. The 2010-2015 CEDS identified "proximity to Chicago, Madison, and Milwaukee" as an asset
    c. The region has active Farm Bureaus, conservation organizations and relationships with the U.S. Department of Agriculture that help preserve farmland.
        i. Region's cities provide a strong, accessible market for locally grown goods

   ii. Larger markets such as Chicago, Madison, and Milwaukee are easily reachable by highway
   iii. Support for locally grown foods, as well as interest in urban agriculture and farmers markets, are also strengths
4. Quality of Life
   a. Affordable housing and real estate
   b. Low cost of living
   c. Parks, rivers, and green space
5. Workforce and Education
   a. McHenry County stakeholders identify the local workforce combined with the ability to pull from the larger Chicago regional labor pool, when necessary, as assets
   b. The two community colleges – McHenry County College (MCC) and Rock Valley College (RVC) – run training programs geared toward manufacturing
   c. Belvidere School District 100 has developed the STEM-based Washington Academy, and Huntley School District 158 has a Medical Academy. These programs can serve as models for the region to develop its workforce

For a complete overview of the CEDS report see Attachment A.

APPENDIX B: EMERGING INDUSTRY CLUSTER PROFILES

Cluster profiles detail emerging trends, opportunities, and challenges for each of the four industry clusters, as well as providing national and regional context for the broad sectors within which each emerging industry cluster operates. Emerging industry clusters are made up of businesses at the leading edge of technological innovation in their respective sectors, and as a result, they cannot be defined neatly in terms of NAICS codes. To facilitate analysis, we have developed NAICS-based definitions of the broad sectors that each emerging cluster falls within. Data presented in these profiles are for the broad sector as a whole, both nationally and regionally. An understanding of these broader sectoral trends combined with insight into recent and emerging innovation activity uncovered through desktop research and stakeholder interviews paints a more complete picture of opportunities and challenges for the Tri-County Region.

Emerging industry clusters related to broad sectors are as follows:

- The **Electric Vehicles** industry cluster falls within the broad **Automotive** sector.
- The **Renewable Energy** industry cluster falls within the broad **Energy & Utilities** sector.
- The **Innovative Agriculture** industry cluster falls within the broad **Food & Agriculture** sector.
- The **IT Innovation** industry cluster falls within the broad **IT & Related Manufacturing** sector.

Please refer to Attachment G for a list of NAICS codes used to define each broad sector.

Each profile contains the following components:

- Emerging Trends – discussion of trends, opportunities, and challenges for the emerging industry cluster at the national, state, and regional levels.
- National Outlook – national context on the broad sector within which the emerging industry cluster operates, including national-level data on sector revenue, value add, supply chain, exports and imports, and top products and companies.
- Regional Trends – regional economic performance of each broad sector and sub-sector benchmarked against the Broader Region, the Chicago MSA, and the US.
- Workforce Analysis – analysis of occupations, labor force demographics, and workforce availability and gaps for each broad sector at the regional level.

Electric Vehicles

Emerging Trends

Overview

Within the economy, electric vehicles as an industry are relatively new in terms of the rise in production and consumer demand. This rise in demand has been rapid and is posed to continue over the next ten years. *The Electric Vehicle Market Update* by ERM for the Environmental Defense Fund, declared that "the period from 2025-2035 could bring the most fundamental transformation in the 100-plus year history of the automobile".[3] As battery costs fall and EVs reach price parity with internal combustion engine vehicles, they are projected to become the "dominant type of new vehicles sold by 2035."[4] This emerging trend is confirmed by goals, plans, investments, and projects in the pipeline by major vehicle manufacturers across the globe.

In looking at the trends and related opportunities for regional economic development in the US, it is important to understand the key components and phases of value chains of the electric vehicle industry and related markets. These include:

- Research and development (R&D) – for among other purposes to make vehicles better, cheaper, safer
- Production and assembly including the vehicles themselves and their component parts -including battery, electrical, and all vehicle frames and parts
- Charging and storage – charging stations, batteries (from mining and provision of components to full production and assembly, to integrating into final vehicles, to charging, and to recycling)
- Logistics –for obtaining inputs and getting products to market
- Servicing and maintenance – after sale

In considering market opportunities there are additional complexities to the electric vehicle market that are important to understand including:

- Electrification of transportation – not just cars are being electrified but all vehicles including buses, trucks, marine vehicles, farm vehicles, aircraft, recreation vehicles, and more. Each of these presents different market dynamics
- Transitions in the market along with hybrid options – adoption of electric vehicles is following and will likely continue to occur alongside hybrid options which will continue to rely on traditional fuels fuel for combustion
- Charging methods and charging infrastructure – along with battery and energy storage, production, and supply chains

[3] https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2022/04/electric_vehicle_market_report_v6_april2022.pdf

[4] Walton, Robert. "Zero-emission vehicles 'are coming very fast now,' says author of Congressionally mandated report." Utility Dive, 1 Apr. 2021, https://www.utilitydive.com/news/zero-emission-vehicles-are-coming-very-fast-now-says-author-of-congressi/597711/

- Chips and electronic components – EV's are also embedded with significant digital technology including hardware, microchips, and software

Opportunities

Market trends and opportunities are being driven by three primary factors:

1. Advancement across multiple technologies – energy, materials, IT, and more
2. Changes in consumer and industry demand – increasing acceptance for technology and comfort with electrified vehicles
3. State and federal policy and support – environmental goals and standards, incentives to consumer and producers, US production sourcing goals and policies

Federal policy support is significant in terms of size and includes:

- $1.2 trillion Infrastructure Investment and Jobs Act, of which Illinois expects to receive $17.8 billion over the next five years (Infrastructure Investment & Jobs Act - Illinois)
- President Biden's Executive Order on Strengthening American Leadership in Clean Cars and Trucks, and his Executive Order on Catalyzing Clean Energy Industries and Jobs
- EPA rules and regulations
- And more

Additionally, federal policies and support are catalyzing or in some cases responding to state initiatives, incentives, and policies across multiple aspects of growing the EV economy including:

- Workforce and training
- Direct incentives and subsidies to consumers and companies
- Business and investment attraction, both domestic and abroad
- Land-use policy and site readiness
- And more

Together this is forming an environment for multiple emerging opportunities for regional economic development. The following is a brief overview of opportunities. Each has associated economic potential in terms of investment, businesses, and jobs.

- *Technology* - including software development for operations, battery management systems, autonomous driving features, connectivity; cybersecurity to protect EVs and charging infrastructure from cyber threats and more.

- *Chemical Opportunities* - The adoption of EVs has moved beyond start-ups, with mainstream Original Equipment Manufacturers OEMs now focusing on EVs. Chemical companies are now moving to a system value approach, recognizing that materials solutions can provide significant value in reducing cost and improving the reliability of expensive parts such as batteries, power electronics, and electric motors.
- *Battery Manufacturing* - The production of batteries for EVs has become a crucial sector. As EV adoption continues to rise, battery manufacturing, including plans and investment for additional capacity, is expected to grow significantly. Batteries themselves have multiple components including minerals, chemicals, cells, and casings.
- *Battery Recycling* – while not a major issue yet, as EV's and batteries move further into the market, batteries recycling processes and facilities will steadily significantly increase demand.
- *Charging Infrastructure* - The need for charging stations and infrastructure has created opportunities for companies involved in the installation and maintenance of charging networks.
- *Renewable Energy* - The transition to EVs has increased the demand for renewable energy sources, such as solar and wind power, which are used to charge EVs.

Specific Tri-County Region Opportunities:

Electric Vehicle Readiness - In April 2021 R1PC completed an Electric Vehicle Readiness Plan for the Rockford Region to help local governments in Northern Illinois prepare for EVs. In addition, providing awareness and planning the work led to the development of a Request for Proposals and the selection of Blink Charging Company as a preferred EV products provider. Through this program, Blink is providing significant discounts on its EV charging products within the Tri-County Region. While very beneficial to the current and future build-out of charging stations, more needs to be done to secure companies and workers (installers) in the region for further build-out.

Re-opening and Expansion of Stellantis in Belvedere - The closing of Stellantis in Belvidere had a major impact on automotive manufacturing in the region. Over the five years from 2017-2022, Automotive employment declined by 27% in the Tri-County Region and was highly impacted by the closure of the Stellantis plant. Recent announcements[5] of a tentative deal between the United Auto Workers Union and Stellantis indicate that the Belvidere plant will reopen and suggest that the Belvidere plant will reopen for a production of a new vehicle (mid-size combustion engine truck), construction of a new battery plant, and Mopar parts distribution hub will be added as well. Even if this doesn't lead to -production of electric vehicles and their parts in the short-term it provides a significant continuation and expansion of the workers, skills, supply chain, and overall capacity needed to support further EV and related development.

[5]https://www.motor1.com/news/693756/stellantis-reopen-belvidere-factory-midsize-truck/, https://www.detroitnews.com/story/business/autos/chrysler/2023/10/28/stellantis-strike-uaw-deal/71360452007/

Challenges

In growing the EV industry and related sectors some common challenges arise that require consideration, strategy, and action. These include the following:

- *Unpredictability and Volatility in the Market* – This includes uncertainty in the pace of adoption and cost of the technology and subsequently timing of industry demand for sites, infrastructure, and workforce. It creates risk in economic development for investments in particular for workforce development (uncertainty of the timing and level of future demand and the ability to provide and place workers); and for sites and infrastructure (they are needed to attract investment and companies but may take several years or more to result in actual development.
- *Lack of Acceptance and Support by Communities and Residents* – This includes support to development sites and incentives.
- *Lack of Available and Ready Workforce* – This is a constraint across every industry and will be for years to come. It is especially challenging for new and emerging industries that require new skills, education, and training. EV industry employers are competing with other sectors that are in dire need of workers including some of which, like EVs, pay good wages and provide long-term opportunities.
- *Competition* – This includes both globally and domestically for new investment and development. As an example, domestically, according to a recent CNBC report "Georgia, Kentucky, and Michigan are expected to dominate electric vehicle battery manufacturing in the US by 2030, with each state capable of producing between 97 and 136 gigawatt hours of EV batteries per year. Kansas, North Carolina, Ohio, and Tennessee will also be key players, with planned capacity for between 46 and 97 gigawatt hours of EV battery production per year by 2030" (www.cnbc.com/2023/01/05/map-which-states-will-build-the-most-ev-batteries-in-2030.html)
- *Utility Constraints* - EV-related projects can have significant electric utility requirements amounting to thousands of megawatts in added new load.
- *Supply Chains* – Global and regional supply chains for critical inputs (such as lithium for batteries, but also other inputs) have shown limitations and concerns due to entering from climate changes, pandemics, geo-political conflicts, and more.

Relevant Projects and Companies in the US

The following are examples of recent investment projects broken out by vehicle manufacturing and battery manufacturing.

Vehicles

- Tennessee continues to attract EV investments. (https://www.areadevelopment.com/ContributedContent/Q1-2023/tennessee-is-leader-for-electric-vehicle-production-in-US.shtm)
- Ford announced it would partner with SK Innovation to bring 6,000 EV manufacturing jobs to its new $5.6 billion BlueOval City (an EV mega campus outside of Memphis)
- Ultium Cells will invest an additional $275 million to expand its upcoming production facility in Spring Hill
- Tritium will establish a US manufacturing base in Lebanon
- LG Chem plans to construct a $3.2 billion cathode manufacturing facility in Clarksville
- Daejin Advanced Materials USA will invest $10.2 million to establish a manufacturing and processing facility in Cumberland City

- Duksan Electera America will locate its first North American manufacturing facility in Shelbyville
- Toyota is set to establish its first US electric vehicle assembly line at its Georgetown, Kentucky plant, with a $591 million project expected to retain around 9,000 jobs. To encourage investment and job retention in the community, the Kentucky Economic Development Finance Authority (KEDFA) approved a supplemental project to an existing Kentucky Jobs Retention Act (KJRA) program agreement with the company. (https://www.areadevelopment.com/newsItems/6-1-2023/toyota-georgetown-kentucky.shtml)
- Rivian Inc. is set to invest $5 billion in a 2,000-acre carbon-conscious campus in Stanton Springs, Georgia, which is expected to create 7,500 jobs. The new assembly plant and battery factory will be located at the East Atlanta Megasite and can produce up to 400,000 vehicles per year once production is fully ramped up. (https://www.areadevelopment.com/newsitems/12-20-2021/rivian-stanton-springs-georgia.shtml)

Batteries

Battery production is at a high activity level as it is critically needed to expand the production of EV's. As reported by TechCrunch, "the US has seen a surge in battery factories, with around 30 currently planned, under construction, or operational." Tracking the EV battery factory construction boom across North America (https://techcrunch.com/2023/08/16/tracking-the-ev-battery-factory-construction-boom-across-north-america/)

- BMW announced a $1.7 billion investment in the US in October 2022, with its Spartanburg plant ready for electric vehicle production and a battery assembly facility in nearby Woodruff. The plant is currently used for building BMW's sports utility and crossover vehicles. BMW also partnered with battery maker AESC to invest in a battery cell plant in Florence, South Carolina.
- Ford created a joint venture with South Korean battery maker SK On in September 2021, called BlueOval SK, to build three battery plants in the US. Ford and SK On secured a $9.2 billion loan from the U.S. Department of Energy to finance the construction of these factories. Ford is also building a lithium iron phosphate plant in Michigan.
- General Motors aims to have three total battery plants in the U.S. through its joint venture with LG Chem, named Ultium Cells. The company has also announced a JV with Samsung SDI to build a new battery plant in the United States.
- Honda announced a joint venture with South Korea's LG Energy Solutions to supply the North American market with "pouch type" battery cells. The facility in Ohio will produce both cells and modules. Honda's total investment is projected to be $4.4 billion.
- Hyundai and SK On approved plans to set up a joint venture to build a $5 billion battery plant in Bartow County, Georgia. Hyundai and LG Energy Solution formed another JV to build a battery cell factory near Savannah, Georgia.
- Rivian, a battery technology company, is not committed to building its own batteries in North America. Instead, it plans to build a massive EV production facility in Georgia, which could include a cell manufacturing facility.
- Stellantis and Samsung SDI are constructing a joint venture EV battery facility in Indiana, with a second factory with Samsung set to open in early 2027.
- Tesla has announced plans to invest billions more into the Nevada factory to include a new 4680 cell factory, which is designed to reduce battery costs by over 50%.

- Toyota's planned battery plant in North Carolina will produce both cells and modules, with six production lines supporting hybrid EVs and two supporting battery EVs. The Japanese automaker is also building a battery lab at its North American research and development headquarters in Michigan to develop and evaluate the quality of its EV batteries.
- Volvo has a battery assembly factory in Charleston, South Carolina, but does not manufacture batteries or battery components there. Battery manufacturers building in North America include AESC (formerly Envision AESC), which plans to have three U.S. facilities before the end of the decade, and
- Gotion Inc., which secured $175 million in state funds in April 2023.
- Mercedes-Benz opened a battery plant at its Alabama manufacturing facility in 2022 and is working with Sila, a next-gen battery materials company, to incorporate Sila's battery chemistry into batteries as an option for buyers of the upcoming G-Class.
- LG Energy Solution, a South Korean battery maker, is set to triple its existing lithium-ion cell plant capacity in Michigan to produce new, long-cell design batteries for electric vehicles (EVs). The company also plans to quadruple its investment in a new factory in Arizona to $5.5 billion, with a large portion dedicated to EV battery production. LG Energy Solution plans to spend up to $17 billion through 2025 on constructing eight factories with more than 300 GWh capacity.
- Our Next Energy plans to build a gigafactory in Michigan devoted to lithium-iron-phosphate cells (LFP batteries), with a total investment of $1.6 billion.
- Panasonic plans to build the world's largest EV battery plant in Kansas, with a $4 billion investment.
- SK Battery America, a subsidiary of South Korean battery manufacturer SK On, has invested $2.6 billion into two manufacturing plants in Georgia and reached mass production in early 2022.
- Redwood Materials, a battery recycling startup, plans to expand its battery materials campus in South Carolina to recycle, refine, and remanufacture cathode and anode materials such as nickel, cobalt, lithium, and copper. The company has not yet broken ground on the site, but it has received a $2 billion loan from the DOE to boost its recycling goals.

Additionally in terms of chargers, "Spanish manufacturer Ingeteam is set to expand its Milwaukee plant, creating 100 jobs in electric vehicle charging stations". "Ingeteam will increase production of DC Fast Chargers and L2EV chargers for the US market at its existing plant. The company's new EV production lines in the US will produce up to 13,000 units annually, helping to deploy a network of 500,000 units along America's highways to support EV use and combat climate change". (Ingeteam's Wisconsin expansion charges up the future of electric vehicles in the U.S. www.expansionsolutionsmagazine.com/ingeteams-wisconsin-expansion-future-of-electric-vehicles/)

Relevant Projects and Companies in Illinois

- This article suggests that the vehicles to be produced in Belvidere will be a midsize combustion engine truck: https://www.motor1.com/news/693756/stellantis-reopen-belvidere-factory-midsize-truck/ And this article asserts the Belvidere plant will reopen for a production of a new vehicle, a battery plant will be built AND a Mopar parts distribution hub will be added as well, which, if true, would help

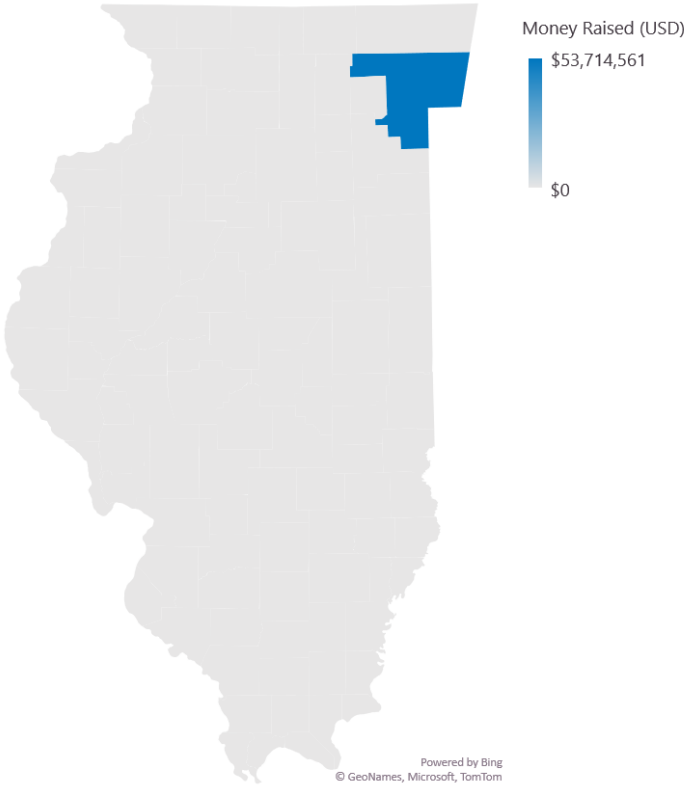
our transportation, distribution, logistics cluster. https://www.detroitnews.com/story/business/autos/chrysler/2023/10/28/stellantis-strike-uaw-deal/71360452007/

- Lion Electric - In August 2023, Lion Electric opened its new 900-thousand-square-foot manufacturing plant for electric school buses and trucks. The factory, located in Joliet, IL, is the largest factory in the country and will produce about 20,000 electric vehicles a year, employing hundreds of workers. (www.cbsnews.com/chicago/news/joliet-ev-factory-lion-electric/)
- Rivian - In 2017, Rivian bought a former Mitsubishi Motors plant in Normal, IL for $17 million. It has since invested an additional $1.2 billion in renovations to the plant. (www.erm.com/globalassets/sustainability.com/thinking/pdfs/2022/ev_market_report_v6_11april22.pdf) The plant is currently up and operating.
- TCCI- TCCI, Illinois' Governor JB Pritzker, Richland Community College, and the Illinois Department of Commerce and Economic Opportunity (DCEO) have partnered to build TCCI's new EV Innovation Hub in Decatur, IL. The hub will include an electric compressor manufacturing facility, the new Climatic Center for Innovation and Research and the EV + Energy Workforce Training Academy. The creation of this hub will bolster workforce development and the EV supply chain in the US. The facility is on track to begin production by the end of 2024. (https://www.expansionsolutionsmagazine.com/tcci-electric-vehicle-innovation-hub-in-decatur/)
- Gotion High-tech- A Chinese-owned company announced plans to invest $2 billion into a lithium battery plant in Manteno, IL. The Governor's office anticipates the new plant will create 2,600 new jobs. (https://www.reuters.com/business/autos-transportation/chinas-gotion-set-up-2-bln-lithium-battery-plant-illinois-2023-09-08/)

State-wide Innovation & Investment

Because electric vehicles represent relatively new and, in many aspects, emerging technology and systems, innovation capacity and performance is a critical part of regional economic competitiveness. The following is an overview of innovation performance and capacity in the region.

Total Venture Capital in Electric Vehicle Categories, 2017-2023



Electric Vehicle Related Companies by Venture Capital Raised, Illinois, 2017-2023

Organization	Total Raised	Related Industries
ForeverCar	$25,489,425	Automotive, E-Commerce, Electric Vehicle, Internet, Online Portals
Veo	$16,000,000	Apps, Electric Vehicle, Software, Transportation
Volexion	$6,560,136	Battery, Chemical, Chemical Engineering, Manufacturing
Blip Energy	$4,185,000	Battery, Clean Energy, Electrical Distribution, Energy, Energy Management, Energy Storage, Power Grid, Renewable Energy, Solar, Supply Chain Management
Fueloyal	$1,330,000	Automotive, Electric Vehicle, SaaS, Software
Renewance	$100,000	Battery, Electronics, Software
Narya Electric	$50,000	Electric Vehicle, Electrical Distribution, Environmental Engineering, GreenTech, Renewable Energy

Source: Crunchbase

Illinois Venture Capital Funding in Electric Vehicle Categories, 2017-2023

	2017	2018	2019	2020	2021	2022	2023	Grand Total
Chicago		$25,489,425		$100,000	$18,725,000	$1,445,000	$1,395,000	$47,154,425
Evanston					$3,280,068		$3,280,068	$6,560,136
Total		**$25,489,425**		**$100,000**	**$22,005,068**	**$1,445,000**	**$4,675,068**	**$53,714,561**

Source: Crunchbase

Foreign Direct Investment in Automotives Sector, Illinois (2017-2023)

Investing Company	Date	Investing Country (State)	Destination County	Subsector	Jobs Created	Capital Investment ($M)
Foreign Investments						
Electric Vehicles					**882**	**$98.6**
Volvo Trucks	May 2022	Sweden	Cook County (IL)	Heavy duty trucks	32	$12.8
Lion Electric	May 2021	Canada	Will County (IL)	Heavy duty trucks	745	$70.0
EVBox	February 2020	France	Lake County (IL)	Electrical equipment	100	$15.0
Navya	March 2017	France	Cook County (IL)	Light trucks & utility vehicles	5	$0.8
General Automotives					**180**	**$48.1**
Nexus Automotive International	November 2019	Switzerland	Cook County (IL)	Motor vehicle & parts dealers (Automotive Components)	42	$2.2
Fiat Chrysler Automobiles (Fiat)	September 2019	United Kingdom	Will County (IL)	Automobiles	32	$12.8
Mercedes-Benz USA (MBUSA)	October 2017	Germany	DuPage County (IL)	Other motor vehicle parts	77	$22.3
Volvo Group Canada	September 2017	Sweden	Cook County (IL)	Heavy duty trucks	29	$10.8
				Total	**1,062**	**$146.7**

Source: fDi Markets, from the Financial Times

Electric Vehicles have accounted for most of the foreign investment in the Automotives sector in Illinois since 2017.

- The largest foreign investment in the Automotive sector was from Lion Electric (Canada), which has committed to an initial investment of $70 million to produce all-electric medium and heavy-duty vehicles in Joliet.
- All foreign investment in the Automotives sector happened outside the Tri-County Region, though Mercedes-Benz invested $22.3 million to renovate a Parts Distribution Center in DuPage County, within the Broader Region
- All major investment in the sector originated from foreign companies. No relevant investments were tracked from domestic companies in other states within the US.

National Outlook

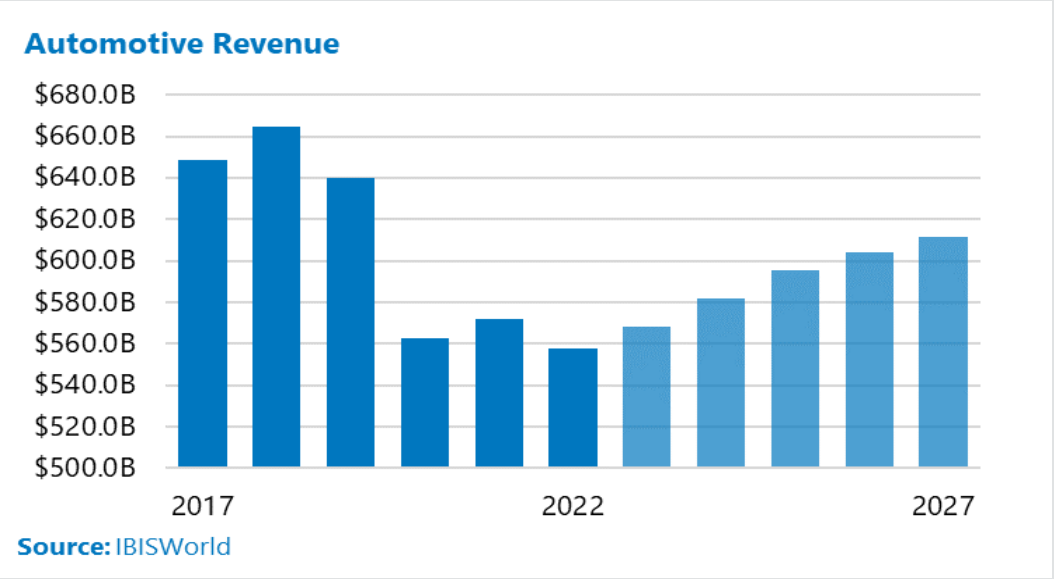
Compound Annual Growth Rate of Key Indicators

	Revenue	Val. Added	Exports	Imports
2017-2022	-3.0%	-4.3%	-3.1%	-0.8%
2022-2027	1.9%	1.6%	3.4%	0.8%

Source: IBISWorld

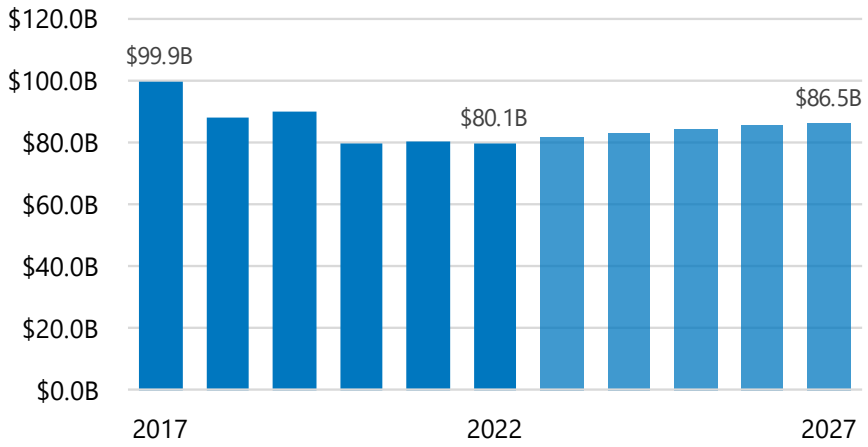
Compound Annual Growth: From 2017-2022, the compound annual growth rate of key indicators such as revenue, value added, exports, and imports was lower than the projection for 2022-2027. This is a positive indicator for the future of revenue, value added, and exports.

Revenue: Total Revenue for the cluster is approx. $557 billion in 2022. Revenue dropped significantly in 2020, slightly over half of which was driven by a drop in Automobile & Light Duty Vehicle Manufacturing (-$40B). Revenue has not picked back up since then. Revenue is projected to increased gradually through 2027, though not regaining its previous peak in the coming 5 years.



Source: IBISWorld

Cluster Value Added

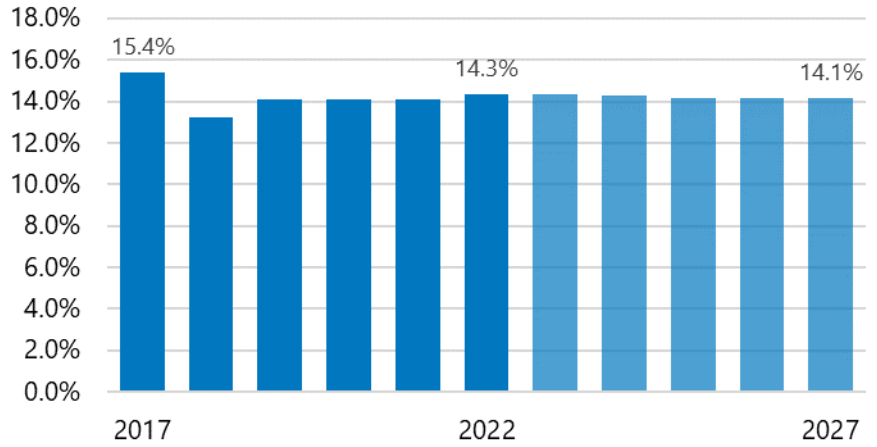


Source: IBISWorld

Value Added: Value added has declined over the past five years, and is expected to continue to grow, although slower, through 2027.

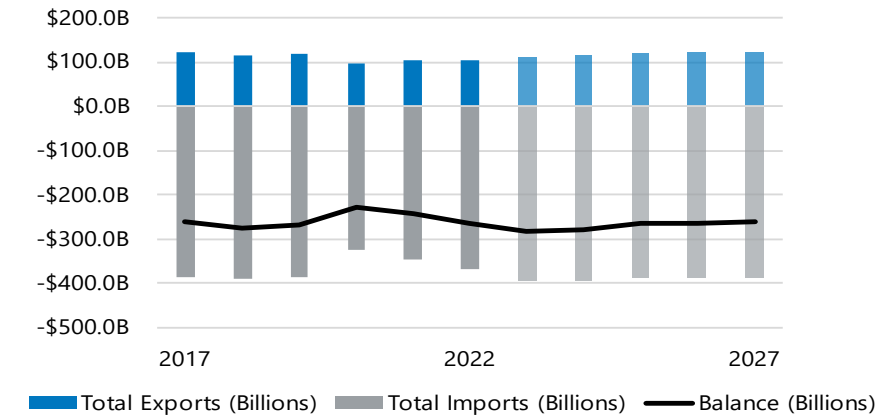
Value Added Share: Value added accounts for 14.3% of revenue in 2022. This share has decreased since 2017 but is projected to remain relatively stable between 2022 and 2027.

Value Added Share of Revenue



Source: IBISWorld

Exports and Imports (Billions of Dollars)



Source: IBISWorld

Exports & Imports: The automotive cluster's trade is unbalanced. Annually, the US imports significantly more automotive related good than it exports. This trend is expected to continue throughout the next five years.

Top Export Countries (2022)

Country	Share of Total Cluster Exports
Canada	34%
Mexico	24%
Germany	6%
China	6%
South Korea	3%

Source: USA Trade Online

Top Exporting Countries: In 2022, nearly 60% of the US's Automotive exports were sent to Canada and Mexico. 6% of exports went to Germany, 6% to China and 3% to South Korea.

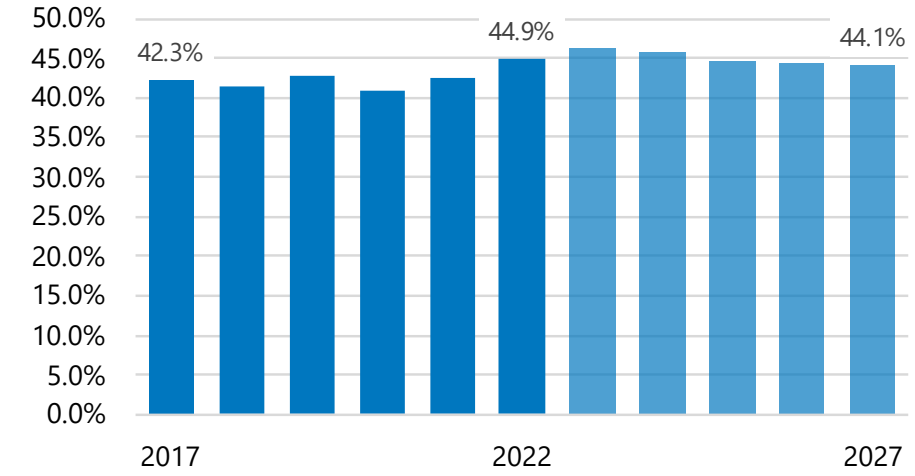
Top Import Countries (2022)

Country	Share of Total Cluster Imports
Mexico	34%
Japan	11%
Canada	10%
China	9%
South Korea	8%

Source: USA Trade Online

Top Importing Countries: In 2022, 34% of the US's total Automotive imports came from Mexico, 11% from Japan, and 10% from Canada

Imports Share of Domestic Demand

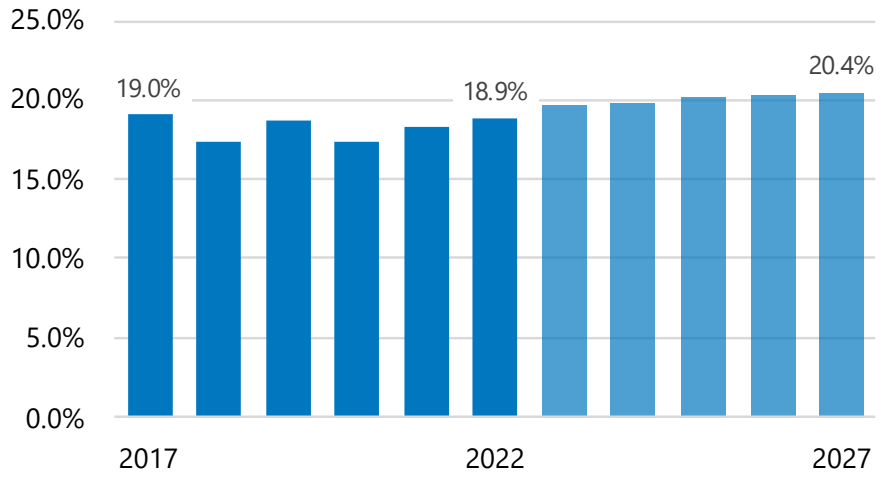


Source: IBISWorld

Import's Share of Domestic Demand: Imports share of domestic demand was 44.9% in 2022 and increased over the last five years. Over the next five years, it is projected to decline slightly.

Export's Share of Revenue: Exports share of revenue was 18.9% in 2022, stable since 2017. Over the next five years, this share is projected to increase slightly.

Exports Share of Revenue



Source: IBISWorld

Top 20 Products and Services of Automotive Cluster in the US, 2022

Product/Service	2022 Revenue (Millions)
Crossovers	$138,440
Pickup Trucks	$66,045
Cars	$62,870
SUVs	$37,785
Other auto parts	$30,485
Light-truck parts stamping	$24,262
Exhaust systems	$19,670
Relays and industrial controls	$13,184
Other	$12,479
Vans	$12,383
Car parts stamping	$10,339
Automobile seats and parts (including belts, frames and covers)	$10,295
Motors and generator manufacturing	$9,865
Vehicular lighting and wiring systems	$9,847
Automobile trimmings and parts	$8,816
Switchgear and switchboards	$8,649
HVAC systems	$6,962
Airplane seats, parts and accessories	$6,873
Information and entertainment devices	$6,508
Secondary batteries	$6,437

Source: IBISWorld

Products & Services: The top products & services in the cluster are various types of automobiles, with Crossovers coming in #1 at over $138 B in revenue in 2022.

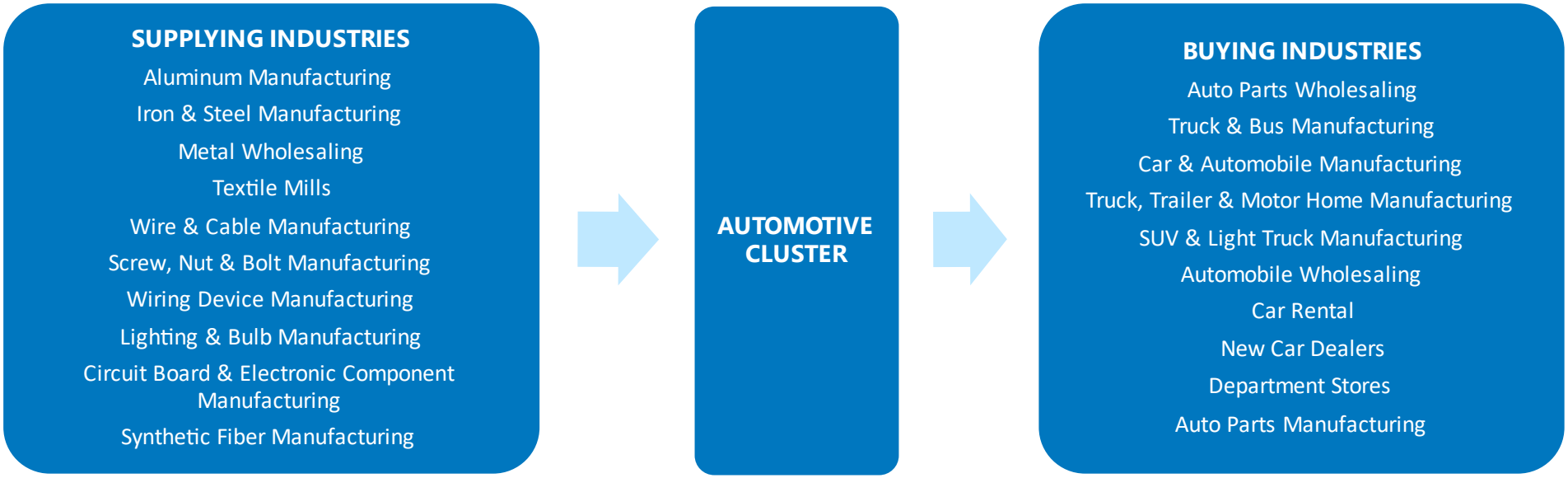
Top 10 Companies in Automotive Cluster in the US, 2022

Company	Approximate Market Share
General Motors Company	19.9%
Toyota Motor Corp	13.6%
Ford Motor Co	10.8%
Stellantis N.V.	6.5%
Honda Motor Co Ltd	2.3%
Denso Corp.	1.6%
Mitsubishi Motors Corp	1.4%
Eaton Corporation Plc	1.2%
Robert Bosch GmbH	1.2%
Adient Plc	1.0%

Source: IBISWorld, Camoin Associates

Top Companies: The cluster's market is highly concentrated, with the top 10 companies accounting for 60% of revenue in the cluster.

Automotive Manufacturing Supply Chain



Automotive Supply Chain: This chart highlights the flow of raw materials through the Automotive Cluster and on to secondary wholesalers and retailers. This cluster does not have a proportion of the inter-industry activity. In other words, the "Supplying Industries" for the Automotive Cluster are different than the "Buying Industries".

Regional Trends

Automotive Summary, 2022

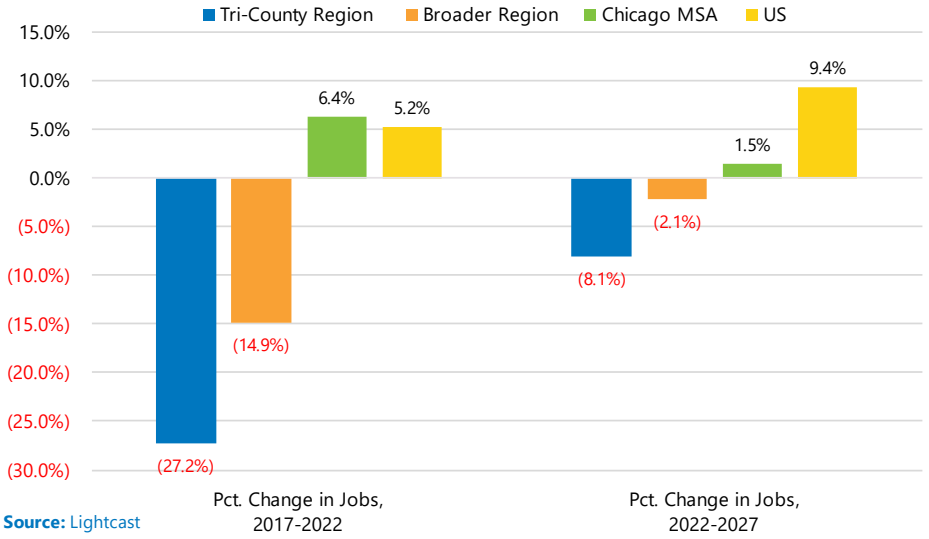
Region	2022 Jobs	Cluster Share of Total Jobs
Tri-County Region	4,432	1.7%
Broader Region	6,325	0.9%
Chicago MSA	16,225	0.4%
US	746,010	0.4%

Source: Lightcast, Camoin Associates

70% of all automotive employment in the Broader Region is located in the Tri-County Region, indicating the region's specialization in the sector. Overall, employment in Automotives accounts for 1.7% of total employment in the Tri-County Region.

Over the five years from 2017-2022, Automotive employment declined by 27% in the Tri-County Region and was highly impacted by the closure of the Stellantis plant, which affected both historic and projected growth trends. Recent announcements of a tentative deal between the United Auto Workers Union and Stellantis indicate that the Belvidere plant will reopen, improving on the existing growth projections for the region. These historic dynamics have been experienced more acutely in the Tri-County Region and in the Broader Region than elsewhere. In the Chicago MSA, Automotive sector employment grew more than 6% from 2017-2022, with another 1.5% projected growth through 2027. Nationwide, employment grew 5.2%, with over 9% further growth projected from 2022-2027.

Historic and Projected Growth in Automotive Sector



Source: Lightcast

Automotive Summary, 2022

Region	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (millions)	Share of Total GRP	Productivity (GRP Per Job)
Tri-County Region	3.9	(2,700)	29	$1,198	4.1%	$270,194
Broader Region	2.0	(2,220)	46	$1,504	1.9%	$237,721
Chicago MSA	0.8	75	165	$3,831	0.5%	$236,145
US	N/A	N/A	6,417	$158,630	0.7%	$212,638
Lansing, MI Region	8.7	(253)	47	$2,712	6.2%	$193,891

Source: Lightcast, Camoin Associates

Automotive Summary: The Tri-County Region was more specialized in the Automotive Sector (LQ of 3.9) in 2022 than the Broader Region (2.0) and the Chicago MSA (0.8).

Tri-County Region Automotive Summary, 2022

Industry Cluster	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (millions)	Share of Total GRP	Productivity (GRP Per Job)
Electric Motor & Battery Manufacturing	0.3	(84)	3	$5	0.4%	$125,986
Auto & Auto Parts Manufacturing	4.4	(2,616)	26	$1,192	99.6%	$271,549

Tri-County Region Automotive Summary: While the Tri-County Region is more specialized than the Nation in Auto & Auto Parts Manufacturing (4.4), the Region is less specialized than the Nation in Electric Motor & Battery Manufacturing.

Average Annual Pay in Automotive Cluster and Deviation from Regional Living Wage

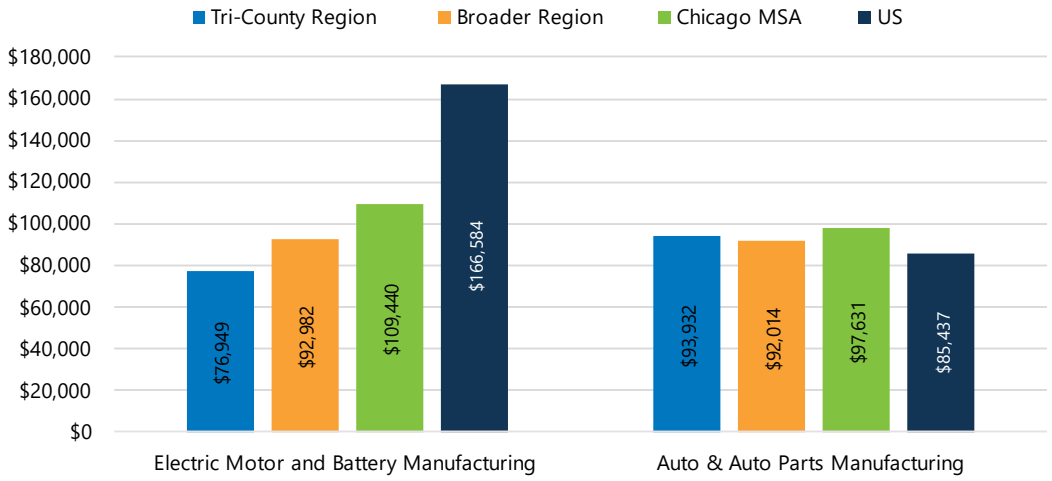
Description	Tri-County Region		Broader Region		Chicago MSA	
	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage
Electric Motor and Battery Manufacturing	$76,949	$36,209	$92,982	$52,623	$109,440	$66,488
Auto & Auto Parts Manufacturing	$93,932	$53,191	$92,014	$51,655	$97,631	$54,679

Source: Lightcast, MIT Living Wage Calculator, Camoin Associates

Average Annual Pay and Deviation from Regional Living Wage: In 2022, average earnings per job for the Electric Motor & Battery Manufacturing and Auto & Auto Parts Manufacturing subclusters were more than $35,000 above the living wage in the Tri-County Region and the comparison regions.

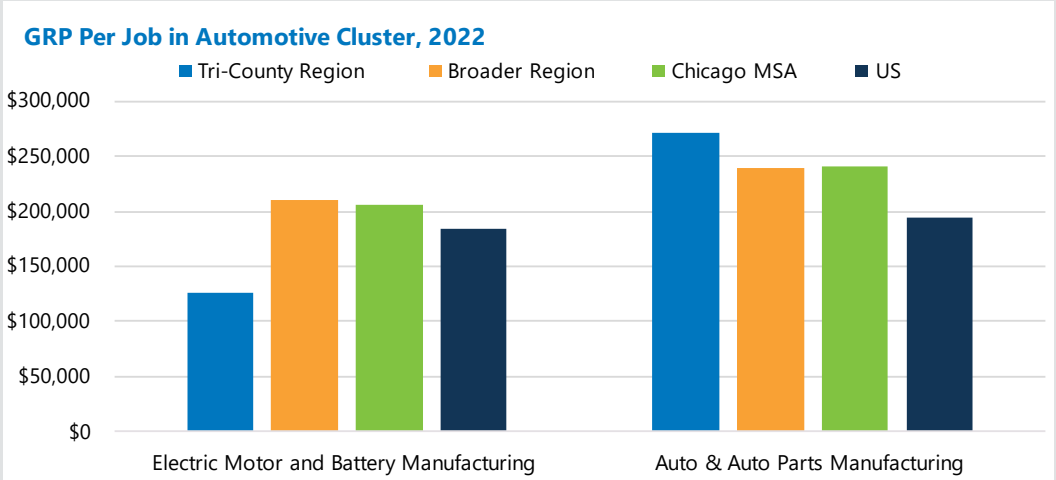
Average Earnings Per Job: In 2022, the Tri-County Region had the lowest earnings per job in the Electric Motor & Battery Manufacturing Subcluster. Earnings per job in the Auto & Auto Parts Manufacturing subcluster were higher in the Tri-County Region than the Broader Region but lower than earnings in the Chicago MSA.

Average Earnings Per Job in Automotive Cluster, 2022

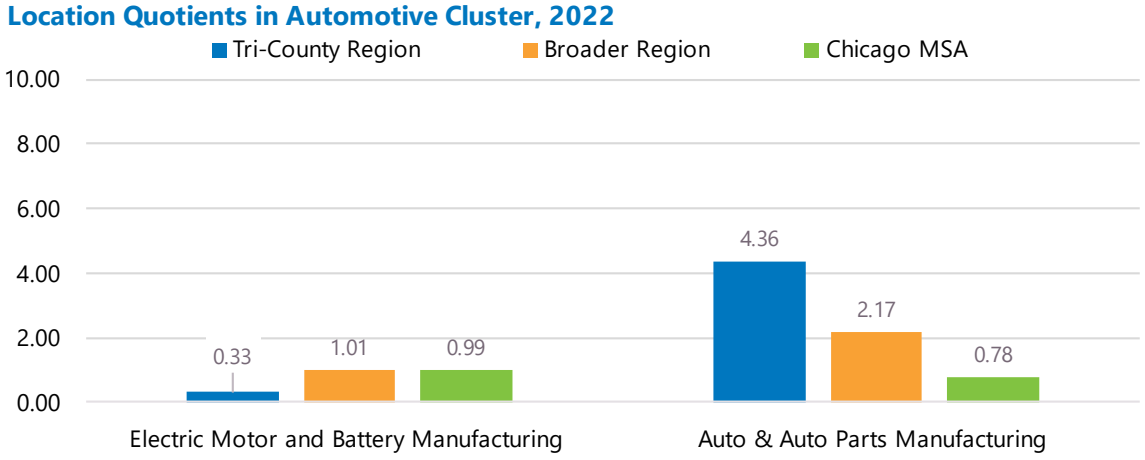


Source: Lightcast, Camoin Associates

GRP Per Job: In the Tri-County Region, productivity is the highest for Auto and Auto Parts Manufacturing and lowest in Electric Motor and Battery Manufacturing. Productivity in Auto and Auto Parts Manufacturing is the highest among the comparison groups.



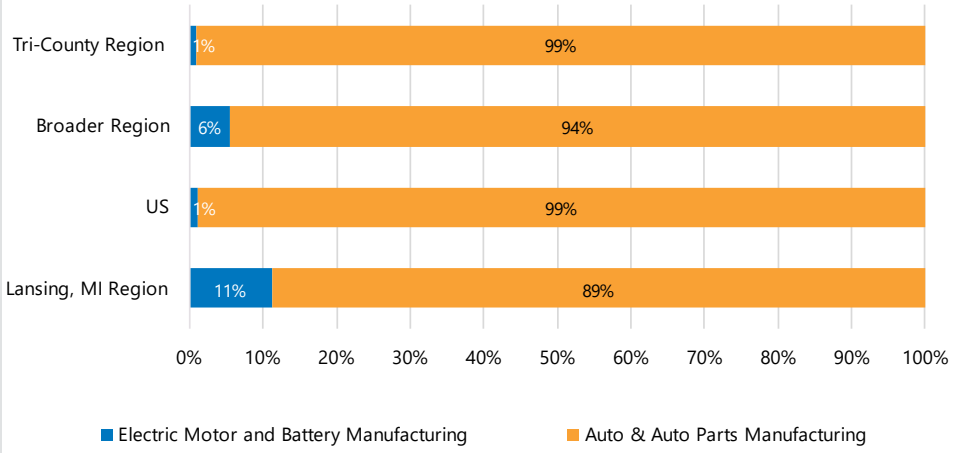
Source: Lightcast, Camoin Associates



Source: Lightcast, Camoin Associates

Location Quotient: The Tri-County Region is the most concentrated in Auto and Auto Parts Manufacturing when compared to the Boarder Region and the Chicago MSA. It is 4.4 times more concentrated than the US. None of the regions have a concentration in electric motor and battery manufacturing

Industry Mix of Automotive Cluster, 2022 (Job Share)

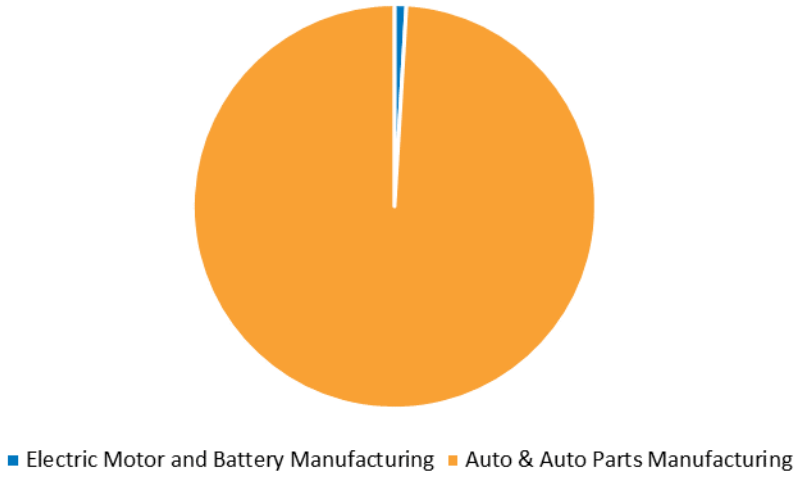


Source: Lightcast, Camoin Associates

Industry Mix (Job Share): Within the Automotive Cluster, the Tri-County Region has a higher share of Auto and Auto Parts Manufacturing than the Broader Region or Chicago MSA. The Tri-County Region's job shares are in line with the US.

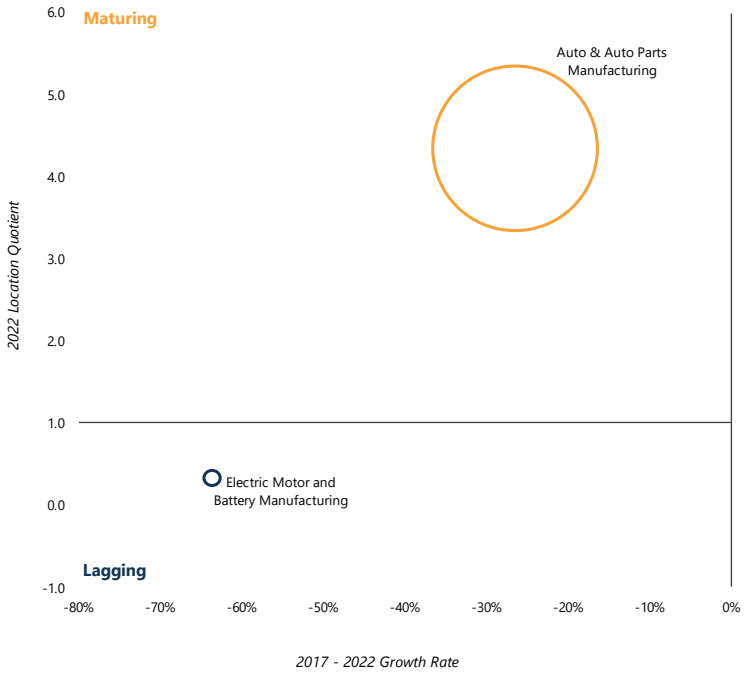
Share of Jobs: The greatest share of jobs in the Automotive Cluster was in Auto and Auto Parts Manufacturing.

Share of Cluster Jobs, Tri-County Region



Key Metrics by Automotive Subcluster, Tri-County Region

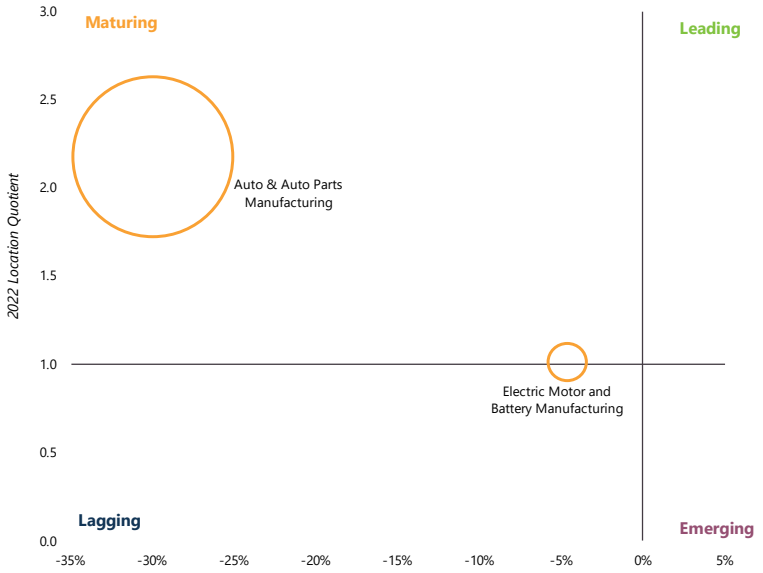
Bubble size indicates 2022 job count



Key Metrics by Subcluster: In the Tri-County Region, Auto and Auto Parts Manufacturing is Maturing, with a high location quotient but slowing growth. Electric Motor and Battery Manufacturing is lagging with a low location quotient and negative growth rate.

Key Metrics by Automotive Subcluster, Broader Region

Bubble size indicates 2022 job count



Key Metrics by Subcluster, Broader Region: In the Broader Region, Electric Motor and Battery Manufacturing is closer to emerging with and location quotient near one but a negative growth rate. While Concentration is high in the Auto and Auto Parts Manufacturing subcluster, the growth rate declined between 2017 and 2022.

Sales and Demand for Automotive Cluster, 2022

Region	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Tri-County Region	$5,463,096,635	87%	$1,754,857,728	60%
Broader Region	$6,659,265,665	81%	$3,207,597,956	60%
Chicago MSA	$16,245,877,151	34%	$16,809,736,338	37%

Source: Camoin Associates

Sales and Demand for the Automotive Cluster by Region, 2022: The Tri-County Region has a relatively high share of demand that is met by imports (60%) and exports about 87% of the cluster's goods and services. The Tri-County Region exports more than the than the Broader Region (81%), and the Chicago MSA (34%).

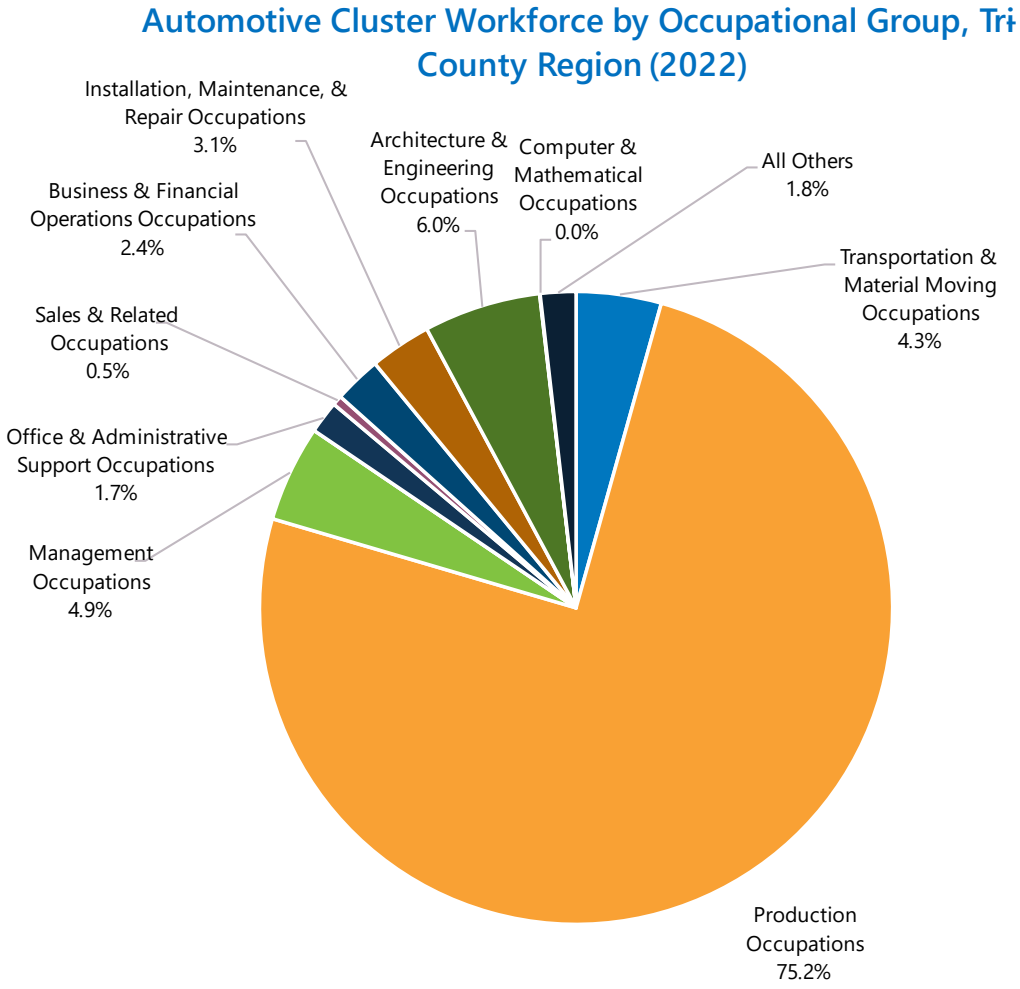
Sales and Demand for Automotive Clusters in Tri-County Region, 2022

Sub-Industry	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Electric Motor and Battery Manufacturing	$11,465,213	85%	$72,594,221	98%
Auto & Auto Parts Manufacturing	$5,451,631,422	87%	$1,682,263,507	59%

Source: Camoin Associates

Sales and Demand for Automotives Cluster by Subcluster in Region, 2022: Demand for Electric Motor and Battery Manufacturing is primarily met by imports (98%). 85% of this subcluster's goods are exported. 59% of the demand for Auto and Auto Parts Manufacturing in the Tri-County Region is met by imports while the Region exports 87% these goods.

Workforce Analysis



Workforce by Occupational Group: The Tri-County Region 's Automotive Cluster currently has 4,432 jobs comprised of 135 occupations Production Occupations make up over 75% of the Automotive Cluster's workforce. Other occupation groups include Architecture & Engineering Occupations (6.0%) and Management Occupations (4.9%).

Source: Lightcast, 2023.3

Top Occupations in the Staffing Pattern, Automotive Cluster, Tri-County Region (2022)

SOC	Description	Employed in Industry Group	Share of Total Jobs in Cluster
51-2098	Miscellaneous Assemblers and Fabricators	2,306	52.0%
17-2112	Industrial Engineers	156	3.5%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	149	3.4%
51-1011	First-Line Supervisors of Production and Operating Workers	131	2.9%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	130	2.9%
51-4041	Machinists	96	2.2%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	81	1.8%
11-3051	Industrial Production Managers	74	1.7%
17-2141	Mechanical Engineers	74	1.7%
51-4111	Tool and Die Makers	63	1.4%
47-2111	Electricians	60	1.4%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	59	1.3%
51-4121	Welders, Cutters, Solderers, and Brazers	55	1.2%

Source: Lightcast 2023.3

Top Occupations Staffing Patterns: With almost 3,500 of the 4,423 jobs, the top 30 occupations account for 77.5% of the cluster's jobs in the Tri-County Region.

Comparison of Staffing Patterns across Regions, Electric Vehicle Cluster, Tri-County Region (2022)

SOC	Description	Share of Total Jobs in the Cluster (2022)				Difference from Tri-County Region		
		Tri-County Region	Broader Region	Chicago MSA	US	Broader Region	Chicago MSA	US
51-2098	Miscellaneous Assemblers and Fabricators	52.0%	43.4%	31.6%	33.3%	-8.6%	-20.4%	-18.8%
17-2112	Industrial Engineers	3.5%	3.3%	2.9%	2.8%	-0.2%	-0.6%	-0.8%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	3.4%	3.6%	3.3%	3.3%	0.2%	-0.1%	-0.1%
51-1011	First-Line Supervisors of Production and Operating Workers	2.9%	3.2%	3.4%	3.5%	0.3%	0.5%	0.6%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	2.9%	3.5%	4.1%	2.7%	0.6%	1.2%	-0.3%
51-4041	Machinists	2.2%	2.2%	1.8%	1.9%	0.1%	-0.3%	-0.3%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	1.8%	2.9%	3.7%	3.5%	1.1%	1.9%	1.7%
11-3051	Industrial Production Managers	1.7%	1.6%	1.6%	1.5%	0.0%	-0.1%	-0.2%
17-2141	Mechanical Engineers	1.7%	1.6%	1.6%	1.5%	-0.1%	-0.1%	-0.2%
51-4111	Tool and Die Makers	1.4%	1.6%	1.6%	1.4%	0.2%	0.2%	0.0%
47-2111	Electricians	1.4%	1.1%	1.0%	1.2%	-0.2%	-0.4%	-0.2%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	1.3%	1.5%	1.6%	2.3%	0.2%	0.3%	1.0%
51-4121	Welders, Cutters, Solderers, and Brazers	1.2%	1.4%	1.5%	1.9%	0.2%	0.3%	0.6%
Share of Total Staffing Pattern		**77.5%**	**71.1%**	**59.9%**	**60.6%**	**-6.4%**	**-17.6%**	**-16.9%**

Source: Lightcast 2023.3

Comparison of Staffing Patterns Across Regions: The Tri-County Region has a higher share of than at the national level include Miscellaneous Assemblers and Fabricators (52.0% compared to 33.3%).

Top Occupations in the Staffing Pattern, Automotive Cluster, Tri-County Region (2022)

SOC	Description	Employed in Industry Group	Share of Total Jobs in Cluster	Total Jobs in Economy	Cluster's Share of Total Jobs in Economy
51-2098	Miscellaneous Assemblers and Fabricators	2,306	52.0%	6,567	35.1%
17-2112	Industrial Engineers	156	3.5%	939	16.6%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	149	3.4%	2,108	7.1%
51-1011	First-Line Supervisors of Production and Operating Workers	131	2.9%	1,877	7.0%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	130	2.9%	8,933	1.5%
51-4041	Machinists	96	2.2%	3,457	2.8%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	81	1.8%	807	10.0%
11-3051	Industrial Production Managers	74	1.7%	681	10.9%
17-2141	Mechanical Engineers	74	1.7%	854	8.6%
51-4111	Tool and Die Makers	63	1.4%	505	12.5%
47-2111	Electricians	60	1.4%	953	6.3%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	59	1.3%	363	16.2%
51-4121	Welders, Cutters, Solderers, and Brazers	55	1.2%	1,191	4.6%

Source: Lightcast 2023.3

Share of Jobs Across the Economy: The Automotive Cluster's top three occupations are primarily employed in other sectors. About 35% of Miscellaneous Assemblers and Fabricators; 16.6% of Industrial Engineers; and 7.1% of Inspectors, Testers, Sorters, Samplers, and Weighers are employed within the cluster. The top occupation in the cluster, Miscellaneous Assemblers and Fabricators accounts for 52% of total employment in the cluster.

Comparison of Projected Growth in Top Occupations in the Automotive Cluster across Region (2022)

		Tri-County Region			Broader Region			Chicago MSA			US		
			2022 - 2027			2022 - 2027			2022 - 2027			2022 - 2027	
SOC	Description	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate
51-2098	Miscellaneous Assemblers and Fabricators	2,306	(210)	-9.1%	2,746	(154)	-5.6%	5,451	77	1.4%	248,197	17,989	7.2%
17-2112	Industrial Engineers	156	(2)	-1.1%	212	10	4.8%	508	51	10.0%	20,549	3,736	18.2%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	149	(12)	-8.0%	226	(4)	-1.6%	566	5	0.8%	24,509	2,523	10.3%
51-1011	First-Line Supervisors of Production and Operating Workers	131	(9)	-6.6%	202	1	0.7%	588	16	2.7%	26,284	3,022	11.5%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	130	(11)	-8.4%	222	(1)	-0.3%	714	5	0.7%	19,868	2,249	11.3%
51-4041	Machinists	96	(9)	-9.6%	141	(4)	-3.1%	316	3	0.8%	14,196	1,564	11.0%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	81	(8)	-10.5%	183	(1)	-0.3%	647	(28)	-4.3%	26,079	1,078	4.1%
11-3051	Industrial Production Managers	74	(7)	-8.8%	104	(3)	-2.6%	279	4	1.5%	10,840	1,145	10.6%
17-2141	Mechanical Engineers	74	(5)	-6.8%	101	(1)	-1.3%	275	8	3.0%	11,114	1,256	11.3%
51-4111	Tool and Die Makers	63	(8)	-12.5%	103	(5)	-4.7%	277	(10)	-3.7%	10,653	429	4.0%
47-2111	Electricians	60	(3)	-4.9%	72	(0)	-0.3%	172	10	5.7%	8,745	1,106	12.7%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	59	(3)	-4.7%	97	3	3.2%	285	10	3.5%	17,426	1,832	10.5%
51-4121	Welders, Cutters, Solderers, and Brazers	55	(3)	-4.8%	91	3	3.3%	261	8	3.0%	13,870	1,603	11.6%

Source: Lightcast 2023.3

Comparison of Projected Growth: Miscellaneous Assemblers and Fabricators is currently projected to lose 210 jobs between 2022 and 2027. Inspectors, Testers, Sorters, Samplers, and Weighers are projected to lose 12 jobs.

Median Hourly Earnings for the Top Occupations in the Automotive Cluster (2022)

SOC	Description	Tri-County Region	Broader Region	Chicago MSA	United States	Difference from Tri-County Region		
						Broader Region	Chicago MSA	US
51-2098	Miscellaneous Assemblers and Fabricators	$20.26	$18.27	$17.71	$17.91	(9.8%)	(12.6%)	(11.6%)
17-2112	Industrial Engineers	$42.67	$41.69	$48.50	$46.30	(2.3%)	13.7%	8.5%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	$18.31	$18.26	$20.34	$21.11	(0.3%)	11.1%	15.3%
51-1011	First-Line Supervisors of Production and Operating Workers	$29.03	$28.94	$30.83	$30.43	(0.3%)	6.2%	4.8%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	$15.84	$16.27	$18.05	$17.33	2.8%	14.0%	9.5%
51-4041	Machinists	$23.08	$22.58	$23.51	$23.23	(2.2%)	1.8%	0.6%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	$17.28	$17.87	$17.45	$18.91	3.4%	1.0%	9.5%
11-3051	Industrial Production Managers	$49.32	$49.68	$55.87	$51.35	0.7%	13.3%	4.1%
17-2141	Mechanical Engineers	$39.84	$40.27	$47.42	$46.30	1.1%	19.0%	16.2%
51-4111	Tool and Die Makers	$27.78	$27.60	$28.67	$28.75	(0.6%)	3.2%	3.5%
47-2111	Electricians	$37.79	$37.79	$42.94	$28.48	(0.0%)	13.6%	(24.6%)
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	$20.46	$18.13	$19.22	$18.82	(11.4%)	(6.1%)	(8.0%)
51-4121	Welders, Cutters, Solderers, and Brazers	$21.99	$22.54	$22.75	$22.73	2.5%	3.5%	3.4%

Source: Lightcast 2023.3

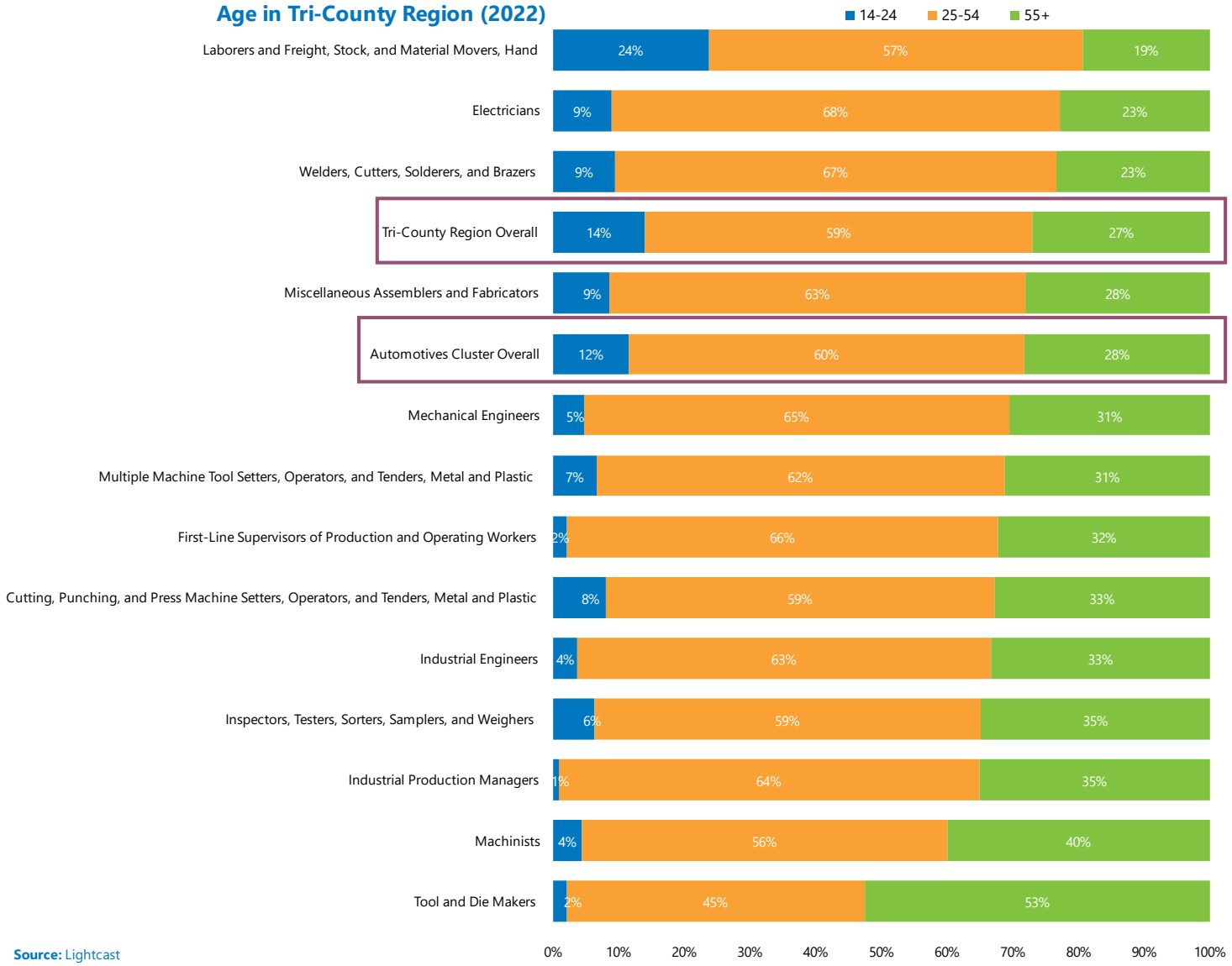
Median Hourly Earnings: Miscellaneous Assemblers and Fabricators have higher Median Hourly Earnings in the Tri-County Region when compared to other regions. In the Tri-County Region, Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic have lower median hourly earnings compared to the other regions.

Deviation from Regional Living Wage in Automotive Occupations (2022)

NAICS	Description	Tri-County Region	Broader Region	Chicago
51-2098	Miscellaneous Assemblers and Fabricators	$0.67	($1.13)	($2.94)
17-2112	Industrial Engineers	$23.08	$22.29	$27.85
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	($1.28)	($1.14)	($0.31)
51-1011	First-Line Supervisors of Production and Operating Workers	$9.45	$9.54	$10.18
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	($3.75)	($3.13)	($2.60)
51-4041	Machinists	$3.50	$3.17	$2.86
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	($2.31)	($1.54)	($3.20)
11-3051	Industrial Production Managers	$29.74	$30.27	$35.22
17-2141	Mechanical Engineers	$20.25	$20.86	$26.77
51-4111	Tool and Die Makers	$8.19	$8.20	$8.02
47-2111	Electricians	$18.20	$18.39	$22.29
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	$0.88	($1.27)	($1.43)
51-4121	Welders, Cutters, Solderers, and Brazers	$2.40	$3.14	$2.10

Source: Lightcast 2023.3
Note: Deviations based on living wage data from MIT Living Wage Calculator.
Living Wage: Region 1 = $19.59, Broader Region = $19.40, Chicago MSA = $20.65

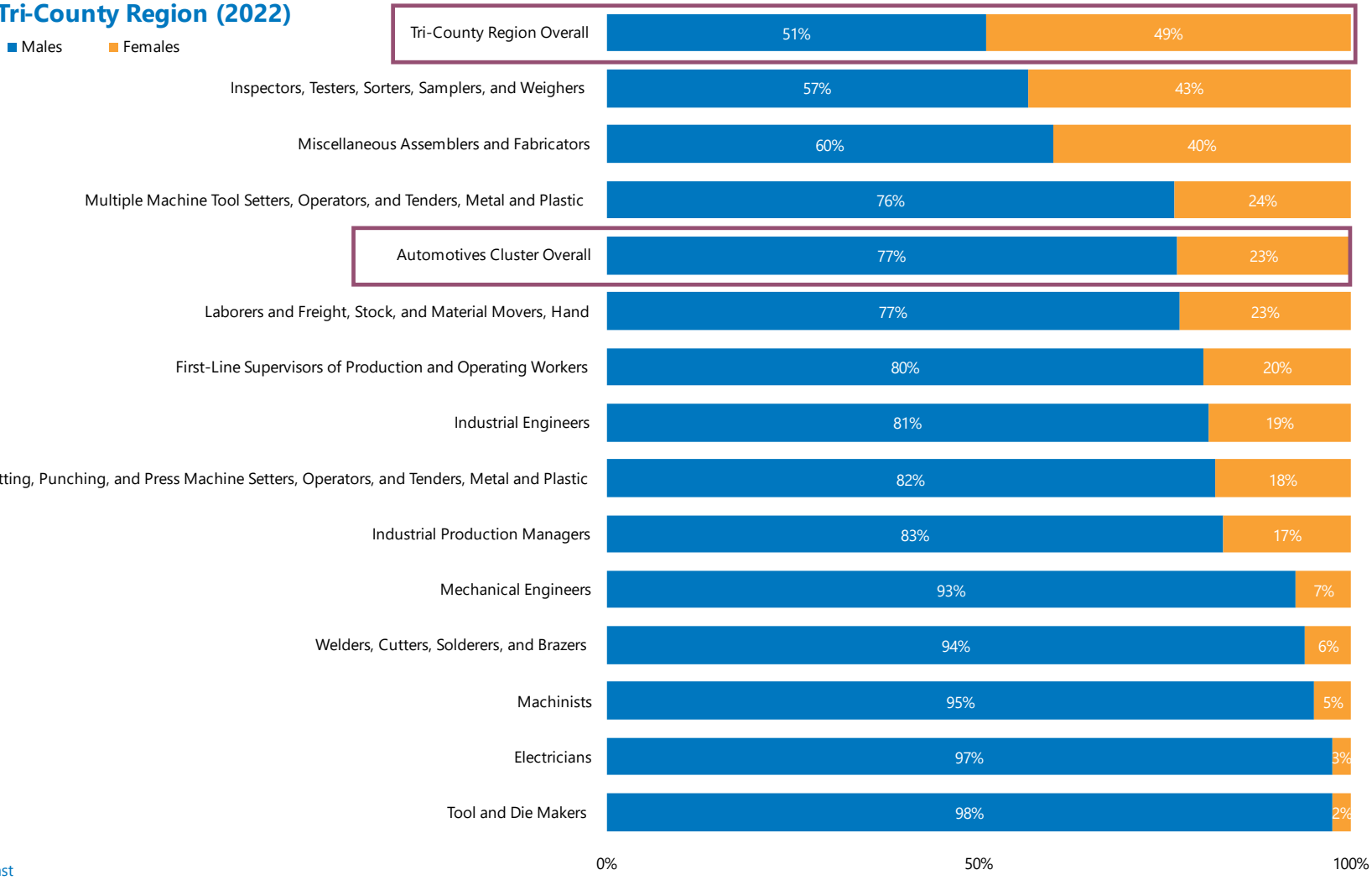
Deviation from Regional Living Wage: Laborers and Freight, Stock, and Material Movers workers have the greatest deficit compared to the living wage in the Tri-County Region, with the median worker earning $3.75 per hour less than the living wage.



Source: Lightcast

Age: The population ages 14+ in the Tri-County Region is primarily people ages 25-54 (59%). This is reflected in the top 30 Automotive occupations, where 60% of workers are between ages 25-54. The only occupation with a majority of workers age 55+ is Tool and Die Makers.

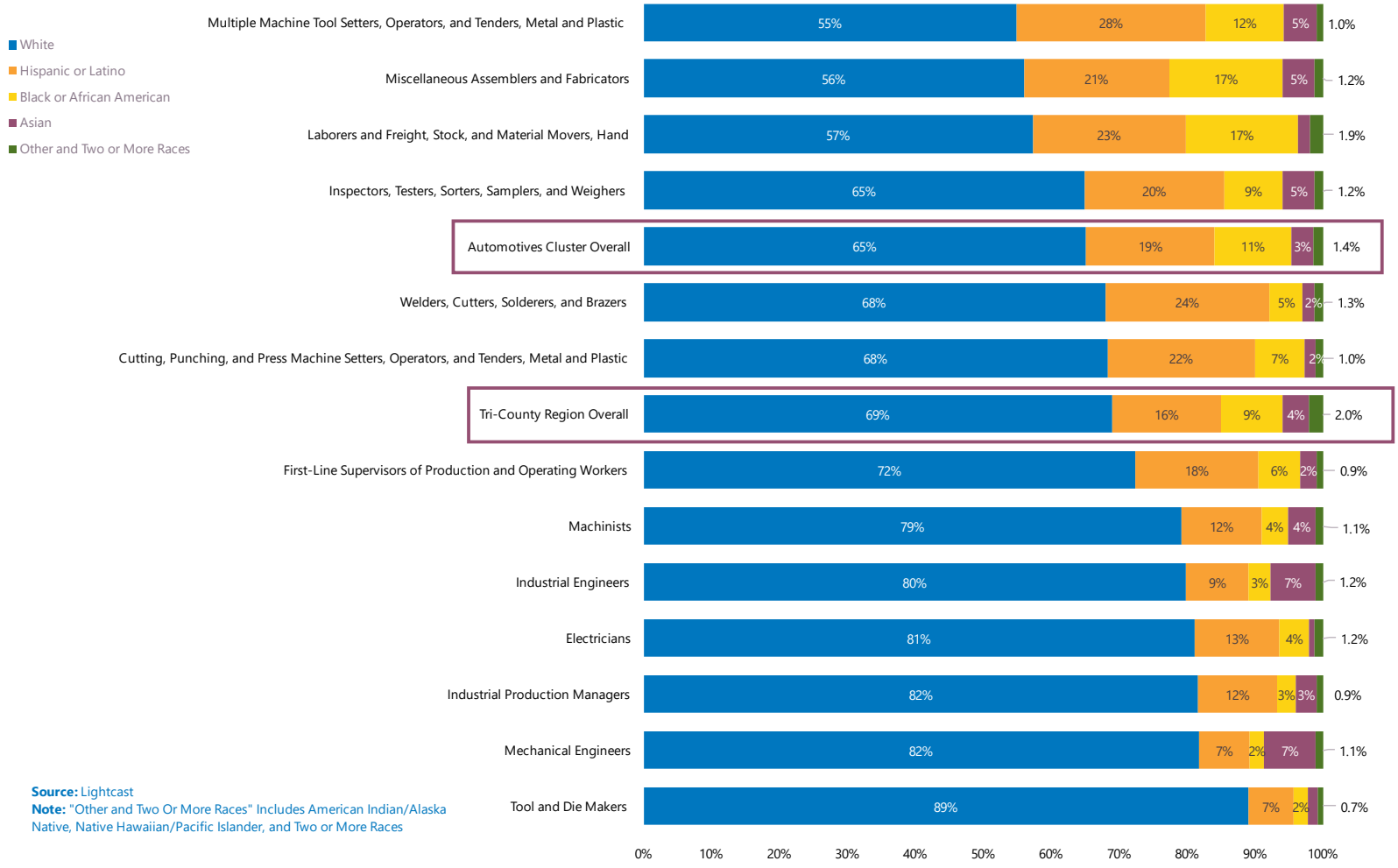
Sex in Tri-County Region (2022)



Source: Lightcast

Sex: While the Tri-County Region is almost evenly split between males and females, males make up 77% of the workers in the top 30 Automotive occupations. Electricians and Tool and Die Makers have a very small share of female workers, 3% and 2% respectively.

Race in Tri-County Region (2022)



Source: Lightcast
Note: "Other and Two Or More Races" Includes American Indian/Alaska Native, Native Hawaiian/Pacific Islander, and Two or More Races

Race: The Tri-County Region is 69% White, 16% Hispanic or Latino, and 9% Black or African American. There are small shares of Asian individuals or people who are two or more races. No one in the Tri-County Region is reported to be solely American Indian, Alaskan Native, Native Hawaiian, or Other Pacific Islander. The racial breakdown in the Automotive Cluster mirrors that of the Region, with slightly more Hispanic or Latino individuals. The occupation with the most White workers is Tool and Die Makers (89%). The occupation with the most Hispanic or Latino workers is Multiple Machine Tool Setters, Operators and Tenders, Metal and Plastic with 28%.

Projected Workforce Gaps, Automotive Cluster, Tri-County Region (2022 - 2027)

SOC	Description	Average Annual Openings (2022 -	Adjusted Completions	Estimated Workforce Surplus / (Gap)
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,353	0	(1,353)
51-2098	Miscellaneous Assemblers and Fabricators	775	0	(775)
51-4041	Machinists	359	34	(325)
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	255	6	(249)
51-1011	First-Line Supervisors of Production and Operating Workers	201	12	(189)
51-4121	Welders, Cutters, Solderers, and Brazers	146	69	(77)
47-2111	Electricians	104	35	(69)
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	84	34	(50)
51-4111	Tool and Die Makers	53	10	(43)
11-3051	Industrial Production Managers	50	12	(38)
17-2112	Industrial Engineers	65	40	(25)
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	39	20	(19)
17-2141	Mechanical Engineers	53	40	(13)

Source: Lightcast 2023.3, Camoin

Notes:

- Openings = New Jobs due to Growth + Replacements due to Retirement and Turnover
- Completions for "Manager" or "Supervisor" occupations are likely overstated since qualification for these positions are usually a function of years of experience rather than graduating from a management program
- Completions may be double counted (i.e., a graduate from a program may be listed for multiple occupations). For example, there are 69 completions listed for Industrial Engineers and 69 completions listed for Mechanical Engineers. These are the same individuals.
- Assumes 2021 completions levels will be consistent over the next 5 years
- Assumes occupations that require only a high school diploma or equivalent do not have completions
- These completions are across the entire economy
- Completions for occupations that typically require a union apprenticeship are likely understated since they are not included in higher educational institution data
- Assumes no completions for first-line supervisors as they are likely a function of being promoted from within or years of experience

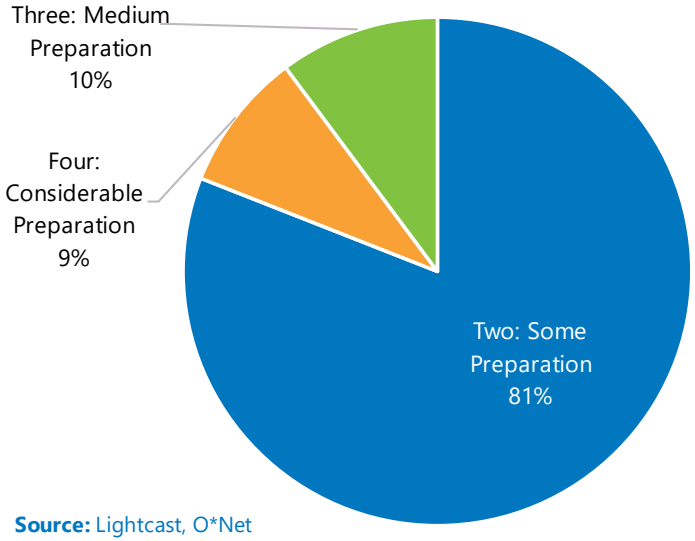
Projected Workforce Gaps: Laborers and Freight, Stock, and Material Movers are likely to be in high demand over the next 5 years, with an average annual gap of over 1,300 workers.

Preparation Required for Top Occupations by Projected Gap, Automotives Cluster, Tri-County Region (2022)

SOC	Description	Typical Entry Level Education	Work Experience Required	Typical On-The-Job Training	Job Zone
17-2112	Industrial Engineers	Bachelor's degree	None	None	Four: Considerable Preparation Needed
11-3051	Industrial Production Managers	Bachelor's degree	5 years or more	None	Four: Considerable Preparation Needed
17-2141	Mechanical Engineers	Bachelor's degree	None	None	Four: Considerable Preparation Needed
51-1011	First-Line Supervisors of Production and Operating Workers	High school diploma or equivalent	Less than 5 years	None	Three: Medium Preparation Needed
51-4041	Machinists	High school diploma or equivalent	None	Long-term on-the-job training	Three: Medium Preparation Needed
51-4111	Tool and Die Makers	Postsecondary nondegree award	None	Long-term on-the-job training	Three: Medium Preparation Needed
47-2111	Electricians	High school diploma or equivalent	None	Apprenticeship	Three: Medium Preparation Needed
51-2098	Miscellaneous Assemblers and Fabricators	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	No formal educational credential	None	Short-term on-the-job training	Two: Some Preparation Needed
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
51-4121	Welders, Cutters, Solderers, and Brazers	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed

Source: Lightcast, O*Net

Job Zones for the Top Occupations in the Tri-County Region Automotives Cluster



Source: Lightcast, O*Net

Job Zones: The O*Net Job Zones system has five zones, with One indicating the fewest barriers to entry and least preparation needed and Five indicating the most training and preparation needed.

The occupations that staff the Automotive Cluster have relatively low barriers to entry – 81% of the jobs in these occupations have a Job Zone at level 2. These include the occupations with the largest gaps: Laborers and Freight, Stock, and Material Movers and Misc. Assemblers and Fabricators

In-Demand Skills for Critical Occupations, Automotives Cluster, Tri-County Region (2022)

SOC	Description	Estimated Annual Workforce Surplus /	Job Zone	In-Demand Skills		
				Necessary (1)	Defining (2)	Distinguishing (3)
51-4041	Machinists	(325)	Three: Medium Preparation Needed	Machinery	Machining	Speeds and Feeds
				Blueprint Reading	Lathes	Tapping
				Grinding Machine	Tooling	**Fanuc Controllers**
				Drilling	CNC	Indicators (Measuring Device)
				Machine Operation	Mills	Mastercam (CAD/CAM Software)
47-2111	Electricians	(40)	Three: Medium Preparation Needed	Machinery	Electrical Wiring	**Motor Controllers**
				Electric Components	Electrical Systems	Voltmeter
				Test Equipment	Blueprinting	**Relays**
				Wiring Diagram	Hand Tools	**Electrical Theory**
				Programmable Logic Controll	Transformers (Electrical)	Lighting Systems
11-3051	Industrial Production Managers	(38)	Four: Considerable Preparation Needed	Continuous Improvement Proc	Auditing	Supplier Quality Management
				Good Manufacturing Processe	**Quality Management**	
				Lean Manufacturing	Production Management	
				Product Quality	ISO 9000 Series	
				Project Management	**Corrective and Preventive Action**	
17-2112	Industrial and Mechanical Engineers	(818)	Four: Considerable Preparation Needed	New Product Development	Manufacturing Processes	Process Failure Mode and Effects Analysis
				Process Improvement	Lean Manufacturing	Production Part Approval Process
				Auditing	Continuous Improvement Process	Suppleir Quality Management
				Tooling	Quality Management	Eight Disciples Problem Solving
				Root Cause Analysis	**Six Sigma Methodology**	Aerospace Basic Quality Systems Standards

Source: Lightcast, O*Net

Note: Bolded skills indicate that they are correlated with an increase in pay.

(1) The specialized skills required for that job and relevant across other similar jobs. An employee needs these skills as building blocks to perform the more complex Defining Skills.

(2) The day-to-day tasks and responsibilities of the job. An employee needs these skills to qualify for and perform successfully in this occupation.

(3) The advanced skills that are called for occasionally. An employee with these skills is likely more specialized and able to differentiate themselves from others in the same role.

Renewable Energy

Emerging Trends

Overview

The US's renewable energy sector has grown steadily during the last five years, and according to Deloitte's *2023 Renewable Energy Industry Outlook* this growth is likely to be accelerated in 2023 due to increasing demand and the numerous clean energy incentives in the Inflation Reduction Act (IRA)[6]. Industry growth in the US is in line with global trends. A 2022 report published by the International Energy Agency found that, "renewables are set to account for over 90% of global electricity expansion over the next five years, overtaking coal to become the largest source of global electricity by early 2025"[7].

In 2022, renewable energy accounted for approximately 14% of Illinois total, in-state electricity generation with wind being the primary renewable resource. Illinois is the Nation's fifth largest energy producer and consumer[8]. On average, the state sends about one-fifth of the power it generates to other states via interstate transmission lines. Electricity generation in Illinois is primarily powered by nuclear and coal-fired energy. In recent years however, Illinois reduced its share of coal powered electricity production from 41% of net generation in 2012 to 21% in 2022 [9]. The Tri-County Region is serviced by the Commonwealth Edison electrical grid and multiple alternative retail electric suppliers (ARES). Several ARES in the Tri-County Region currently purchase and distribute electricity from renewable sources. The generation of renewable energy is also increasing in the Tri-County Region, primarily in the form of solar farms.

Opportunities

Several factors are driving market trends and opportunities:

1. Falling costs- technological advancements and learning effects have significantly decreased wind and solar costs making them more competitive with fossil fuels.
2. Increasing consumer demand –environmental awareness, social responsibility, and cost savings are contributing to this increase. Specifically, we see rising demand for community solar and continuing demand for personal solar.
3. State and federal policy and support – federal, state, and local policies have provided incentives and mandates for renewable energy deployment
4. Private Investment—in 2022 private investment in renewable energy exceed 10 billion dollars. This trend is expected to continue due to incentives in the IRA.

[6] https://www2.deloitte.com/us/en/pages/energy-and-resources/articles/renewable-energy-outlook.html
[7] https://www.iea.org/news/renewable-power-s-growth-is-being-turbocharged-as-countries-seek-to-strengthen-energy-security
[8] https://www.eia.gov/state/analysis.php?sid=IL
[9] https://www.eia.gov/tools/faqs/faq.php?id=427&t=3

5. Utility Decarbonization—by the end of 2022, 43 of the 45 largest US investor-owned utilities had committed to reducing their carbon emissions. Increasing renewables was cited by the companies as a key strategy for meeting those commitments.
6. Corporate Renewable Procurement— More than 400 global businesses committed to 100% clean electricity by 2040 as part of the RE100 renewable electricity initiative.

Policy support for the renewable energy sector is significant in Illinois at the state and federal level.

State level initiatives include:

- The "Sitting Bill"— restricts local government regulation from being more stringent than the state regulations outlined in the bill.
- Illinois Shine's — an incentive program that supports the development of solar energy in the state.
- Illinois Clean Jobs Workforce Network Program—supports the training and development of renewable energy workers.
- And more

Federal support increased significantly with the signing of the IRA in 2022. This Act is designed to support the renewable energy sector by:

- **Increased deployment**: The IRA extends and expands tax credits for clean electricity technologies, such as the investment tax credit (ITC) and the production tax credit (PTC), which lower the cost of developing and maintaining renewable energy projects. The IRA also introduces new tax credits for energy storage, green hydrogen, and carbon capture and sequestration.
- **Enhanced grid integration**: The IRA allocates funds for upgrading and modernizing the electric grid. It also supports the expansion of transmission lines, microgrids, smart meters, and demand response programs, which can improve the reliability and resilience of the grid.
- **Boosted domestic manufacturing**: The IRA provides incentives for domestic manufacturing of clean energy components and materials, such as solar panels, wind turbines, batteries, and critical minerals. The IRA also supports research and development, innovation, and workforce training in the clean energy sector.

Together this is forming an environment for multiple emerging opportunities for regional economic development. The following is a brief overview of opportunities. Each has associated economic potential in terms of investment, businesses, and jobs.

- **Clean Tech Accelerators:** component of cleantech innovation ecosystems. They support early-stage start-ups to bring their solutions to the market, providing mentorship, resources, and networking opportunities to founding teams.
- Chain Reaction Innovations is in Chicago. It is a program at Argonne National Laboratory that supports entrepreneurs who are developing technologies to address energy and sustainability challenges.
- **Advanced photovoltaics (PV)**: development of high-efficiency solar cells and modules that can capture more sunlight and convert it into electricity. Some of the innovations in this field include perovskite solar cells, tandem solar cells, and bifacial solar modules https://energy5.com/innovations-in-solar-panel-manufacturing-for-improved-efficiency

- **AI and Big Data**: leveraging artificial intelligence (AI) and big data analytics to optimize the operation and management of renewable energy systems. AI and big data can help forecast supply and demand, integrate distributed energy resources, detect faults, and improve grid stability. https://www.datadynamicsinc.com/blog-ai-in-energy-your-data-is-the-game-changer-7-reasons-why/
- **Green hydrogen**: producing hydrogen from renewable sources such as water electrolysis powered by wind or solar energy. Green hydrogen can be used as a clean fuel for transportation, industry, and power generation. It can also be stored and transported over long distances. https://www.deloitte.com/global/en/issues/climate/green-hydrogen.html?id=us:2ps:3gl:4green_hydrogen:5GC1000229:6abt:20230802:GCP100058:us_gh2_google_ads&gclid=CjwKCAjwvrOpBhBdEiwAR58-3KDOCnM7o7xSgwlhEIFdRRon7XmSyIMODw_vBdi9F_-4sQMugoM97BoCPOoQAvD_BwE
- **Advanced robotics**: enhancing the installation, inspection, and maintenance of renewable energy assets. Advanced robotics can reduce labor costs, improve safety, and increase productivity. https://www.renewableenergyworld.com/wind-power/how-robotics-can-revolutionize-the-path-toward-net-zero/#gref

Challenges

- *Supply Chain Disruption* – Global and regional supply chains for critical inputs have shown limitations and concerns due to entering from climate changes, pandemics, geo-political conflicts, and more. In 2022, gas prices caused transportation and component assembly costs to rise along every step of the supply chain, which in turn effected prices for clean power developers.
- Trade policy uncertainty— Unstable trade policies can create hesitation among investors leading to delayed or reduced investment in projects. Uncertainty related to tariffs, subsidies, or other trade-related measures may also hinder renewable related projects.
- Inflation and Increasing Interest Rates—Increased costs to the consumer and produce may affect the viability of renewable energy related developments
- Interconnection delays-- Rapid growth in renewable energy projects can strain existing grid infrastructure and require updates or enhancements to accommodate additional capacity.

Relevant Projects and Companies in the US

As of September 2023, the Bureau of Land Management had approved 16 solar projects covering 33,502 acers in six states. An addition 29 renewable energy projects are currently under review, including three wind farm proposals. (https://www.blm.gov/programs/energy-and-minerals/renewable-energy/active-renewable-projects)

Wind

- *Arcosa Wind Towers*- The Dallas, TX based company, will open a wind-tower production facility in Belen, NM and anticipates hiring 250 employees. Arcosa has received new orders for wind towers totaling $750 million, with the majority of those for projects in New Mexico and the Southwest. (https://edd.newmexico.gov/stories/wind-tower-manufacturer-picks-new-mexico-for-expansion/)

Solar

Kendall Sustainable Infrastructure (KSI), AC Power, and GreenSpark Solar- The three companies are partnering on two brownfield solar sites in upstate New York. The first project in Ft. Edward, NY is on a capped landfill, and should be completed by the end of 2023. The second project in Queensbury, NY is on former factory grounds. Construction on this site is scheduled for 2024. (https://www.expansionsolutionsmagazine.com/ksi-ac-power-and-greenspark-to-partner-on-new-york-brownfield-solar-sites/)

Invenergy- A sustainable energy company, is investing more than $600 million to create one of the largest solar panel production facilities in the country. The 1.1 million-square-foot facility in Pataskala, OH, was purchased by Invenergy for $220 million. After completion, the solar panel operation is expected to employ 850 workers. (https://columbusregion.com/press-release/landmark-manufacturing-facility/)

Primergy Solar and APG Group- The companies are partners on the Gemini Solar Project near Las Vegas, NV. The project includes a solar panel farm and battery storage facility. The project received $1.9 billion in debt and equity financing and is expected to be completed in 2023. (https://www.airswift.com/blog/solar-energy-projects-usa)

Relevant Projects and Companies in Illinois

As of February 2023, Northern Illinois had more than 75 community solar farms. (https://www.renewableenergyworld.com/solar/northern-illinois-now-has-75-operating-community-solar-farms/#gref)

Double Black Diamond Solar Farm- Illinois' largest solar farm is being constructed in Sangamon and Morgan Counties. The project is expected to be operational by the end of 2024 and has collected estimated investments of $779m. The project involves the installation of 1.6 million solar panels and a proportion of the new, clean energy will power Chicago O'Hare International Airport and Midway International Airport. (https://www.power-technology.com/projects/double-black-diamond-solar-project-illinois-us/)

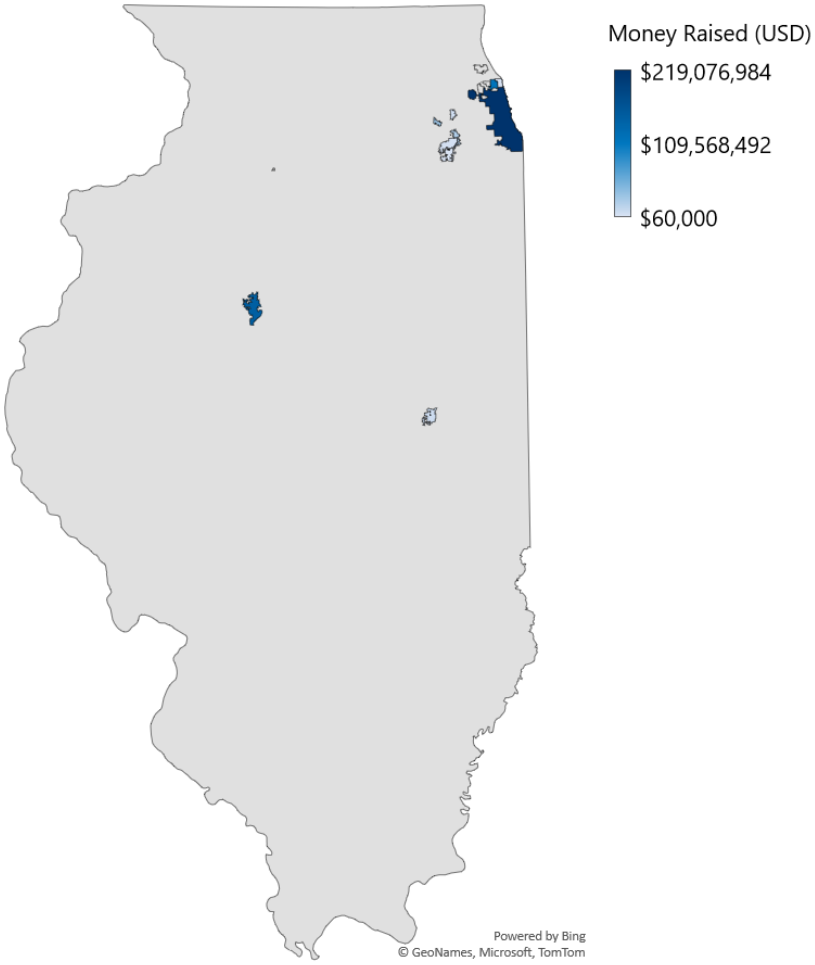
ComEd- The company has opened the Speedway Solar project near Joliet, IL. The project included the installation of more than 2,300 solar panels on 31 acres of land. This community solar farm will provide approximately 350 ComEd customers with access to solar energy. (https://www.businesswire.com/news/home/20230202005195/en/%C2%A0Summit-Ridge-Energy-and-ComEd-Mark-75th-Community-Solar-Project-in-Northern-Illinois)

Enel North America- Enel begun operations at the Alta Farm's wind farm in DeWitt County. Construction on the 229 wind turbines started in 2021 and the project cost approximately $345 million. (https://www.power-technology.com/marketdata/power-plant-profile-alta-wind-farm-us/?cf-view)

State-wide Innovation & Investment

Renewable energy represents relatively new emerging technology and systems, and innovation capacity and performance is a critical part of regional economic competitiveness. The following is an overview of innovation performance and capacity in the region. Deals in the state over a wide range of cleantech including grid management, clean manufacturing, recycling, and more.

Total Venture Capital in Renewable Energy Categories, 2017-2023



Top 15 Renewable Energy Companies by VC Raised, Illinois, 2017-2023

Organization	Total Raised	Related Industries
Natural Fiber Welding	$148,344,429	CleanTech, Manufacturing, Sustainability, Textiles
LanzaTech	$102,000,000	Clean Energy, CleanTech, Natural Resources, Renewable Energy, Sustainability
Bluestar Energy Capital	$99,819,127	Renewable Energy
ampCNG	$47,000,000	Energy, Oil and Gas, Renewable Energy, Retail
Synata Bio	$30,000,000	Clean Energy, Energy, Renewable Energy
PVPower	$20,000,000	Clean Energy, E-Commerce, Solar
Elevance Renewable Sciences	$18,000,000	Chemical, CleanTech, Natural Resources
Chromatin	$13,749,210	Agriculture, Biotechnology, Energy, Green Consumer Goods, Renewable Energy
NuMat Technologies	$12,400,000	Hardware, Nanotechnology, Renewable Energy, Semiconductor
Cultivate Power	$10,000,000	Renewable Energy, Solar
Climate Vault	$7,254,159	Environmental Consulting, Environmental Engineering, Non Profit
REDWAVE ENERGY	$5,207,498	Energy, Oil and Gas, Renewable Energy, Solar
BrokerX	$5,000,000	Big Data, CRM, Energy, Energy Management, Oil and Gas, Renewable Energy, Software
Cache Energy	$4,500,000	Electrical Distribution, Energy, Energy Storage, Power Grid
Mycocycle	$2,829,353	Advanced Materials, Agriculture, Biotechnology, CleanTech, Recycling, Waste Management

Source: Crunchbase

Illinois Venture Capital Funding in Renewable Energy Categories, 2017-2023

	2017	2018	2019	2020	2021	2022	2023	Total
Champaign	$2,285,000						$4,500,000	$6,785,000
Cook	$66,987,069	$39,623,409	$72,000,000	$2,800,000	$34,393,220	$101,019,127	$18,715,349	$335,538,174
DuPage		$48,000,000	$5,207,498	$2,093,346				$55,300,844
Peoria				$13,000,000	$15,000,000	$120,344,429		$148,344,429
Will			$558,000	$529,353		$100,000	$2,200,000	$3,387,353
Total	**$69,272,069**	**$87,623,409**	**$77,765,498**	**$18,422,699**	**$49,393,220**	**$221,463,556**	**$25,415,349**	**$549,355,800**

Source: Crunchbase

The Broader Region saw over $55.3 million in venture capital investment related to Renewable Energy from 2017-2023, 10% of all VC in Illinois during this time period.

- Two deals totaling $48 million in 2018 drove total VC in the Broader region during this time period
- VC is concentrated Cook County and Peoria Counties, which each account for 61% and 27% of total VC raised, raised

Foreign investment in Renewable Energy in Illinois totaled nearly $2.7 billion between 2017-2023 YTD.

- Among the top 10 investments in Illinois, 8 are in Wind Electric Power. Among all investments, wind has accounted for the bulk of capital investments in Illinois, totaling over $1.8 billion, or 69% of total capital investment in renewable energy in the state since 2017
- Overall, Portuguese ($753.9 million) and Italian ($717.1 million) companies have invested the most in Illinois' renewable cluster
- The Tri-County Region saw $143.5 million of capital investment from the French Air Liquide within the Biomass subsector in Rockford. This investment created 53 jobs.

Top Foreign Investments in Renewable Energy Sector, Illinois (2017-2023)

Investing Company	Date	Investing Country (State)	Destination County	Subsector	Jobs Created	Capital Investment ($M)
Top 10 Foreign Investments						
EDP Renewables (EDP Renovaveis)	February 2020	Portugal	McLean County (IL)	Wind electric power	24	$300.0
Vitol Green Holdings	April 2021	Netherlands	Not Specified	Wind electric power	20	$250.0
BayWa Re Solar Projects	May 2023	Germany	Not Specified	Other electric power generation (Renewable Energy)	36	$218.7
Enel Green Power North America	May 2021	Italy	DeWitt County (IL)	Wind electric power	36	$216.9
National Grid Renewables (Geronimo Energy)	February 2021	United Kingdom	Coles County (IL)	Solar electric power	36	$216.9
Akuo Energy	September 2020	France	Marshall County (IL)	Wind electric power	36	$216.9
EDP Renewables (EDP Renovaveis)	August 2020	Portugal	Douglas County (IL)	Wind electric power	36	$216.9
Enel Green Power North America	August 2019	Italy	Logan County (IL)	Wind electric power	36	$216.9
Enel Green Power North America	December 2018	Italy	Logan County (IL)	Wind electric power	36	$216.9
EDP Renewables North America (Horizon Wind Energy)	May 2018	Portugal	Not Specified	Wind electric power	36	$216.9
Other Investments in Broader Region						
Air Liquide	February 2022	France	Winnebago County (IL)	Biomass power	53	$143.5
				Total, All Investments	**1,106**	**$2,696.3**

Source: fDi Markets, from the Financial Times

National Outlook

Compound Annual Growth Rate of Key Indicators

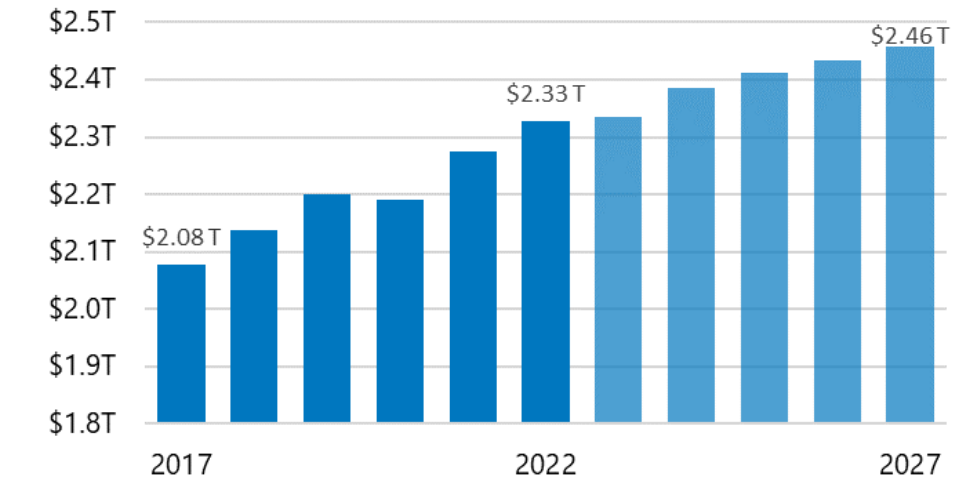
	Revenue	Val. Added	Exports	Imports
2017-2022	2.3%	3.1%	-0.1%	4.4%
2022-2027	1.1%	1.6%	0.9%	-1.4%

Source: IBISWorld

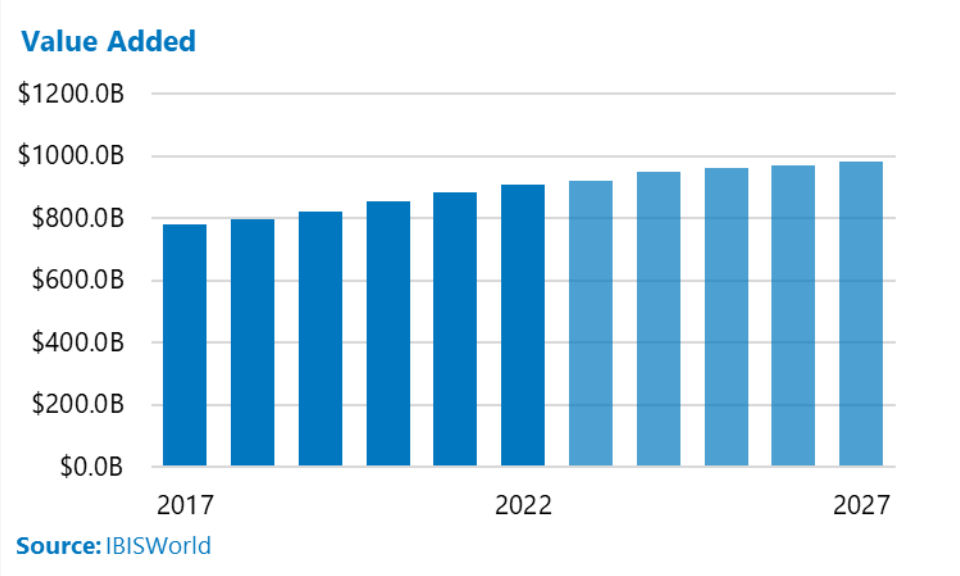
Compound Annual Growth: The compound annual growth rate of these indicators shows that although revenue and value added are expected to decline, the US is expected to import less and export more, which is a positive sign for the Energy & Utilities cluster.

Revenue: Revenues related to the Energy & Utilities cluster have risen significantly during the last five years. They are projected to increase at a similar rate between 2022 and 2027.

Energy & Utilities Revenue

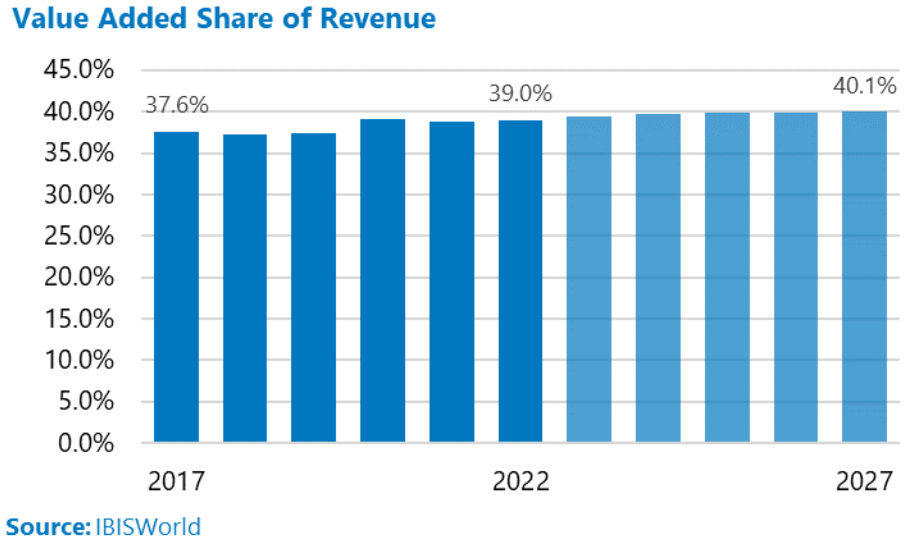


Source: IBISWorld

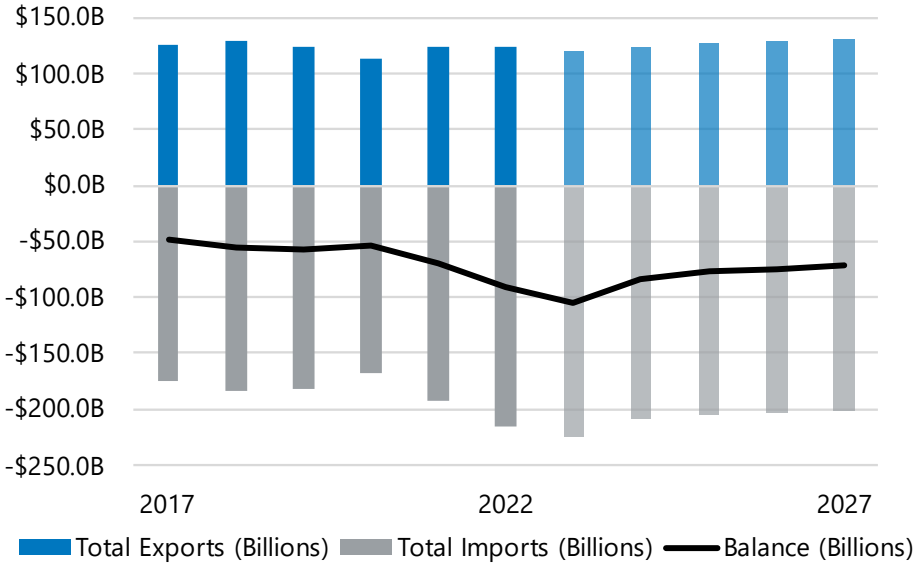


Value Added: Value added has risen consistently over the past five years and is expected to continue to grow through 2027.

Value Added Share of Revenue: Value added as a share of revenue has grown since 2017 and is expected to continue to grow through 2027.



Exports and Imports (Billions of Dollars)



Source: IBISWorld

Exports & Imports: The Energy & Utilities sector's trade is imbalanced, with imports greater than exports each year. Imports are expected to become slightly more balanced in the next 5 years, with an increase in exports and a decrease in imports.

Top Export Countries (2022)

Country	Share of Total Cluster Exports
Mexico	19%
Canada	17%
China	8%
Germany	6%
Japan	4%

Source: USA Trade Online

Top Exporting Countries: In 2022, 19% of the US's Energy & Utilities exports were shipped to Mexico, 17% to Canada, 8% to China, 6% to Germany and 4% to Japan.

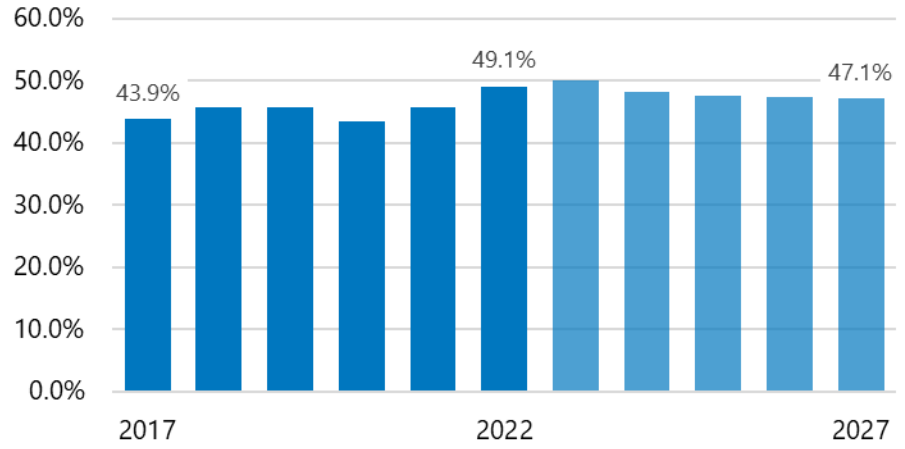
Top Import Countries (2022)

Country	Share of Total Cluster Imports
Mexico	23%
China	13%
Japan	9%
Germany	9%
Canada	5%

Source: USA Trade Online

Top Importing Countries: In 2022, 23% of the US's total Energy & Utilities imports came from Mexico, 13% from China, 9% from Japan, 9% from Germany, and 5% from Canada.

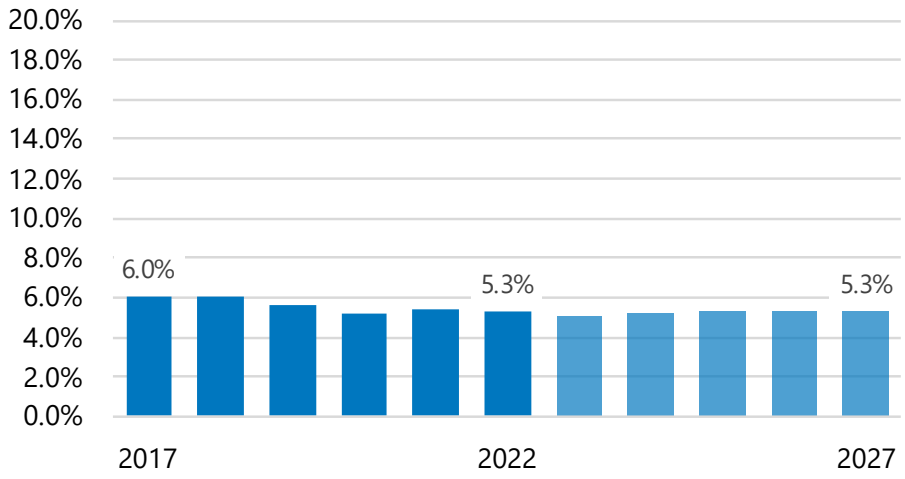
Import's Share of Domestic Demand



Source: IBISWorld

Import's Share of Domestic Demand: During the last five years, the US's demand for Energy & Utilities goods has been met by foreign suppliers at an increasing rate. This share is expected to decrease over the next five years.

Export's Share of Revenue



Source: IBISWorld

Export's Share of Revenue: The share of the total national revenue generated by exports declined slightly (by 0.7 percentage points) between 2017 and 2022. By 2027 this share is expected to remain constant.

Top 20 Products and Services of the Energy & Utilities Cluster

Product/Service	2022 Revenue (Millions)
Electric power and systems installation and servicing	$168,929
Natural gas-generated electricity	$167,170
Other	$149,517
Coal-generated electricity	$115,427
Renewable sources	$112,442
Distributed generation	$101,389
Nuclear-generated electricity	$100,999
Industrial, commercial and institutional projects	$86,549
Physical and engineering sciences	$66,668
Search, detection and navigation instruments	$65,909
Consulting and project management	$62,230
Life sciences	$61,207
New construction HVAC installations	$57,403
Transportation projects	$55,434
Electric power transmission infrastructure construction and repair	$48,681
Air conditioning, warm air heating and refrigeration equipment	$34,076
Residential and municipal utility projects	$32,545
HVAC maintenance and repairs	$31,775
Central AC Units	$29,961
Other plumbing supplies	$29,041

Source: IBISWorld

Top Companies: Revenue is highest in the Energy & Utilities sector for renewable energy sources.

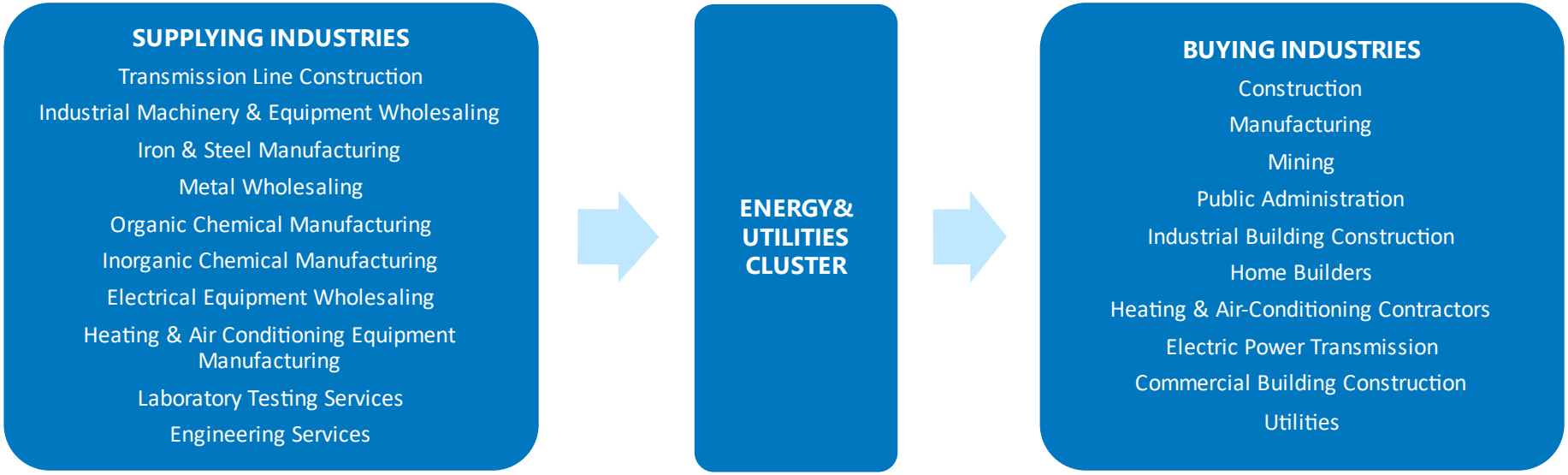
Top 10 Companies in the Energy & Utilities Cluster in the US, 2022

Company	Approximate Market Share
Exelon Corporation	1.3%
Aecom	0.8%
Quanta Services, Inc.	0.7%
Jacobs Engineering Group Inc.	0.6%
Edison International	0.5%
Cummins, Inc	0.5%
Trane Technologies, Plc	0.4%
General Electric Company	0.4%
Caterpillar Inc.	0.3%
Consolidated Edison	0.3%

Source: IBISWorld, Camoin Associates

Top Companies: No single company holds a high percentage of the market share of the Energy & Utilities industry. The company with the highest percentage of the market share—Exelon Corporation— only holds 1.3%.

Energy & Utilities Supply Chain



Regional Trends

Energy & Utilities Summary, 2022

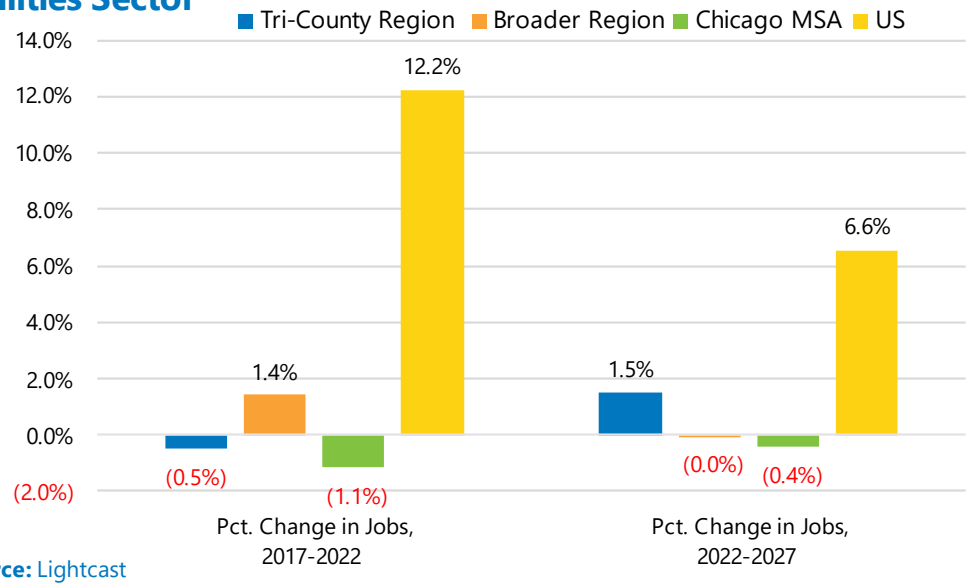
Region	2022 Jobs	Cluster Share of Total Jobs
Tri-County Region	9,035	3.5%
Broader Region	23,358	3.3%
Chicago MSA	120,463	2.5%
US	5,284,391	3.1%

Source: Lightcast, Camoin Associates

The Tri-County Region accounts for about 39% of the Broader Region's employment in Energy & Utilities, with just over 9,000 jobs in 2022. Energy & Utilities jobs make up 3.5% of all jobs in the Tri-County Region's economy, a higher share than the Broader Region, Chicago MSA, and United States.

During the five years from 2017-2022, employment in Energy & Utilities declined by about 0.5%, but is expected to see modest growth of 1.5% in the next five years from 2022-2027. All local regions lag US growth in the sector, with gains of 12.2% in the last five years and projected gains of 6.6% in the next five.

Historic and Projected Growth in the Energy & Utilities Sector



Source: Lightcast

Energy & Utilities Summary, 2022

Region	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (Millions)	Share of Total GRP	Productivity (GRP Per Job)
Tri-County Region	1.12	(804)	615	$1,945,619,987	6.7%	$215,340
Broader Region	1.07	1,611	1,638	$4,560,656,437	5.7%	$195,247
Chicago MSA	0.79	(14,532)	8,640	$24,652,954,409	3.3%	$204,652
US	N/A	N/A	423,512	$923,840,365,660	4.0%	$174,824

Source: Lightcast, Camoin Associates

Regional Summary: The Tri-County Region's employment is 1.12 times as concentrated in the Energy & Utilities cluster as the national average, compared to 1.07 times more concentrated in the Broader region and 79% as concentrated in Chicago, MSA. The Tri-County Region's negative competitive effect indicates that job growth is underperforming what could be expected based on national economy and industry trends. In the Tri-County Region, the cluster generates $215,340 of GRP per job, lagging all other study regions. Productivity is highest in Chicago, at around $205,000 per job.

Energy & Utilities Summary, 2022

Industry Cluster	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (Millions)	Share of Total GRP	Productivity (GRP Per Job)
Utilities	2.03	60	11	$848	43.6%	$871,805
Contractor-Related	1.14	(138)	435	$619	31.8%	$131,956
Equipment Manufacturing for Renewable Products	2.48	(685)	39	$270	13.9%	$136,320
HVAC Wholesalers	1.05	126	17	$60	3.1%	$188,847
Professional and Technical Services	0.46	(167)	114	$149	7.7%	$138,338

Source: Lightcast, Camoin Associates

Subcluster Summary: Within Energy & Utilities, the Equipment and Manufacturing for Renewables is the most concentrated relative to the US. The industries that are most productive in the Tri-County Region are in the Utilities subcluster, which generated an average of $871,805 of GRP in 2022 for a total of $848 million.

Average Annual Pay in Energy & Utilities Cluster and Deviation from Regional Living Wage

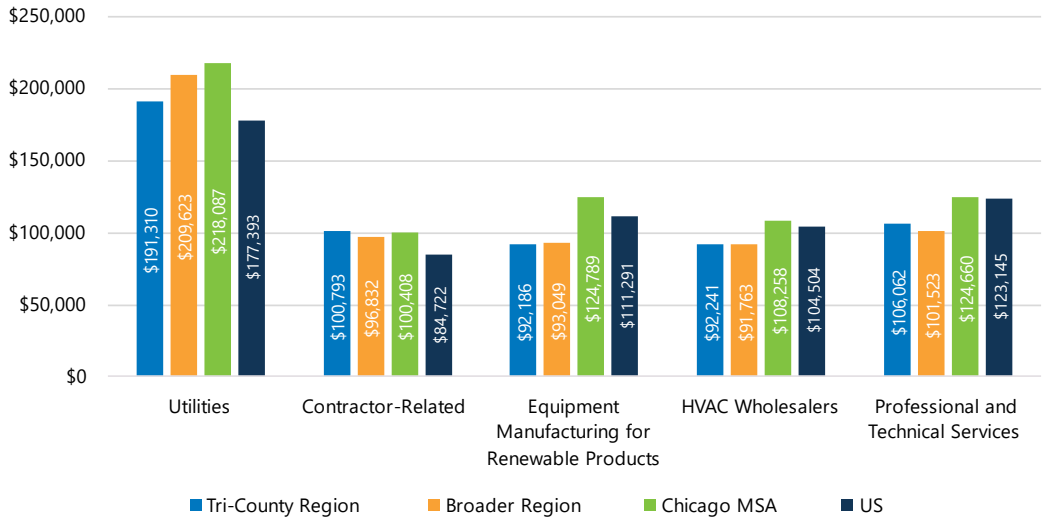
Industry Cluster	Tri-County Region		Broader Region		Chicago MSA	
	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage
Utilities	$191,310	$150,569	$209,623	$169,264	$218,087	$175,135
Contractor-Related	$100,793	$60,052	$96,832	$56,473	$100,408	$57,456
Equipment Manufacturing for Renewable Products	$92,186	$51,446	$93,049	$52,690	$124,789	$81,837
HVAC Wholesalers	$92,241	$51,500	$91,763	$51,404	$108,258	$65,306
Professional and Technical Services	$106,062	$65,322	$101,523	$61,164	$124,660	$81,708

Source: Lightcast, MIT Living Wage Calculator, Camoin Associates

Pay and Deviation from Living Wage: Average earnings per job in the cluster for the Tri-County Region were $116,518 in 2022. The subcluster with the highest average earnings was Utilities ($191,310). Average earnings in the Tri-County Region are on par with the Broader Region but underperform Chicago MSA.

Average Earnings Per Job: Average earnings are relatively consistent for each subcluster across regions, with Chicago consistently outperforming all other study regions.

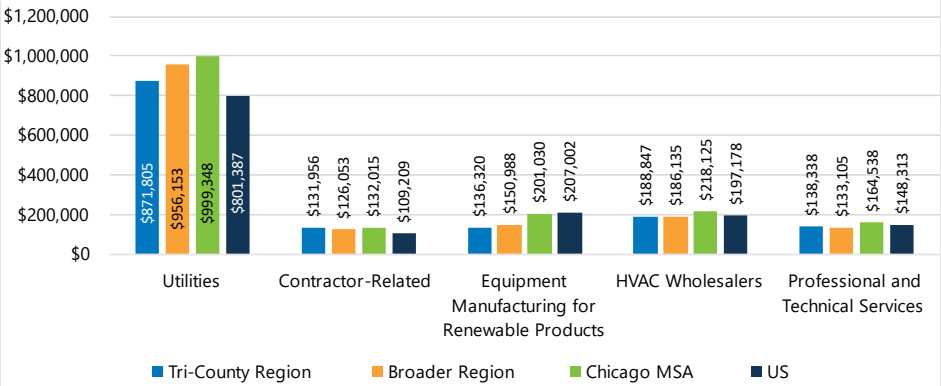
Average Earnings Per Job in Energy & Utilities Cluster, 2022



Source: Lightcast, Camoin Associates

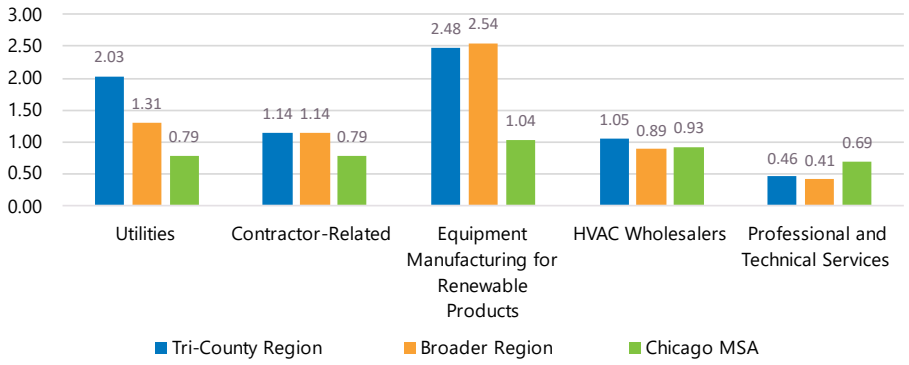
GRP Per Job: Productivity in the Tri-County Region is highest for Utilities and lowest in Contractor-Related Occupations. In most clusters, the Tri-County Region's productivity is on par with the Broader Region and the US, but underperforming Chicago.

GRP Per Job in Energy & Utilities Cluster, 2022



Source: Lightcast, Camoin Associates

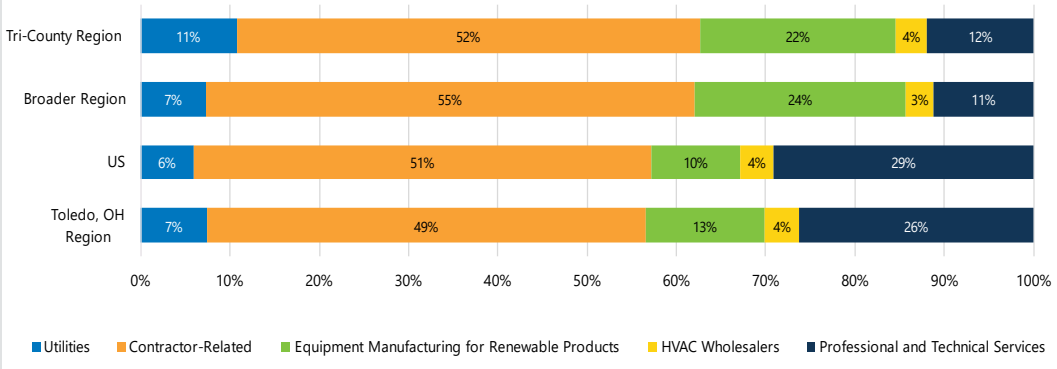
Location Quotients in Energy & Utilities Cluster, 2022



Source: Lightcast, Camoin Associates

Location Quotient: The Tri-County Region is most concentrated in Equipment Manufacturing for Renewable Products (2.48 times more than the US) and least concentrated in Professional & Technical Services (46% as concentrated).

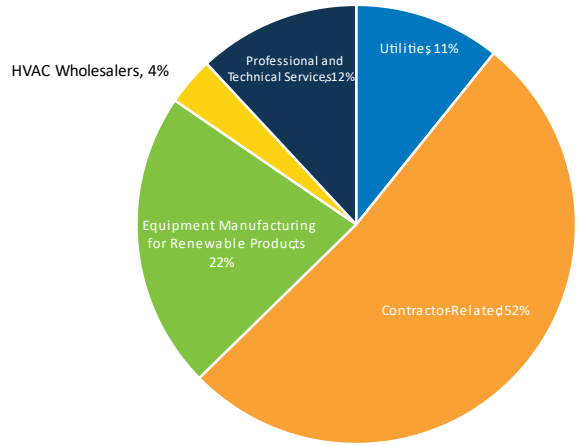
Industry Mix of the Energy & Utilities Cluster, 2022 (Job Share)



Source: Lightcast, Camoin Associates

Industry Mix (Job Share): The Tri-County Region has a higher shares of Utilities than all other study regions and comparable shares of all other Energy & Utilities subclusters.

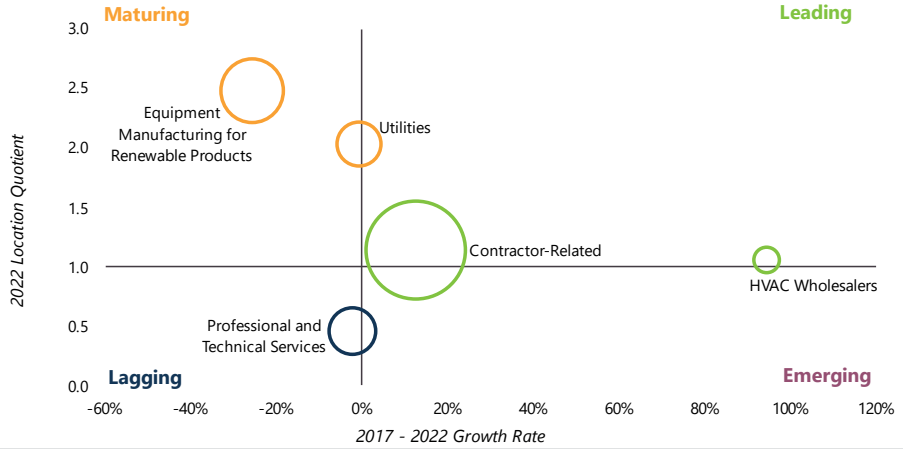
Share of Energy & Utilities Jobs, Tri-County Region



Share of Jobs: Of the 9,035 Energy & Utilities jobs in The Tri-County Region, the greatest share is in Contractor-Related Occupations and the smallest in HVAC Wholesalers.

Key Metrics by Energy Subcluster, Tri-County Region

Bubble size indicates 2022 job count

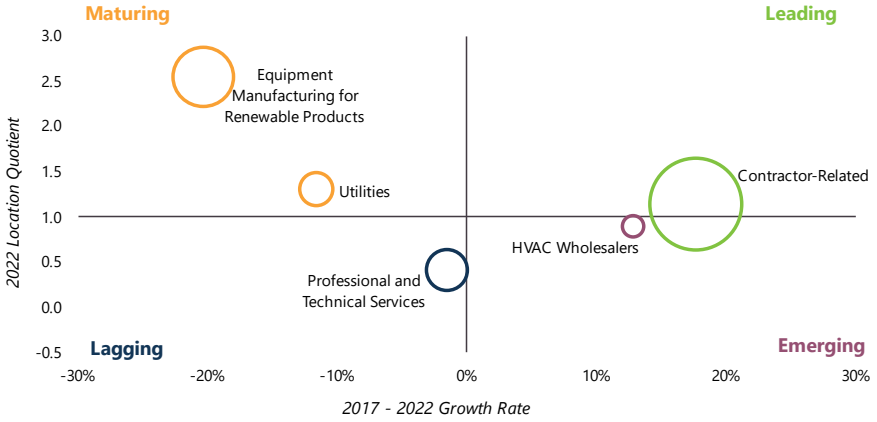


Key Metrics by Subcluster, Tri-County Region: In the Tri-County Region, HVAC Wholesalers and Contractor-Related jobs are leading subclusters, with high location quotients and employment growth. Utilities and Equipment Manufacturing for Renewable Products are maturing in the Tri-County Region, with higher location quotients but negative or low growth. Professional and Technical Services is lagging in the Tri-County Region, meaning there is a low location quotient and declining

Key Metrics by Subcluster, Broader Region: In the Broader Region, Contractor-Related jobs are a leading subcluster, with a high location quotient and positive growth. HVAC Wholesalers are emerging, with positive growth but lower location quotients and Professional and Technical Services are lagging, with a low location quotient and low or negative growth. Equipment Manufacturing for Renewable Products and Utilities are maturing, with a higher location quotient but negative growth.

Key Metrics by Energy & Utilities Subcluster, Broader Region

Bubble size indicates 2022 job count



Sales and Demand for the Energy & Utilities Cluster, 2022

Region	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Tri-County Region	$3,595,053,316	61%	$2,451,058,267	43%
Broader Region	$8,699,286,082	58%	$6,505,417,617	44%
Chicago MSA	$45,586,390,466	21%	$48,187,839,268	25%

Source: Camoin Associates

Sales and Demand by Region, 2022: The Tri-County Region meets less than half of demand by imports (43%) and exports about 61% of the cluster's goods and services, slightly more than the Broader Region (58%) and significantly more than the Chicago MSA (21%).

Sales and Demand for the Energy & Utilities in Tri-County Region, 2022

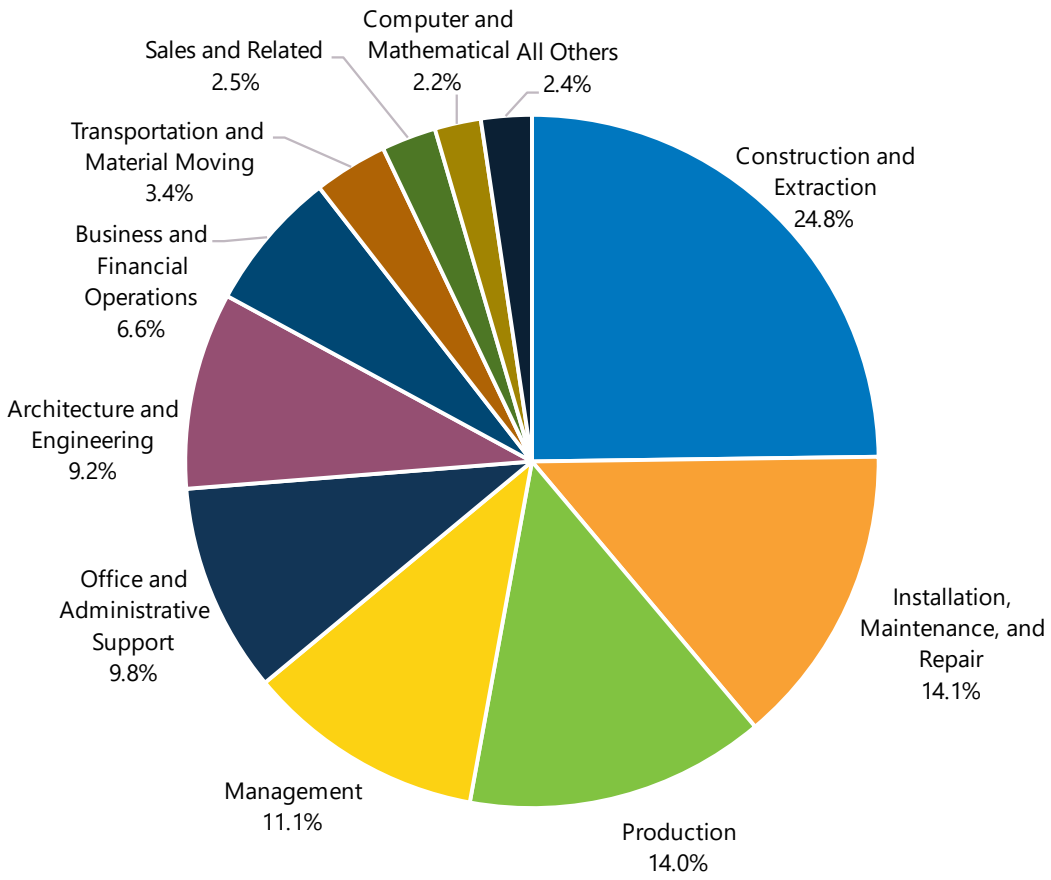
Sub-Industry	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Utilities	$1,446,865,043	72%	$686,582,715	41%
Contractor-Related	$1,255,082,686	45%	$837,374,904	18%
Equipment Manufacturing for Renewable Products	$526,241,501	92%	$373,516,852	90%
HVAC Wholesalers	$108,214,503	65%	$134,511,963	72%

Source: Camoin Associates

Sales and Demand for by Subcluster in the Tri-County Region, 2022: The Tri-County Region both exports a relatively large share of sales (92%) and meets a high share of demand by imports (90%) for the Utilities subcluster, suggesting an opportunity to meet more demand in-region. The same is true for HVAC Wholesalers, with 65% of sales exported and 72% of demand met by imports.

Workforce Analysis

Energy & Utilities Cluster Workforce by Occupational Group, Tri-County Region (2022)



Source: Lightcast, 2023.3

Workforce by Occupational Group: The Tri-County Region's Energy & Utilities cluster had 9,035 jobs in 2022 comprised of 797 occupations. Construction and Extraction occupations make up almost a quarter (24.8%) of the cluster's workforce. Other major occupation groups include Installation, Maintenance, and Repair (14.1%), and Production (14.0%).

Top Occupations in the Staffing Pattern, Energy & Utilities, Tri-County Region (2022)

SOC	Description	Employed in Cluste	Share of Total Jobs in Cluste
47-2152	Plumbers, Pipefitters, and Steamfitters	706	7.8%
47-2111	Electricians	602	6.7%
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	468	5.2%
11-1021	General and Operations Managers	343	3.8%
47-2061	Construction Laborers	287	3.2%
49-9051	Electrical Power-Line Installers and Repairers	270	3.0%
43-9061	Office Clerks, General	256	2.8%
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	236	2.6%
51-2098	Miscellaneous Assemblers and Fabricators	226	2.5%
11-9021	Construction Managers	199	2.2%
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	188	2.1%
51-4041	Machinists	186	2.1%
17-2051	Civil Engineers	180	2.0%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	170	1.9%
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	150	1.7%
13-1082	Project Management Specialists	148	1.6%
17-2141	Mechanical Engineers	137	1.5%
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	122	1.3%
47-2211	Sheet Metal Workers	122	1.3%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	118	1.3%
51-1011	First-Line Supervisors of Production and Operating Workers	110	1.2%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	108	1.2%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	106	1.2%
11-9041	Architectural and Engineering Managers	106	1.2%
43-4051	Customer Service Representatives	102	1.1%
Top Occupations TOTAL		**5,643**	**62%**

Source: Lightcast 2023.3

Top 30 Occupations Staffing Patterns: With about 5,600 of the 9,035 jobs, the top occupations account for 62% of the cluster's jobs in the Tri-County Region. It should be noted many of the occupations in the cluster are a very small portion of the same occupations in all other industries, meaning the Energy & Utilities cluster must compete intensively for talent.

Comparison of Staffing Patterns Across Energy & Utilities Cluster, Tri-County Region (2022)

SOC	Description	Share of Total Jobs in the Cluster (2022)				Difference from Tri-County Region		
		Tri-County Region	Broader Region	Chicago MSA	US	Broader Region	Chicago MSA	US
47-2152	Plumbers, Pipefitters, and Steamfitters	7.8%	6.9%	7.1%	6.2%	-0.9%	-0.8%	-1.6%
47-2111	Electricians	6.7%	9.3%	9.4%	10.3%	2.6%	2.8%	3.7%
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	5.2%	5.4%	5.2%	5.6%	0.2%	0.0%	0.4%
11-1021	General and Operations Managers	3.8%	3.5%	4.2%	3.0%	-0.3%	0.4%	-0.8%
47-2061	Construction Laborers	3.2%	2.9%	2.2%	2.4%	-0.2%	-1.0%	-0.8%
49-9051	Electrical Power-Line Installers and Repairers	3.0%	2.0%	1.7%	1.8%	-1.0%	-1.3%	-1.2%
43-9061	Office Clerks, General	2.8%	2.8%	2.9%	2.3%	0.0%	0.1%	-0.6%
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	2.6%	2.5%	1.8%	1.0%	-0.1%	-0.8%	-1.6%
51-2098	Miscellaneous Assemblers and Fabricators	2.5%	2.2%	1.4%	1.2%	-0.3%	-1.1%	-1.3%
11-9021	Construction Managers	2.2%	2.1%	2.1%	1.4%	-0.1%	-0.1%	-0.8%
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	2.1%	2.6%	2.0%	2.9%	0.5%	-0.1%	0.8%
51-4041	Machinists	2.1%	1.7%	0.7%	0.5%	-0.4%	-1.4%	-1.6%
17-2051	Civil Engineers	2.0%	1.8%	4.0%	3.1%	-0.2%	2.0%	1.1%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1.9%	1.7%	1.7%	1.0%	-0.1%	-0.1%	-0.9%
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	1.7%	1.5%	1.0%	1.3%	-0.2%	-0.6%	-0.3%
13-1082	Project Management Specialists	1.6%	1.6%	1.9%	2.3%	0.0%	0.3%	0.6%
17-2141	Mechanical Engineers	1.5%	1.5%	1.5%	1.4%	0.0%	0.0%	-0.2%
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	1.3%	1.4%	1.5%	1.5%	0.0%	0.2%	0.2%
47-2211	Sheet Metal Workers	1.3%	1.3%	1.5%	1.1%	0.0%	0.2%	-0.2%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	1.3%	1.4%	1.3%	1.3%	0.1%	0.0%	0.0%
51-1011	First-Line Supervisors of Production and Operating Workers	1.2%	1.2%	0.6%	0.5%	0.0%	-0.6%	-0.7%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1.2%	1.1%	1.2%	1.0%	-0.1%	0.0%	-0.2%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	1.2%	1.2%	0.8%	0.6%	0.0%	-0.4%	-0.6%
11-9041	Architectural and Engineering Managers	1.2%	1.0%	1.3%	1.1%	-0.2%	0.1%	-0.1%
43-4051	Customer Service Representatives	1.1%	1.0%	1.1%	1.1%	-0.1%	0.0%	-0.1%
17-2112	Industrial Engineers	1.0%	1.2%	0.8%	0.7%	0.2%	-0.3%	-0.3%
17-2071	Electrical Engineers	1.0%	0.9%	0.9%	1.3%	-0.2%	-0.1%	0.3%
11-9199	Managers, All Other	1.0%	0.9%	1.0%	1.0%	0.0%	0.0%	0.0%
47-2073	Operating Engineers and Other Construction Equipment Operators	0.9%	0.8%	0.4%	0.5%	-0.1%	-0.5%	-0.4%
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	0.9%	0.9%	1.2%	1.1%	0.0%	0.3%	0.2%
Share of Total Staffing Pattern		**67.3%**	**66.5%**	**64.4%**	**60.3%**	**-0.8%**	**-2.9%**	**-7.0%**

Source: Lightcast 2023.3

Comparison of Staffing Patterns Across Regions: While there are slight variations in this cluster's staffing patterns across regions, they match fairly well. The top three occupations in the Tri-County Region make up almost 20% of the cluster's jobs in the region.

Energy & Utilities Cluster's Share of Occupation's Jobs Across the Economy, Tri-County Region (2022)

SOC	Description	Employed in Industry Group	Total Jobs in Economy	Cluster's Share of Total Jobs in Economy
49-9051	Electrical Power-Line Installers and Repairers	270	294	91.7%
47-2152	Plumbers, Pipefitters, and Steamfitters	706	944	74.8%
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	468	628	74.5%
47-2111	Electricians	602	953	63.1%
17-2051	Civil Engineers	180	344	52.4%
17-2071	Electrical Engineers	94	203	46.0%
47-2211	Sheet Metal Workers	122	286	42.6%
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	236	634	37.2%
11-9041	Architectural and Engineering Managers	106	403	26.2%
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	188	814	23.1%
11-9021	Construction Managers	199	976	20.3%
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	150	801	18.8%
13-1082	Project Management Specialists	148	889	16.7%
17-2141	Mechanical Engineers	137	854	16.0%
47-2061	Construction Laborers	287	2,013	14.2%
47-2073	Operating Engineers and Other Construction Equipment Operators	82	632	12.9%
17-2112	Industrial Engineers	94	939	10.0%
11-9199	Managers, All Other	86	1,300	6.6%
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	81	1,343	6.0%
51-1011	First-Line Supervisors of Production and Operating Workers	110	1,877	5.8%
51-4041	Machinists	186	3,457	5.4%
43-9061	Office Clerks, General	256	5,077	5.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	106	2,108	5.0%
11-1021	General and Operations Managers	343	6,836	5.0%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	118	2,489	4.7%
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	122	2,855	4.3%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	108	2,630	4.1%
51-2098	Miscellaneous Assemblers and Fabricators	226	6,567	3.4%
43-4051	Customer Service Representatives	102	4,125	2.5%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	170	8,933	1.9%

Source: Lightcast 2023.3

Share of Jobs Across the Economy: The top 3 Energy & Utilities occupations in the Tri-County Region are primarily employed in the cluster.

Comparison of Projected Growth in Top Occupations in the Energy & Utilities Cluster Across Region (2022)

		Tri-County Region			Broader Region			Chicago MSA			US		
			2022 - 2027			2022 - 2027			2022 - 2027			2022 - 2027	
SOC	Description	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate
47-2152	Plumbers, Pipefitters, and Steamfitters	706	38	5.4%	1,621	105	6.4%	8,502	154	1.8%	329,266	21,197	6.4%
47-2111	Electricians	602	-1	-0.1%	2,161	201	9.3%	11,345	-243	-2.1%	544,723	51,003	9.4%
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	468	38	8.1%	1,260	106	8.4%	6,219	283	4.5%	295,505	25,397	8.6%
11-1021	General and Operations Managers	343	5	1.5%	823	24	2.9%	5,029	-33	-0.7%	159,620	10,716	6.7%
47-2061	Construction Laborers	287	18	6.3%	689	69	10.0%	2,596	93	3.6%	125,850	9,145	7.3%
49-9051	Electrical Power-Line Installers and Repairers	270	29	10.6%	464	72	15.5%	2,012	212	10.5%	95,559	8,739	9.1%
43-9061	Office Clerks, General	256	-6	-2.5%	663	-3	-0.4%	3,520	-191	-5.4%	119,678	1,445	1.2%
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	236	-39	-16.5%	589	-55	-9.4%	2,193	-201	-9.2%	51,942	4,890	9.4%
51-2098	Miscellaneous Assemblers and Fabricators	226	-39	-17.4%	524	-63	-12.1%	1,640	-188	-11.5%	62,538	543	0.9%
11-9021	Construction Managers	199	15	7.4%	486	49	10.2%	2,510	92	3.7%	75,412	7,565	10.0%
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	188	9	4.8%	611	56	9.2%	2,425	7	0.3%	150,704	10,356	6.9%
51-4041	Machinists	186	-13	-7.2%	387	-19	-4.8%	789	-73	-9.3%	24,941	1,225	4.9%
17-2051	Civil Engineers	180	13	7.5%	422	29	6.8%	4,861	227	4.7%	164,432	16,053	9.8%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	170	7	4.2%	404	11	2.6%	2,103	-30	-1.4%	51,426	4,143	8.1%
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	150	15	9.9%	353	36	10.1%	1,258	49	3.9%	70,985	5,054	7.1%
13-1082	Project Management Specialists	148	3	2.3%	376	18	4.8%	2,346	-4	-0.2%	120,733	7,557	6.3%
17-2141	Mechanical Engineers	137	-6	-4.3%	348	-3	-0.7%	1,771	-38	-2.2%	71,386	3,902	5.5%
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	122	-5	-3.9%	323	-9	-2.9%	1,850	-133	-7.2%	79,913	-1,154	-1.4%
47-2211	Sheet Metal Workers	122	3	2.5%	311	11	3.5%	1,820	-9	-0.5%	59,847	2,150	3.6%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	118	-2	-1.7%	332	0	0.1%	1,587	-71	-4.5%	69,509	1,224	1.8%
51-1011	First-Line Supervisors of Production and Operating Workers	110	0	0.0%	276	-11	-4.0%	718	-37	-5.1%	27,341	1,704	6.2%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	108	10	9.6%	257	14	5.3%	1,412	7	0.5%	52,862	4,816	9.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	106	-15	-13.7%	274	-26	-9.4%	908	-88	-9.7%	29,860	580	1.9%
11-9041	Architectural and Engineering Managers	106	-1	-1.4%	233	-3	-1.2%	1,582	-19	-1.2%	55,813	3,046	5.5%
43-4051	Customer Service Representatives	102	-2	-2.1%	244	-4	-1.7%	1,380	-24	-1.8%	56,644	1,522	2.7%
17-2112	Industrial Engineers	94	1	1.6%	278	18	6.6%	941	46	4.9%	37,625	5,722	15.2%
17-2071	Electrical Engineers	94	0	0.0%	204	0	-0.1%	1,144	17	1.5%	68,742	4,303	6.3%
11-9199	Managers, All Other	86	4	4.4%	214	9	4.3%	1,206	37	3.1%	50,408	4,255	8.4%
47-2073	Operating Engineers and Other Construction Equipment Operators	82	6	7.9%	193	25	13%	523	32	6%	25,741	2,302	8.9%
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	81	2	1.9%	220	8	3.8%	1,399	1	0.1%	57,370	3,725	6.5%

Source: Lightcast 2023.3

Comparison of Projected Growth: Plumbers, Pipefitters, and Steamfitters and Heating, Air Conditioning, and Refrigeration Mechanics and Installers are expected to see the most growth between 2022-2027 (38 new jobs each). These occupations are projected to grow in the Broader Region, Chicago MSA, and the US as well.

Median Hourly Earnings for the Top 30 Occupations in the Energy and Utilities Cluster (2022)

SOC	Description	Tri-County Region	Broader Region	Chicago MSA	United States	Difference from Tri-County Region		
						Broader Region	Chicago MSA	US
47-2152	Plumbers, Pipefitters, and Steamfitters	$44.32	$42.26	$44.83	$28.22	(4.7%)	1.1%	(36.3%)
47-2111	Electricians	$37.79	$37.79	$42.94	$28.48	(0.0%)	13.6%	(24.6%)
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	$26.83	$26.09	$27.66	$24.44	(2.7%)	3.1%	(8.9%)
11-1021	General and Operations Managers	$42.69	$43.99	$50.24	$47.00	3.1%	17.7%	10.1%
47-2061	Construction Laborers	$22.86	$22.98	$25.19	$18.97	0.5%	10.2%	(17.0%)
49-9051	Electrical Power-Line Installers and Repairers	$52.13	$51.14	$53.22	$39.54	(1.9%)	2.1%	(24.2%)
43-9061	Office Clerks, General	$17.95	$17.87	$19.58	$18.28	(0.5%)	9.1%	1.9%
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	$17.10	$17.20	$17.94	$18.55	0.6%	4.9%	8.5%
51-2098	Miscellaneous Assemblers and Fabricators	$20.26	$18.27	$17.71	$17.91	(9.8%)	(12.6%)	(11.6%)
11-9021	Construction Managers	$39.75	$40.91	$44.82	$40.19	2.9%	12.7%	1.1%
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	$39.97	$38.88	$45.72	$34.77	(2.7%)	14.4%	(13.0%)
51-4041	Machinists	$23.08	$22.58	$23.51	$23.23	(2.2%)	1.8%	0.6%
17-2051	Civil Engineers	$41.66	$41.31	$47.44	$43.21	(0.8%)	13.9%	3.7%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	$15.84	$16.27	$18.05	$17.33	2.8%	14.0%	9.5%
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	$36.34	$35.20	$38.95	$35.14	(3.1%)	7.2%	(3.3%)
13-1082	Project Management Specialists	$39.70	$41.28	$48.63	$45.78	4.0%	22.5%	15.3%
17-2141	Mechanical Engineers	$39.84	$40.27	$47.42	$46.30	1.1%	19.0%	16.2%
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	$19.00	$19.30	$22.06	$19.67	1.6%	16.1%	3.5%
47-2211	Sheet Metal Workers	$38.11	$36.45	$39.47	$26.29	(4.4%)	3.6%	(31.0%)
43-3031	Bookkeeping, Accounting, and Auditing Clerks	$21.58	$21.25	$23.58	$22.02	(1.5%)	9.3%	2.1%
51-1011	First-Line Supervisors of Production and Operating Workers	$29.03	$28.94	$30.83	$30.43	(0.3%)	6.2%	4.8%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	$29.42	$29.11	$31.69	$30.22	(1.1%)	7.7%	2.7%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	$18.31	$18.26	$20.34	$21.11	(0.3%)	11.1%	15.3%
11-9041	Architectural and Engineering Managers	$64.85	$65.44	$75.38	$76.84	0.9%	16.2%	18.5%
43-4051	Customer Service Representatives	$17.59	$17.62	$19.46	$18.14	0.1%	10.6%	3.1%
17-2112	Industrial Engineers	$42.67	$41.69	$48.50	$46.30	(2.3%)	13.7%	8.5%
17-2071	Electrical Engineers	$45.54	$44.83	$49.09	$49.61	(1.6%)	7.8%	8.9%
11-9199	Managers, All Other	$38.85	$40.18	$50.26	$45.95	3.4%	29.4%	18.3%
47-2073	Operating Engineers and Other Construction Equipment Operators	$39.30	$36.60	$41.08	$24.65	(6.9%)	4.5%	(37.3%)
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	$27.36	$27.31	$30.52	$29.89	(0.2%)	11.5%	9.2%

Source: Lightcast 2023.3

Median Hourly Earnings: Among the top occupations in the cluster, the highest-paying in the Tri-County Region is Architectural and Engineering Managers ($64.85), followed by Electrical Power-Line Installers and Repairers ($52.13), and Electrical Engineers ($45.54). Earnings for these occupations in the Tri-County Region are on par with the Broader Region but tends to lag the Chicago MSA and the United States.

Deviation from Regional Living Wage in Energy and Utilities Occupations

NAICS	Description	Tri-County Region Deviation from Living Wage	Broader Region Deviation from Living Wage	Chicago MSA Deviation from Living Wage
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	($3.75)	($3.13)	($2.60)
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	($2.49)	($2.21)	($2.71)
43-4051	Customer Service Representatives	($1.99)	($1.79)	($1.19)
43-9061	Office Clerks, General	($1.64)	($1.54)	($1.07)
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	($1.28)	($1.14)	($0.31)
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	($0.58)	($0.10)	$1.41
51-2098	Miscellaneous Assemblers and Fabricators	$0.67	($1.13)	($2.94)
43-3031	Bookkeeping, Accounting, and Auditing Clerks	$1.99	$1.84	$2.93
47-2061	Construction Laborers	$3.28	$3.58	$4.54
51-4041	Machinists	$3.50	$3.17	$2.86
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	$7.24	$6.69	$7.01
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	$7.78	$7.91	$9.87
51-1011	First-Line Supervisors of Production and Operating Workers	$9.45	$9.54	$10.18
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	$9.83	$9.70	$11.04
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	$16.76	$15.80	$18.30
47-2111	Electricians	$18.20	$18.39	$22.29
47-2211	Sheet Metal Workers	$18.53	$17.05	$18.82
11-9199	Managers, All Other	$19.26	$20.77	$29.61
47-2073	Operating Engineers and Other Construction Equipment Operators	$19.72	$17.19	$20.43
13-1082	Project Management Specialists	$20.11	$21.88	$27.98
11-9021	Construction Managers	$20.17	$21.51	$24.17
17-2141	Mechanical Engineers	$20.25	$20.86	$26.77
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	$20.39	$19.48	$25.07
17-2051	Civil Engineers	$22.07	$21.90	$26.79
17-2112	Industrial Engineers	$23.08	$22.29	$27.85
11-1021	General and Operations Managers	$23.11	$24.59	$29.59
47-2152	Plumbers, Pipefitters, and Steamfitters	$24.74	$22.86	$24.18
17-2071	Electrical Engineers	$25.95	$25.43	$28.44
49-9051	Electrical Power-Line Installers and Repairers	$32.55	$31.73	$32.57
11-9041	Architectural and Engineering Managers	$45.26	$46.04	$54.73

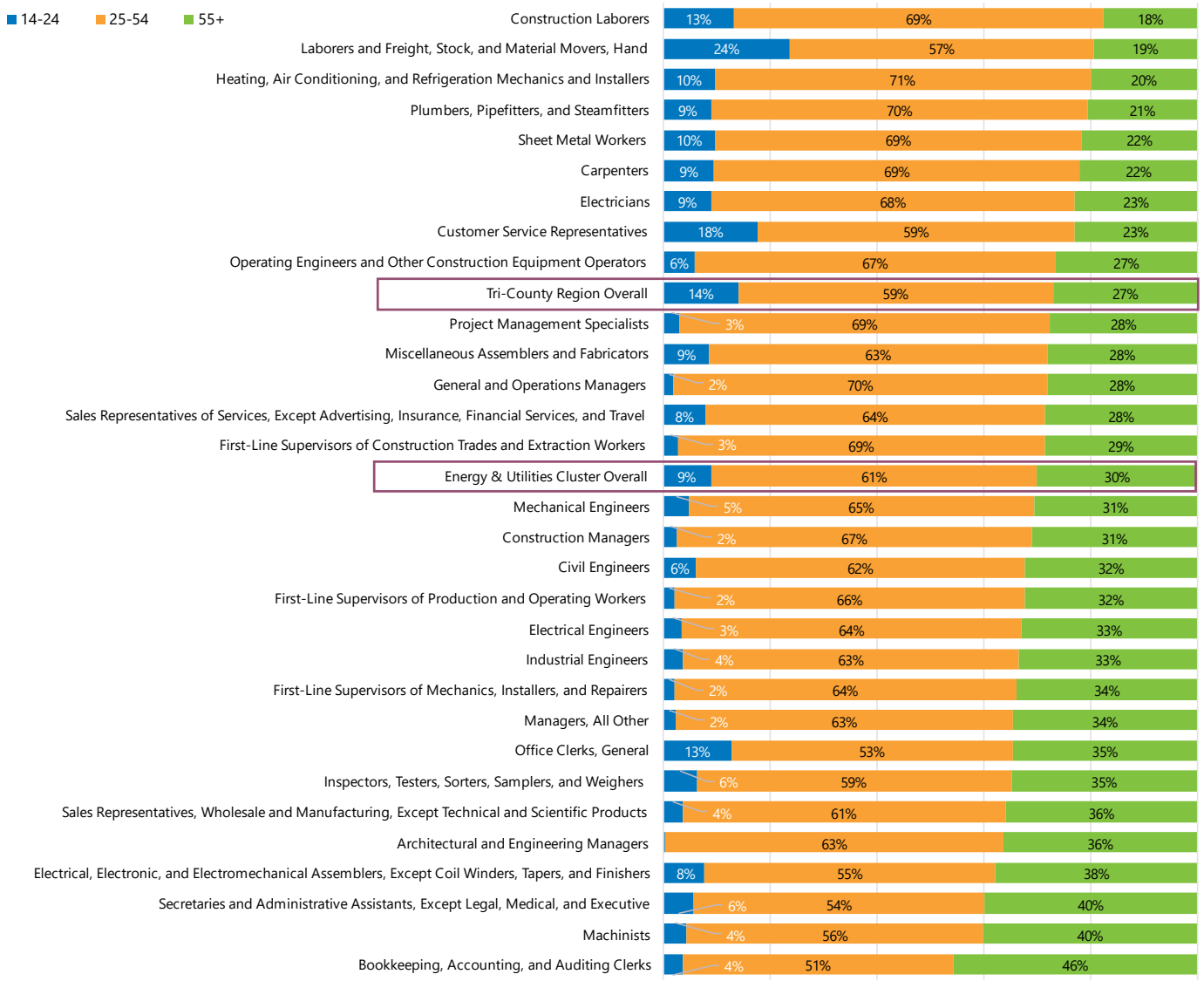
Source: Lightcast 2023.3

Note: Deviations based on living wage data from MIT Living Wage Calculator.

Living Wage: Region 1 = $19.59, Broader Region = $19.40, Chicago MSA = $20.65

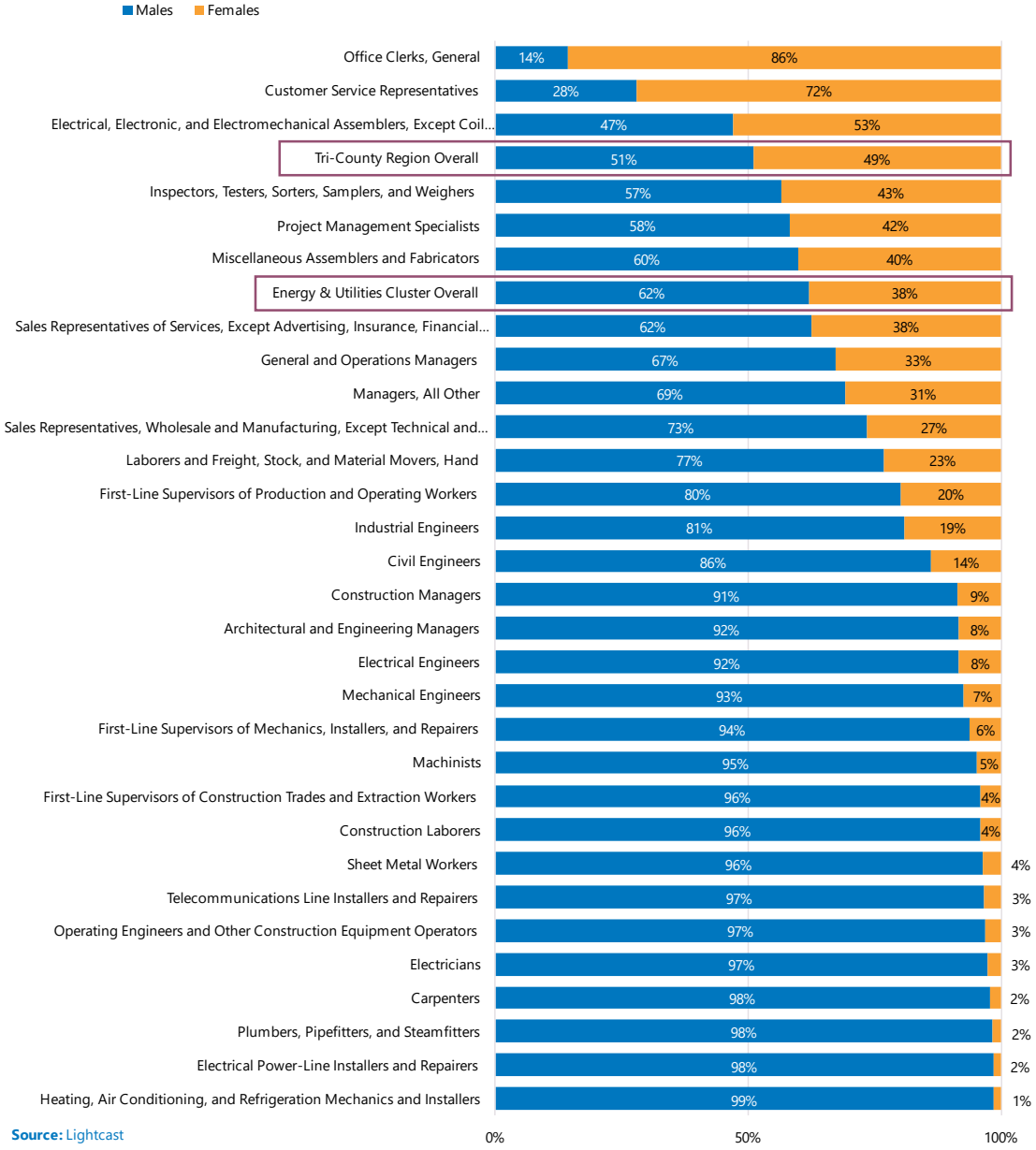
Deviation from Regional Living Wage: 6 of the top occupations pay less than a living wage in the Tri-County Region, similar to the Broader Region and the Chicago MSA. Laborers and Freight, Stock, and Material Movers (Hand) have the greatest deficit compared to the living wage in the Tri-County Region, with the median worker earning $3.75 per hour less than the living wage. Conversely, Architectural and Engineering Managers have the greatest surplus, with the median worker earning $45.26 per hour more than the living wage.

Age in Tri-County Region (2022)



Age: The population ages 14+ in the Tri-County Region is primarily people ages 25-54 (59%). This is reflected in the top Energy & Utilities occupations, where 61% of workers are between ages 25-54. The occupation with the most workers age 55+ is Bookkeeping, Accounting, and Auditing Clerks (46%). The occupation with the highest share of peoples ages 14-24 is Laborers and Freight, Stock, and Material Movers (Hand) (24%).

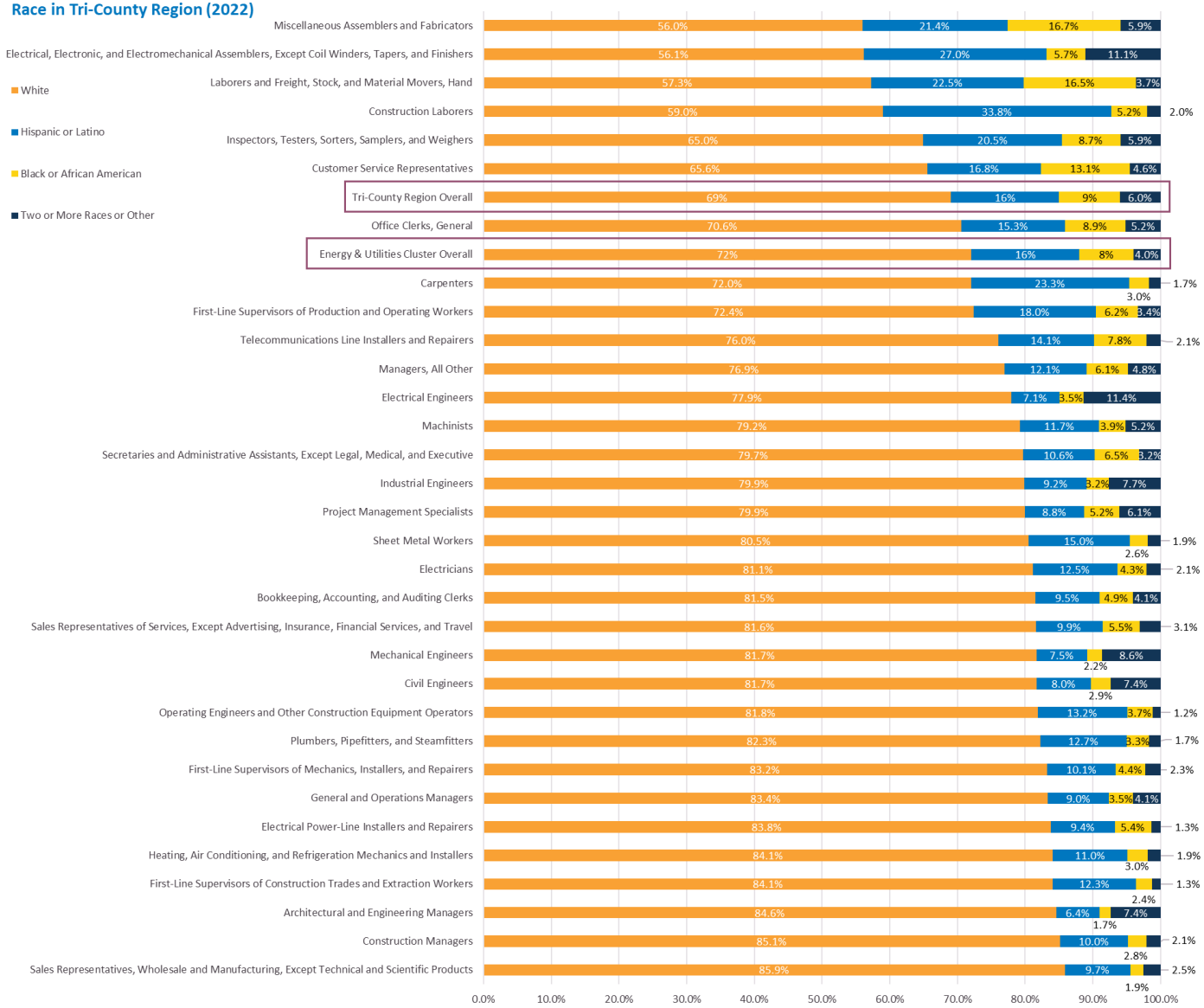
Sex in Tri-County Region (2022)



Source: Lightcast

Sex: While the Tri-County Region is almost evenly split between males and females, males make up 62% of the workers in the top Energy & Utilities occupations. The majority of workers in 28 of the 30 top occupations are males. The occupation with the highest share of males is Heating, Air Conditioning, and Refrigeration Mechanics and Installers (99%) and the occupation with the highest share of females is Office Clerks (86%).

Race in Tri-County Region (2022)



Source: Lightcast

Race: The racial breakdown in the Energy and Utilities cluster mirrors that of the Region. The occupation with the most White workers is Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products (85.9%). The occupation with the most Hispanic or Latino workers is Construction Laborers (33.8%). The occupation with the most Black or African American workers is Miscellaneous Assemblers and Fabricators (16.7%).

Projected Workforce Gaps, Energy & Utilities Cluster, Tri-County Region (2022 - 2027)

SOC	Description	Average Annual Openings (2022 - 2027)	Adjusted Completions	Estimated Annual Workforce Surplus / (Gap)
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,353	0	(1,353)
51-2098	Miscellaneous Assemblers and Fabricators	775	0	(775)
43-9061	Office Clerks, General	641	0	(641)
43-4051	Customer Service Representatives	579	0	(579)
11-1021	General and Operations Managers	652	197	(455)
51-4041	Machinists	359	34	(325)
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	334	15	(319)
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	286	0	(286)
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	255	0	(255)
43-3031	Bookkeeping, Accounting, and Auditing Clerks	306	55	(251)
47-2061	Construction Laborers	216	8	(208)
51-1011	First-Line Supervisors of Production and Operating Workers	201	0	(201)
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	151	0	(151)
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	85	0	(85)
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	83	0	(83)
47-2073	Operating Engineers and Other Construction Equipment Operators	71	0	(71)
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	73	2	(71)
11-9021	Construction Managers	86	17	(69)
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	70	24	(46)
47-2111	Electricians	104	64	(40)
49-9051	Electrical Power-Line Installers and Repairers	32	0	(32)
11-9041	Architectural and Engineering Managers	29	0	(29)
47-2152	Plumbers, Pipefitters, and Steamfitters	106	0	(106)
17-2112	Industrial Engineers	65	69	4
17-2051	Civil Engineers	28	40	12
17-2141	Mechanical Engineers	53	69	16
17-2071	Electrical Engineers	14	40	26
47-2211	Sheet Metal Workers	33	93	60
11-9199	Managers, All Other	114	185	71
13-1082	Project Management Specialists	82	208	126

Source: Lightcast 2023.3, Camoin

Completions have been adjusted to reflect the relevant programs servicing these occupations

Notes

- Openings = New Jobs due to Growth + Replacements due to Retirement and Turnover
- Completions for "Manager" or "Supervisor" occupations are likely overstated since qualification for these positions are usually a function of years of
- Completions may be doublecounted (i.e. a graduate from a program may be listed for multiple occupations). For example, there are 69 completions listed for Industrial Engineers and 69 completions listed for Mechanical Engineers. These are the same individuals.
- Assumes 2021 completions levels will be consistent over the next 5 years
- Assumes occupations that require only a high school diploma or equivalent do not have completions
- These completions are across the entire economy
- Completions for occupations that typically require a union apprenticeship are likely understated since they are not included in higher educational insti
- Assumes no completions for first-line supervisors as they are likely a function of being promoted from within or years of experience

Projected Workforce Gaps: Laborers and Freight, Stock, and Material Movers (Hand) are likely to be in high demand over the next 5 years, with an average annual gap of over 1,300 workers. This is also true for Miscellaneous Assemblers and Fabricators, with an average annual gap of 775 workers.

Notes:

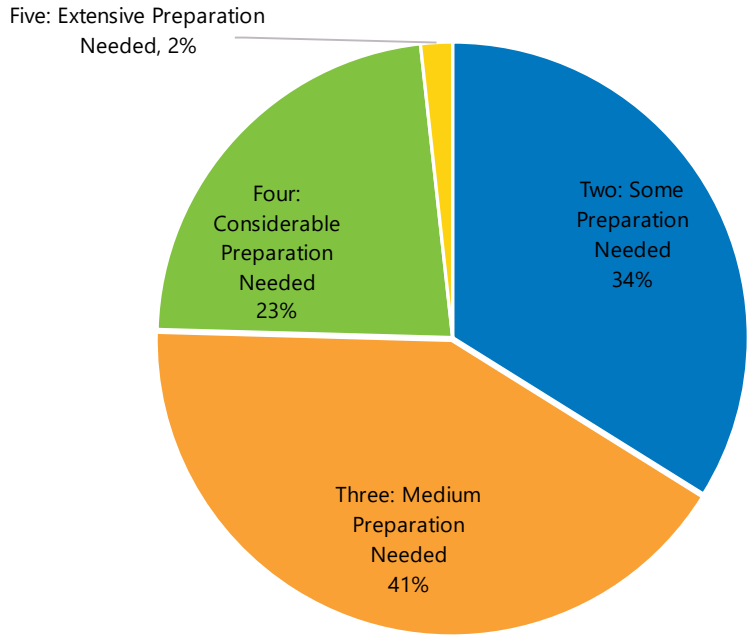
- Openings = New Jobs due to Growth + Replacements due to Retirement and Turnover
- Completions for "Manager" or "Supervisor" occupations are likely overstated since qualification for these positions are usually a function of years of experience rather than graduating from a management program
- Completions may be double counted (i.e., a graduate from a program may be listed for multiple occupations). For example, there are 69 completions listed for Industrial Engineers and 69 completions listed for Mechanical Engineers. These are the same individuals.
- Assumes 2021 completions levels will be consistent over the next 5 years

Preparation Required for Top Occupations, Energy & Utilities Cluster, Tri-County Region (2022)

SOC	Description	Typical Entry Level Educatio	Work Experience Required	Typical On-The-Job Training	Job Zone
47-2152	Plumbers, Pipefitters, and Steamfitters	High school diploma or equivalent	None	Moderate-term	Four: Considerable Preparation
47-2111	Electricians	High school diploma or equivalent	None	None	Five: Extensive Preparation
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	Postsecondary nondegree award	None	None	Four: Considerable Preparation
11-1021	General and Operations Managers	Bachelor's degree	5 years or more	None	Four: Considerable Preparation
47-2061	Construction Laborers	No formal educational credential	None	None	Four: Considerable Preparation
49-9051	Electrical Power-Line Installers and Repairers	High school diploma or equivalent	None	None	Four: Considerable Preparation
43-9061	Office Clerks, General	High school diploma or equivalent	None	None	Four: Considerable Preparation
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	High school diploma or equivalent	None	None	Four: Considerable Preparation
51-2098	Miscellaneous Assemblers and Fabricators	High school diploma or equivalent	None	None	Four: Considerable Preparation
11-9021	Construction Managers	Bachelor's degree	None	Moderate-term	Two: Some Preparation
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	High school diploma or equivalent	5 years or more	Moderate-term	Four: Considerable Preparation
51-4041	Machinists	High school diploma or equivalent	None	Moderate-term	Three: Medium Preparation
17-2051	Civil Engineers	Bachelor's degree	None	Short-term	Two: Some Preparation
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	No formal educational credential	None	Short-term	Two: Some Preparation
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	High school diploma or equivalent	Less than 5 years	Short-term	Two: Some Preparation
13-1082	Project Management Specialists	Bachelor's degree	None	None	Three: Medium Preparation
17-2141	Mechanical Engineers	Bachelor's degree	None	Short-term	Two: Some Preparation
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	High school diploma or equivalent	None	Moderate-term	Two: Some Preparation
47-2211	Sheet Metal Workers	High school diploma or equivalent	None	Apprenticeship	Three: Medium Preparation
43-3031	Bookkeeping, Accounting, and Auditing Clerks	Some college, no degree	None	Apprenticeship	Three: Medium Preparation
51-1011	First-Line Supervisors of Production and Operating Workers	High school diploma or equivalent	Less than 5 years	Apprenticeship	Two: Some Preparation
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	High school diploma or equivalent	None	None	Three: Medium Preparation
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	High school diploma or equivalent	None	Long-term	Three: Medium Preparation
11-9041	Architectural and Engineering Managers	Bachelor's degree	5 years or more	Long-term	Two: Some Preparation
43-4051	Customer Service Representatives	High school diploma or equivalent	None	None	Three: Medium Preparation
17-2112	Industrial Engineers	Bachelor's degree	None	Moderate-term	Two: Some Preparation
17-2071	Electrical Engineers	Bachelor's degree	None	Moderate-term	Two: Some Preparation
11-9199	Managers, All Other	Bachelor's degree	Less than 5 years	Long-term	Three: Medium Preparation
47-2073	Operating Engineers and Other Construction Equipment Operators	High school diploma or equivalent	None	Moderate-term	Two: Some Preparation
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	High school diploma or equivalent	None	Short-term	Two: Some Preparation

Source: Lightcast, O*Net

Job Zones for the Top Occupation in the Tri-County Region's Energy & Utilities Sector



Source: Lightcast, O*Net

Job Zones: The O*Net Job Zones system has five zones, with One indicating the fewest barriers to entry and least preparation needed and Five indicating the most training and preparation needed.

The occupations that staff the Energy & Utilities Cluster have medium barriers to entry, the largest share of jobs (41%) in these occupations at a Job Zone level 3. About a third of the cluster's jobs are at Job Zone 2, while another quarter are at level 4.

In-Demand Skills for Critical Occupations, Energy & Utilities Cluster, Tri-County Region (2022)

SOC	Description	Estimated Annual Workforce Surplus / (Gap)	Job Zone	In-Demand Skills		
				Necessary (1)	Defining (2)	Distinguishing (3)
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	(46)	Three: Medium Preparation Needed	Preventative Maintenance	HVAC	Furnaces
				Plumbing	Boilers	North American Technician Excellence Certification
				Hand Tools	EPA 608 Technician Certification	EPA Universal Certification
				Power Tool Operation	Ventilation	Consers
				Carpentry	Refrigeration	Cooling Towers
47-2111	Electricians	(40)	Three: Medium Preparation Needed	Machinery	Electrical Wiring	**Motor Controllers**
				Electric Components	Electrical Systems	Voltmeter
				Test Equipment	Blueprinting	**Relays**
				Wiring Diagram	Hand Tools	**Electrical Theory**
				Programmable Logic Controll	Transformers (Electrical)	Lighting Systems
49-9051	Electrical Power-Line Installers and Repairers	(32)	Two: Some Preparation Needed	Commercial Driver's License ((	Telecommunications	**Tower Climbing**
				Construction	**Underground Utilities**	Journeyman Lineman
				Excavation	Sewer Systems	
				Hand Tools	Insulator	
				High Voltage		
47-2152	Plumbers, Pipefitters, and Steamfitters	(106)	Three: Medium Preparation Needed	Soldering	**Plumbing**	Pipe Installation
				Valves (piping)	Plumbing Codes	**Water Heating**
				Hand Tools	**Drainage Systems**	Tube Bending
				Blueprinting	Pipe (Fluid Conveyance)	**Cross-Linked Polyethylene**
				HVAC	Pipe Threading	**Cast Iron**

Source: Lightcast, O*Net

(1) The specialized skills required for that job and relevant across other similar jobs. An employee needs these skills as building blocks to perform the more complex Defining Skills.
(2) The day-to-day tasks and responsibilities of the job. An employee needs these skills to qualify for and perform successfully in this occupation.
(3) The advanced skills that are called for occasionally. An employee with these skills is likely more specialized and able to differentiate themselves from others in the same role.

Innovative Agriculture

Emerging Trends

Overview

Innovative agriculture and agtech is the overlap of new and emerging technologies, business models, and processes within the traditional agriculture industry sectors. In the Tri-County Region the traditional agriculture base is centered around corn and soybeans along with dairy, cattle/beef, and hogs.

The goal or objectives of the integration of innovation and technology within agriculture typically includes:

- Increasing productivity including yield in relation to cost or fixed assets, land, and capital, as well as labor costs
- Reducing supply chain costs and/or making supply chains more resilient
- Increasing safety
- Responding to changing market demands including safety and consumer preferences
- Expanding markets
- Climate and environment considerations including decreased use of water, fertilizer, and pesticides; energy efficiency and renewable energy
- Reduced impact on natural ecosystems
- Less runoff of chemicals into rivers and groundwater
- Increased worker safety

Opportunities

There are multiple different types and sources of innovation and technology being integrated into agriculture creating opportunities for increased productivity and economic investment and growth. The following is an overview of some of the categories these fit into. Note, many of these overlap with each other in terms of applications.

- *Precision agriculture* – use of a variety of technologies including digital and GPS embedded within machinery and equipment for precise planting, rowing, and harvesting
- *Robotics, automation, and drones* - including unassisted and assistive automation (machines and equipment) to human labor), autonomous vehicles and equipment, and drones
- *Sensors* – ground, aerial and machine based for plant and soil metrics, animal monitoring, weather forecasting, and more
- *Indoor and vertical faming and horticulture* – for control, production scalability, and quality

- *Energy, environment, and climate resiliency* – including integration of renewable energy sources (such as solar, bio-based), electrification and energy storage for vehicles and equipment, energy conservation water conservation and maximization of use
- *Biomaterials and bio-pharmaceuticals* - extraction and processing for non-food uses (medicines, fuels and related feedstocks, and bio plastics/packaging
- *Data, analytics, and artificial intelligence* (and related software, tools and platforms) – for farm management and operations, supply chain management, market analytics, and more
- *Agriculture biotech* - inputs for crop and animal agriculture including genetics, microbiome, breeding, animal health, pest and disease resistance and treatment, and more

Challenges

Key challenges in growing and supporting innovative agriculture agtech for regional economic development include:

- Technology Adoption - supporting existing farms and farmers in operating profitable farms using existing practices, equipment and technology while taking the time and risk to adopt new methods and technologies
- Workforce – obtaining and retaining needed workers in low density areas and areas that may be experience out-migration
- Land Market Competition - demand on land for no agricultural development
- Rural Infrastructure - in particular broadband connectivity

Relevant Projects and Companies in the US

An important source of government funding is the US Department of Agriculture and in particular the National Institute of Food and Agriculture (NIFA) Small Business Innovation Research (SBIR) program which provides early-stage capital for small agribusinesses developing new agricultural technologies and products. Focus areas include plant and animal production, food science, forestry, aquaculture, biofuels, biobased products, natural resources, and the environment. Some relevant examples of successful Agtech startups that have utilized NIFA SBIR funding include:

- *Blue River Technology* - This California startup developed computer vision and machine learning for precision weed control. Their "see and spray" technology allows farmers to reduce herbicide use. Acquired by John Deere.
- *Vestaron* - A Michigan startup producing a biological insecticide derived from spider venom proteins. Their biopesticides are effective and safe for humans/environment.
- *Inari Agriculture* - A Massachusetts startup using CRISPR and gene editing to develop seeds with beneficial traits like drought tolerance. They aim to sustainably improve crop yields.
- *Plenty* - A vertical farming startup in California that uses AI, robots, and IoT to optimize indoor crop yields and quality. They have raised over $500 million in funding.

- *DoubleTap* - A Utah startup that created a wearable sensor that helps dairy farmers monitor cattle fertility cycles for optimal breeding timing.

The following are select examples of recent project and company investment trends of relevancy to Innovative Agriculture and agtech in the Tri-County Region. It is not an exhaustive list but rather is meant to provide examples of the kinds of projects and investment occurring in the market.

Data, Analytics, and Digital Tools

- *Farmers Business Network* - digital and technology tools, platforms; data and analytics; direct-to-farm commerce; and community and a sustainability platform. Technology and operations located in San Carlos, CA and farmer experience in Sioux Falls, South Dakota (www.fbn.com) – from CB Insights
- *Farm Mobile* (www.farmobile.com) – Farm data and analytics for farm and related value chain located in Leawood, KS from CB Insights
- *Climate Fieldview* - Monsanto's data offering with locations in Chicago and Morton Illinois (https://climate.com) – from CB Insights
- *Granular* – farm management software platform and services acquired by Dupont in 2017 (www.dupont.com/news/dupont-acquires-ag-software-company-granular-to-accelerate-digital-ag-strategy.html)

Robotics, Automation, and Drones

- *John Deere* –Moline Illinois based John Deere has developed and acquired technologies (including Blue River) that provide multiple precision manufacturing products and services (www.deere.com/en/technology-products/precision-ag-technology/). It is also at the early stages of fully autonomous technologies further evident in its acquisitions of Blue River and Bear Flag Robotics in 2017 along with AI patents and technologies since that time. As reported by CNBC in October 2022, "John Deere plans to build a world of fully autonomous farming by 2030" www.cnbc.com/2022/10/02/how-deere-plans-to-build-a-world-of-fully-autonomous-farming-by-2030.html. In the CNBC reporting, according to Jorge Heraud, vice president of automation and autonomy for Moline, Deere, "The total global fleet of autonomous Deere tractors is less than 50 today. In the meantime, as it prepares for full-autonomy markets, according to the CNBC reporting, Deere is creating value with well-established automated systems that can be retrofitted to its existing tractors, such as GPS-based self-steering and precision seeding that measures how deep and far apart to plant.
- *Fyto* - Petaluma, California–based Fyto combines automation, robotics so aquatic 'superplants' can grow almost anywhere (www.fyto.us/) – As reported by TechCrunch, using robots and automation hardware and software in a controlled aquatic environment through Fyto, "In most cases, farms are able to generate 10 to 20 times more protein per acre using five to 10 times less water than crops" https://techcrunch.com/2022/07/07/fyto-combines-automation-robotics-so-aquatic-superplants-can-grow-almost-anywhere/. While the technology and process can potentially be disruptive to existing crop growing markets, it also can provide synergy through dual options and also be used for better quality and predicate animal feed.

Vertical Farming

- *80 Acres Farms* – Vertical farming company initially based out of Ohio but recently expanding production including a $74 million expansion creating 125 jobs in Boone County, Kentucky as reported by Area Development (www.80acresfarms.com/, www.areadevelopment.com/newsitems/1-27-2022/80-acres-farms-boone-county-kentucky.shtml). 80 acres operates 100% on renewable energy.

Plant-Based Alternative Products

- *Nature's Fynd* -Alternative protein (fungi-based) compony based on of Chicago Illinois manufacture of meatless protein patties and dairy-free spreads - (www.naturesfynd.com/)
- *Continental Refining* –In 2021 started construction on the company's new $26.8 million soybean crushing, biodiesel refining and blending facility in Somerset, Kentucky. (www.conrefco.com/fccp-products-services-biodiesel-plant-supply-product-sales-21859 and reported in Area Development, www.areadevelopment.com/newsitems/12-23-2021/continental-refining-somerset-kentucky.shtml)

Relevant Projects and Companies in Illinois

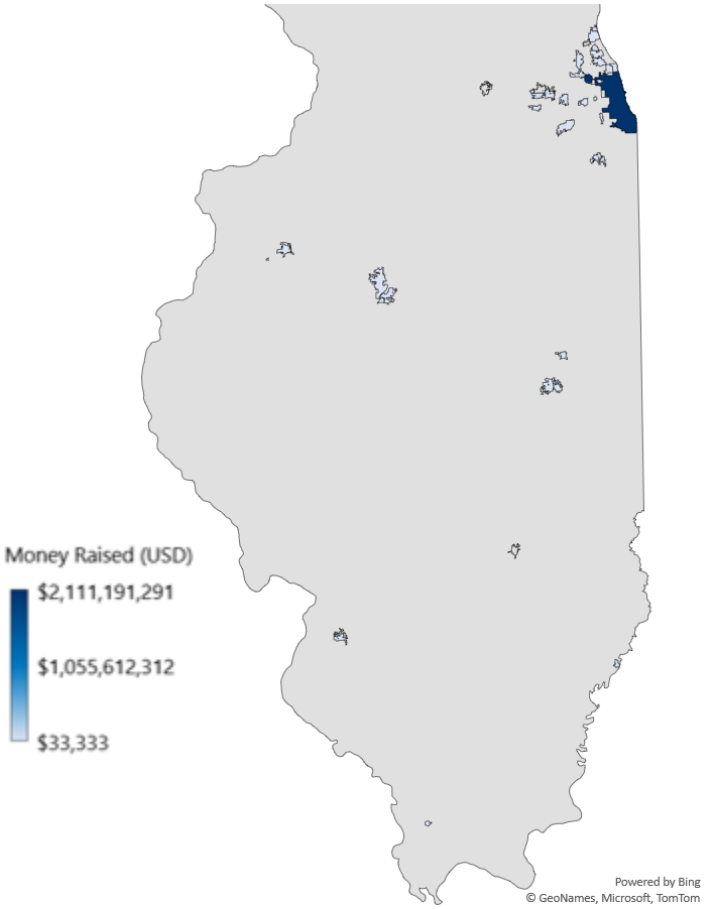
Illinois, with a grounding in agriculture historically through the present has a number of critical assets related to innovation and R&D including:

- University of Illinois Research - The University of Illinois Urbana-Champaign is a major hub for agricultural research and innovation. This includes initiatives like the Integrated Bioprocessing Research Laboratory exploring crop optimization and utilization (https://ibrl.aces.illinois.edu)
- Chicago Tech Incubators and Accelerators including 1871 (https://1871.com/) and mHUB www.mhubchicago.com/ - while not dedicated solely to agriculture innovation and agtech have services and companies within their portfolio related to both including space, mentoring and seed funding. Example companies funded by these and other Chicago area incubators and accelerators include:
- Midwestern BioAg - An Illinois startup developing organic crop inputs and soil amendments. They were part of the Techstars Farm to Fork accelerator powered by Cargill.
- Hazel Technologies - This Chicago startup produces small sachets that release vapor to extend produce shelf life. They've raised $18 million to date.
- Scout & Scroll - An agricultural data analytics platform that was supported by mHUB and is helping farmers optimize decision-making.
- Conservis - A Techstars graduate providing crop management software and analytics to farmers. Recently raised $17 million in funding.
- FarmLogix - Produces hybrid cloud software for commodity supply chain management. Graduated from 1871 and raised $7 million.
- Bushel - A grain trading SaaS startup that went through 1871 and recently raised $8 million in Series A funding.
- Aerofarms - An indoor vertical farming company using aeroponics. Graduated from the Good Food business accelerator.
- Edeniq - Develops processes to convert corn and cellulosic sugars into biofuels. Received early support from 1871 in Chicago.
- Chicago-based VCs like Cultivian Sandbox (https://cultiviansbx.com/) S2G Ventures (www.s2gventures.com) both actively invest in Agtech startups nationally and locally.

State-wide Innovation & Investment

Agriculture and food represent an area ripe for growing technological integration and innovation. The following presents an overview of Illinois' and the Tri-County Region's recent innovation activity within the sector.

Total Venture Capital in Food & Agriculture Categories, 2017-2023



Top 15 Agriculture Companies by VC Raised, Illinois, 2017-2023

Organization	Total Raised	Related Industries
Nature's Fynd	$463,000,000	Agriculture, AgTech, Food and Beverage, Food Processing, Sustainability
Provi	$123,500,000	Craft Beer, E-Commerce, E-Commerce Platforms, Food and Beverage, Hospitality, Marketplace, Online Portals, Restaurants, Wine And Spirits
Revolution Global	$118,219,734	Alternative Medicine, Cannabis, Health Care, Medical
PharmaCann	$109,388,161	Cannabis, Health Care, Medical
Chowbus	$108,270,000	Delivery, Food Delivery, Internet, Local, Mobile Apps
Cresco Labs	$100,000,000	Cannabis, Health Care, Medical, Pharmaceutical
Farmer's Fridge	$99,477,900	Consumer Goods, Delivery, Food and Beverage, Handmade, Restaurants, Snack Food
Fyllo	$98,000,000	Advertising, Cannabis, Cloud Computing, Cloud Data Services, Compliance, Enterprise Software, Marketing
Grassroots Cannabis	$90,000,000	Alternative Medicine, Cannabis
Hazel Technologies	$87,060,000	Agriculture, AgTech, Biotechnology
Tovala	$66,284,183	Cooking, Delivery, Food and Beverage, Food Delivery
ClearFlame Engines	$50,000,000	Automotive, Fuel, Machinery Manufacturing, Manufacturing, Mechanical Engineering
Black Buffalo	$39,750,000	Consumer, Consumer Goods, Tobacco
SomruS	$36,150,000	Wine And Spirits
Chowly	$31,700,000	Data Integration, Food and Beverage, Food Delivery, Food Processing, Information Technology, Restaurants, Technical Support

Source: Crunchbase

Venture Capital Funding in Agriculture Categories, 2018-2022

	2017	2018	2019	2020	2021	2022	2023	Total
Champaign	$9,750,000	$10,000	$1,150,000			$393,333		$11,303,333
Cook	$165,522,096	$254,166,741	$219,897,023	$324,830,438	$786,355,953	$324,101,814	$97,156,212	$2,172,030,277
DuPage	$710,000	$2,005,000	$150,000		$2,382,000		$485,265	$5,732,265
Kane	$1,100,000			$3,000,000	$17,000,000		$31,000,000	$52,100,000
Knox		$57,500						$57,500
Lake				$1,190,000	$12,330,128			$13,520,128
Peoria					$350,000			$350,000
Sangamon			$800,000					$800,000
St. Clair			$375,000					$375,000
Tazewell		$671,025	$2,600,000		$750,000	$2,354,979	$3,000,000	$9,376,004
Union							$7,550,000	$7,550,000
Wabash			$4,250,000					$4,250,000
Warren							$412,500	$412,500
Will			$703,000	$529,353		$100,000	$2,200,000	$3,532,353
Total	**$177,082,096**	**$256,910,266**	**$229,925,023**	**$329,549,791**	**$819,168,081**	**$326,950,126**	**$141,803,977**	**$2,281,389,360**

Source: Crunchbase

According to *Ag Funder's* 2022 Annual Report, investors backed 50 rounds of funding to Illinois-based startups in food and agriculture (https://agfunder.com/). S2g Ventures is active in Illinois in agtech investing and has offices in Chicago (www.s2gventures.com/). Based on the research, a key takeaway regarding investment in robotics, automation, and drones in agriculture involve legacy companies, like John Deere, adopting and integrating new technology through acquisition of intellectual property, start-ups, and access to R&D partners.

Growth investment include regional trends of:

- Silicon Valley – R&D and start-up, then being acquired and applied in agriculture -intensive geographies by legacy companies,
- Midwest - The major agricultural states including Iowa, Illinois, Nebraska, seeing investments in AgriTech from both local funds and firms from other regions. Investment includes focus on productivity and sustainability.
- Northeast - States like New York and Massachusetts have growing urban agriculture sectors including vertical farming and innovations in aquaculture/fish farming (Maine). Investments include both private and public sources.

Top 10 Foreign Investments in Agriculture Sector, Illinois (2017-2023)

Investing Company	Date	Investing Country (State)	Destination County	Subsector	Jobs Created	Capital Investment ($M)
Top 10 Foreign Investments						
Factor75	February 2022	Germany	Lake County (IL)	Food services	700	$247.7
Ferrero North America (USA)	June 2022	Italy	McLean County (IL)	Sugar & confectionary products	200	$214.4
Factor75	November 2020	Germany	Kane County (IL)	Food services	250	$152.2
Ferrara Candy	January 2020	Italy	DeKalb County (IL)	Sugar & confectionary products	500	$100.0
Ferrara Candy	December 2018	Italy	Cook County (IL)	Sugar & confectionary products	400	$95.9
Diageo North America	March 2021	United Kingdom	Will County (IL)	Breweries & distilleries	50	$80.0
Ferrero North America (USA)	November 2020	Italy	McLean County (IL)	Sugar & confectionary products	50	$75.0
Lactalis	June 2023	Belgium	Cook County (IL)	Dairy products	100	$61.5
Planteneers	August 2023	Germany	Kane County (IL)	Fruits & vegetables & specialist foods	108	$50.6
Diageo North America	September 2021	United Kingdom	Cook County (IL)	Breweries & distilleries	109	$49.2
Other Investments in Broader Region						
CoreFX Ingredients	October 2017	Ireland	Stephenson County (IL)	Dairy products	109	$49.2
Syngenta	June 2020	China	DeKalb County (IL)	Grains & oilseed	42	$14.4
Planteneers	August 2023	Germany	Kane County (IL)	Fruits & vegetables & specialist foods	53	$4.6
				Total, all investment	**4,777**	**$1,736.3**

Source: fDi Markets, from the Financial Times

Over $168 Million has been invested into the Broader Region's Food & Agriculture Sector by Foreign Entities since 2017

- Investments in Kane, DeKalb, and Stephenson counties account for nearly 10% of Illinois' foreign investment in the sector since 2017
- Italian ($521 M) and German ($487 M) companies have made the greatest investments in Illinois' Agribusiness and Food cluster since 2017
- Overall, over $1.7 billion has been invested by foreign companies into the cluster in Illinois, creating 4,777 jobs. About 31% of this was in Sugar & Confectionery products.
- All investments in the sector were made by foreign sources. No investments from companies headquartered in other states were tracked during this time period.

National Outlook

Compound Annual Growth Rate of Key Indicators

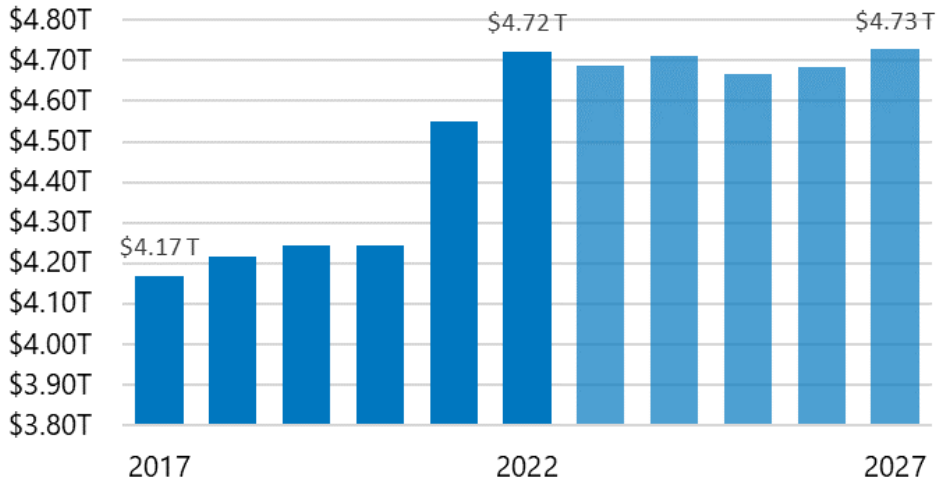
	Revenue	Val. Added	Exports	Imports
2017-2022	2.5%	2.5%	2.7%	5.8%
2022-2027	0.0%	0.7%	2.0%	0.0%

Source: IBISWorld

Compound Annual Growth: From 2017-2022, the compound annual growth rate of key indicators such as revenue, value added, exports, and imports was higher than the projection for 2022-2027. This is a negative sign for the future of revenue, value added, and exports, but a good sign for imports, as it is beneficial to try to meet demand domestically.

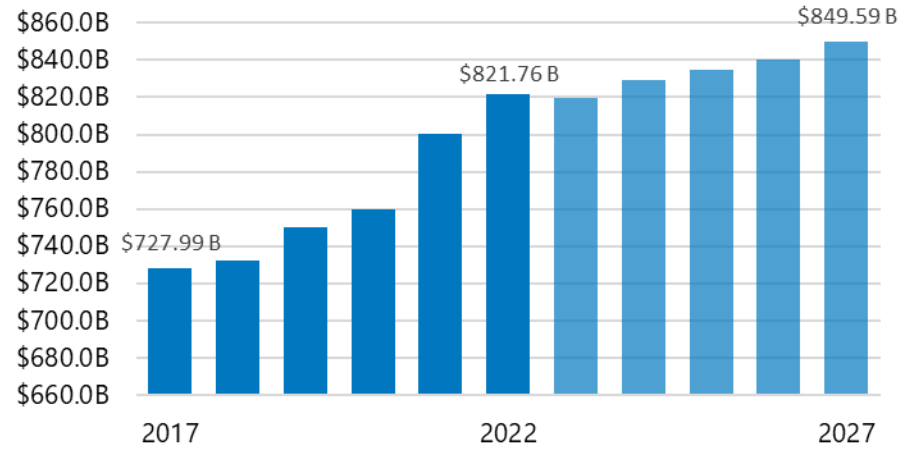
Revenue: Revenues related to the Food and Agriculture cluster have risen significantly during the last five years. They are projected to increase at a slower rate between 2022 and 2027.

Food & Agriculture Revenue



Source: IBISWorld

Value Added

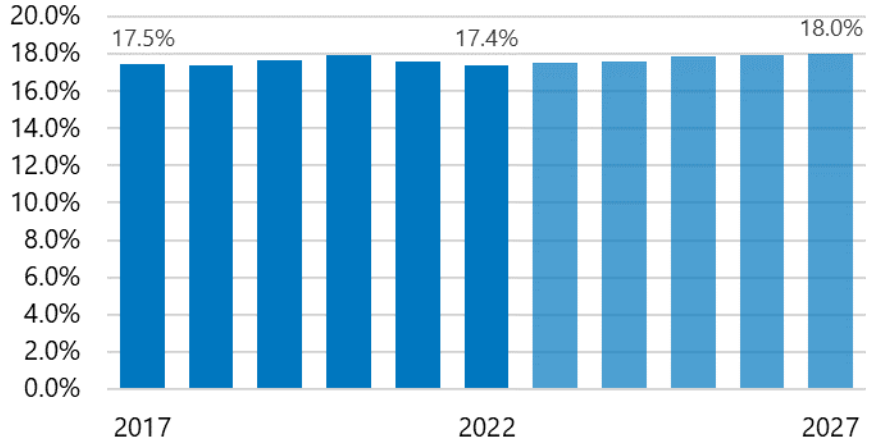


Source: IBISWorld

Value Added: Value added has risen somewhat consistently over the past five years, and is expected to continue to grow, although slower, through 2027.

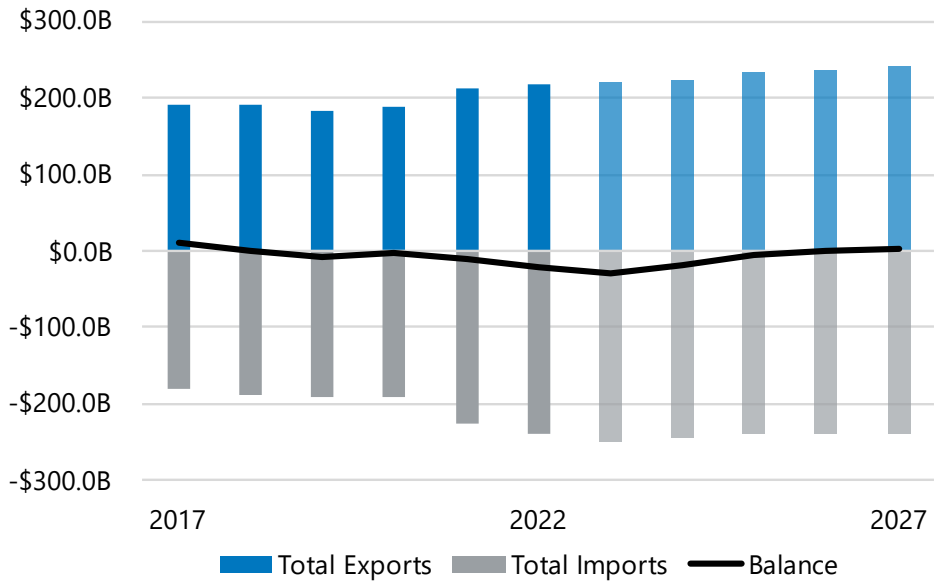
Value Added Share: Value added as a share of revenue has remained relatively consistently since 2017. This share is expected to increase by 0.6% between 2022 and 2027.

Value Added Share of Revenue



Source: IBISWorld

Exports and Imports (Billions of Dollars)



Source: IBISWorld

Exports & Imports: The Food and Agriculture sector's trade is approximately balanced, and imports roughly the same amount that it exports each year. This trend is expected to continue throughout the next five years.

Top Export Countries (2022)

Country	Share of Cluster Exports
China	20%
Canada	16%
Mexico	15%
Japan	7%
Korea, South	5%

Source: USA Trade Online

Top Exporting Countries: In 2022, 20% of the US's Food and Agriculture exports were shipped to China, 16% to Canada, 15% to Mexico, 7% to Japan, and 5% to South Korea.

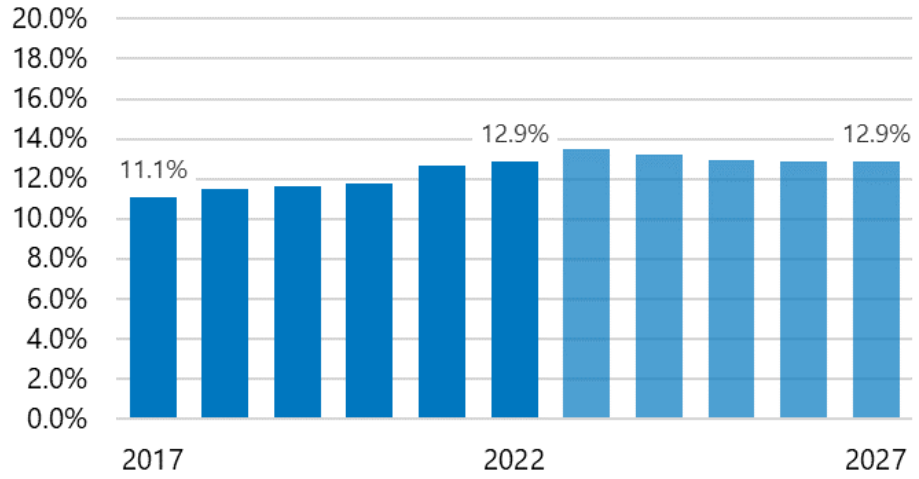
Top Import Countries (2022)

Country	Share of Cluster Imports
Mexico	21%
Canada	19%
France	4%
Italy	4%
Indonesia	3%

Source: USA Trade Online

Top Importing Countries: In 2022, 21% of the US's total Innovative Agriculture imports came from Mexico, 19% from Canada, 4% from France, 4% from Italy, and 3% from Indonesia.

Import's Share of Domestic Demand

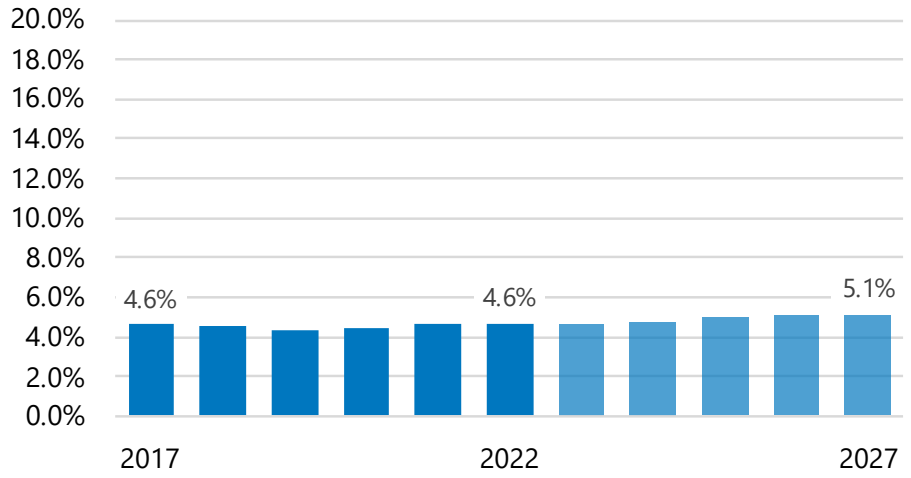


Source: IBISWorld

Import's Share of Domestic Demand: During the last five years, the US's demand for Food and Agricultural goods has been met by foreign suppliers at an increasing rate. This trend is expected to continue during the next five years.

Export's Share of Revenue: The share of the total national revenue generated by exports remained constant between 2017 and 2022. By 2027 this share is expected to increase by 0.5%.

Export's Share of Revenue



Source: IBISWorld

Top 20 Products and Services from Food & Agriculture

Product/Service	2022 Revenue (Millions)
Corn	$144,550
Poultry	$135,385
Soft drinks and bottled water	$124,913
Cheese	$122,503
Slaughtered animal products (except poultry)	$116,031
Soybeans	$99,451
Grocery specialties	$79,846
Processed meats	$75,685
Fruits	$71,774
Fertilizers	$71,651
Nonmenthol cigarettes	$71,577
Physical and engineering sciences	$66,668
Fresh meat and meat products	$62,642
Life sciences	$61,207
Bread and baked goods	$59,272
Menthol cigarettes	$58,031
Entrees	$53,469
Vegetables	$50,977
Farm machinery and equipment	$48,446
Seeds and plant bulbs	$46,849

Source: IBISWorld

Top Products: Innovative products and services such as physical and engineering services, life sciences, and farm machinery and equipment also fall within the top 20 products and services for the cluster.

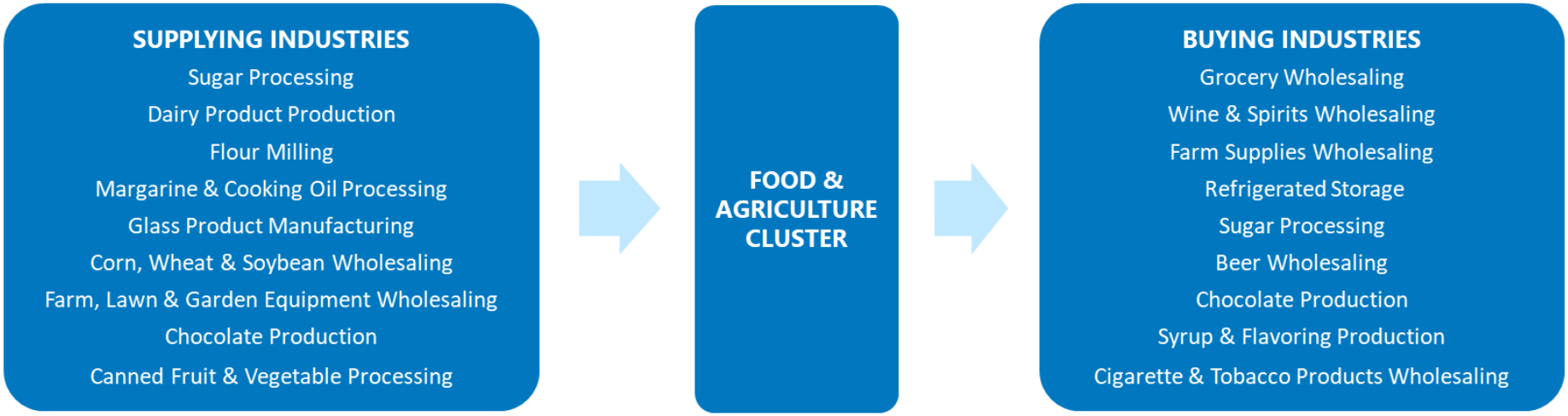
Top 10 Companies in Food & Agriculture in the US, 2022

Company	Approximate Market Share
Sysco Corporation	1.9%
Archer-Daniels-Midland Co	1.6%
Performance Food Group Co	1.3%
Chs Inc.	1.3%
Tyson Foods, Inc.	1.3%
Us Foods Holding Corp.	1.2%
Altria Group, Inc.	1.0%
JBS USA Holdings	1.0%
Cargill, Incorporated	0.8%
Dairy Farmers Of America, Inc.	0.8%

Source: IBISWorld, Camoin Associates

Top Companies: No single company holds a high percentage of the market share of the Food & Agriculture Industry. The company with the highest percentage of the market share—Sysco Corporation—holds 1.9%.

Food & Agriculture Supply Chain



Food & Agriculture Supply Chain: This chart highlights a proportion of the inter-industry activity in the Food & Agriculture supply chain. Farmers, processors buyers and wholesalers participate in this environment. Some products may go through this process multiple times. This is evidenced by the fact that Chocolate Production is both a "Supplying Industries" and a "Buying Industries".

Regional Trends

Food & Agriculture Summary, 2022

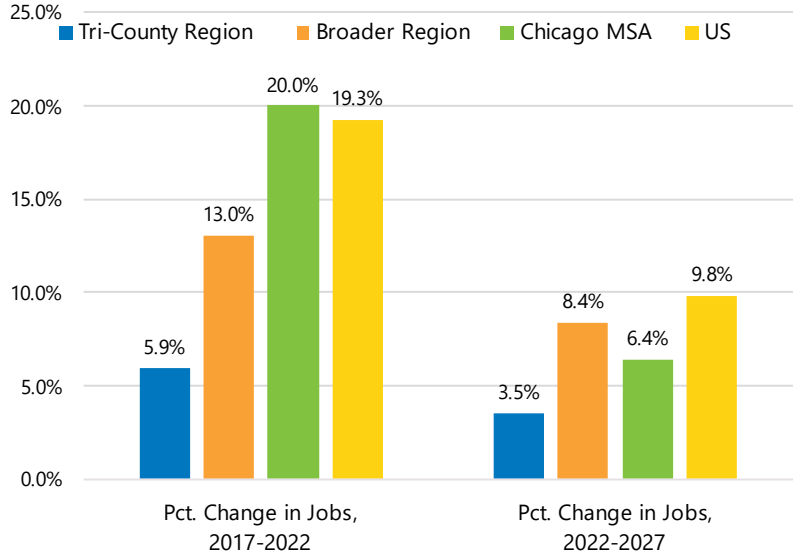
Region	2022 Jobs	Cluster Share of Total Jobs
Tri-County Region	10,134	3.9%
Broader Region	45,784	6.5%
Chicago MSA	227,886	4.7%
US	8,760,202	5.2%

Source: Lightcast, Camoin Associates

The Tri-County Region accounts for just under a quarter of the Broader Region's total employment in the Food & Agriculture sector, with just over 10,100 jobs in 2022. The sector makes up 3.9% of the Tri-County Region's total workforce, a lower concentration compared to the Broader Region, Chicago MSA, and United States.

Meanwhile, the Tri-County Region's employment growth is slower than the comparison regions both historically and projected over the next five years. From 2017-2022, Food & Agriculture jobs increased by 5.9% in the Tri-County Region compared to 13.0% in the Broader Region, 20.0% in the Chicago MSA, and 19.3% in the United States. From 2022-2027, the Tri-County Region is projected to see employment growth of 3.5%.

Historic and Projected Growth in the Food & Agriculture Sector



Source: Lightcast

Food & Agriculture Summary, 2022

Region	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (Millions)	Share of Total GRP	Productivity (GRP Per Job)
Tri-County Region	0.76	(738)	401	$1,309,485,925	4.5%	$129,211
Broader Region	1.26	13	1,403	$6,505,144,804	8.1%	$142,085
Chicago MSA	0.90	(14,740)	6,845	$35,415,136,398	4.7%	$155,407
Lexington, KY Region	1.22	(7,717)	1,257	$4,175,370,667	9.2%	$153,706

Source: Lightcast, Camoin Associates

Food & Agriculture Summary, 2022: The Tri-County Region's employment is 20% as concentrated in the Food & Agriculture cluster as the national average, compared to 1.26 times more concentrated in the Broader region and 90% as concentrated in Chicago, MSA. The Tri-County Region 's negative competitive effect indicates that although jobs in the cluster are increasing, this job growth is underperforming what could be expected based on national economy and industry trends. In the Tri-County Region the cluster generates $129,211 of GRP per job, lagging all other study regions. Productivity is highest in Chicago, at around $155,000 per job.

Tri-County Region Food & Agriculture Summary, 2022

Industry Cluster	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (Millions)	Cluster Share of Total GRP	Productivity (GRP Per Job)
Agricultural Activities	0.8	(332)	115	$280.6	21.4%	$126,489
Food and Beverage Products & Processing	1.1	(518)	76	$507.5	38.8%	$153,580
Fertilizer, Chemical, and Equipment Manufacturing	2.7	282	6	$104.9	8.0%	$172,603
Food and Agricultural Warehousing and Storage	0.8	(148)	38	$143.0	10.9%	$61,774
Professional and Scientific Services for Innovative Agriculture	0.2	71	87	$64.2	4.9%	$116,945

Source: Lightcast, Camoin Associates

Tri-County Region Food & Agriculture Summary, 2022: The industries that are most productive in the Tri-County Region are Food and Agricultural Product Wholesaling; Fertilizer, Chemical, and Equipment Manufacturing; and Food and Beverage Products and Processing which all generated over $150,000 of GRP per job in 2022. Food and Beverage Products and Processing Contributed the most to the Region's 2022 GRP ($507.5 million) and Fertilizer, Chemical, and Equipment Manufacturing was the most concentrated (2.7 times more than the US).

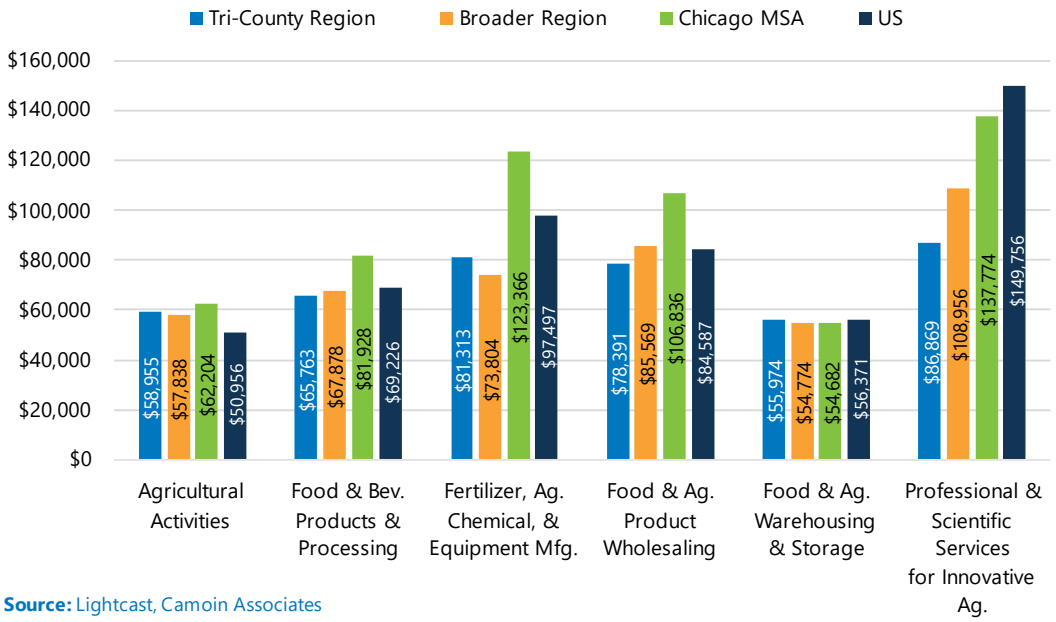
Average Annual Pay in Food & Agriculture Cluster and Deviation from Regional Living Wage

Industry Cluster	Tri-County Region		Broader Region		Chicago MSA	
	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage
Agricultural Activities	$58,955	$18,215	$57,838	$17,480	$62,204	$19,252
Food and Beverage Products & Processing	$65,763	$25,023	$67,878	$27,519	$81,928	$38,976
Fertilizer, Chemical, and Equipment Manufacturing	$81,313	$40,573	$73,804	$33,445	$123,366	$80,414
Food and Agricultural Product Wholesaling	$78,391	$37,650	$85,569	$45,210	$106,836	$63,884
Food and Agricultural Warehousing and Storage	$55,974	$15,234	$54,774	$14,415	$54,682	$11,730
Professional and Scientific Services for Innovative Agriculture	$86,869	$46,129	$108,956	$68,597	$137,774	$94,822

Average Annual Pay and Deviation from Regional Living Wage: Average earnings per job in the cluster for Region were $65,533 in 2022. The subcluster with the highest average earnings was Professional and Scientific Services for Innovative Agriculture ($86,869). Average earnings in the Tri-County Region underperform the Broader Region, the Chicago MSA, and the United States.

Average Earnings Per Job: Average earnings are the highest in Professional & Scientific Services in all regions. The Tri-County Region lags all other study regions in this subcluster, but generally tracks earnings in other regions for other subclusters with a few exceptions.

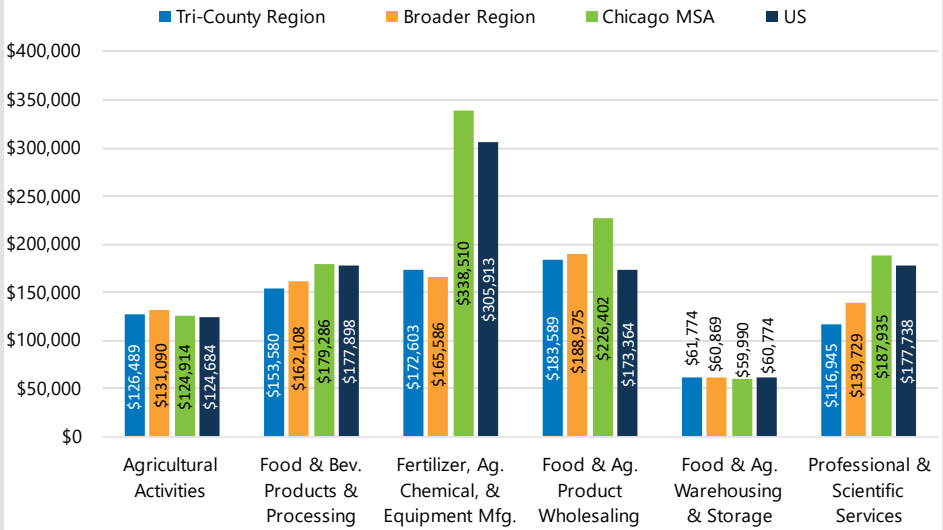
Average Earnings Per Job in Food & Agriculture Cluster, 2022



Source: Lightcast, Camoin Associates

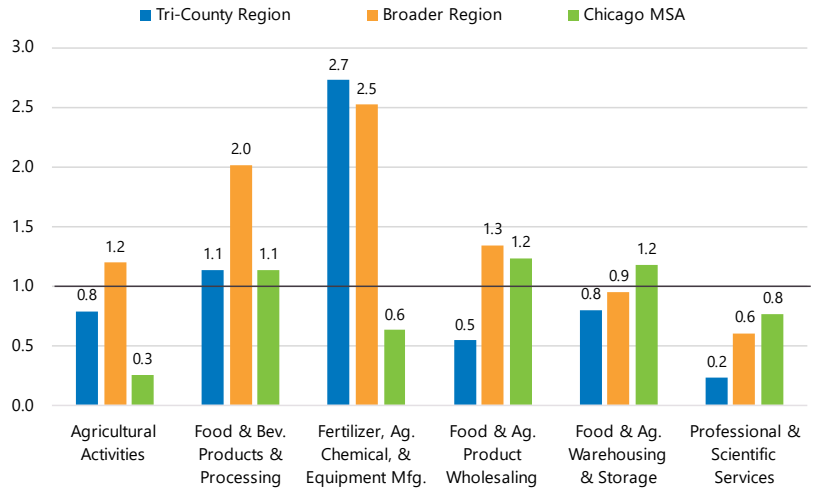
GRP Per Job: Productivity in the Tri-County Region is highest for Food and Agricultural Product Wholesaling and lowest in Food & Agricultural Warehousing Storage. In most clusters, the Tri-County Region's productivity is on par with the Broader Region, but lags Chicago MSA and the US.

GRP Per Job in Food & Agriculture Cluster, 2022



Source: Lightcast, Camoin Associates

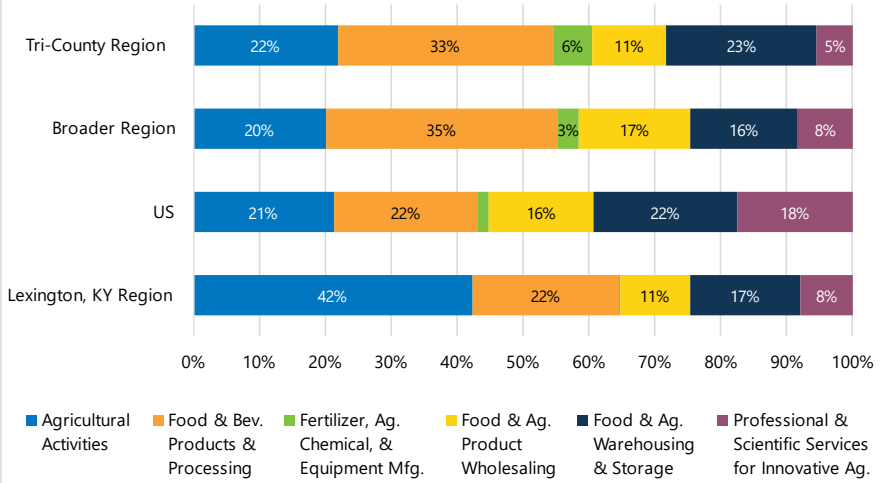
Location Quotients in Food & Agriculture Cluster, 2022



Source: Lightcast, Camoin Associates

Location Quotient: The Tri-County Region is most concentrated in Fertilizer, Agricultural Chemical and Equipment Manufacturing (2.7 times more than the US) and least concentrated in Professional & Scientific Services for Innovative Agriculture (20% as concentrated).

Industry Mix of Food & Agriculture Cluster, 2022 (Job Share)

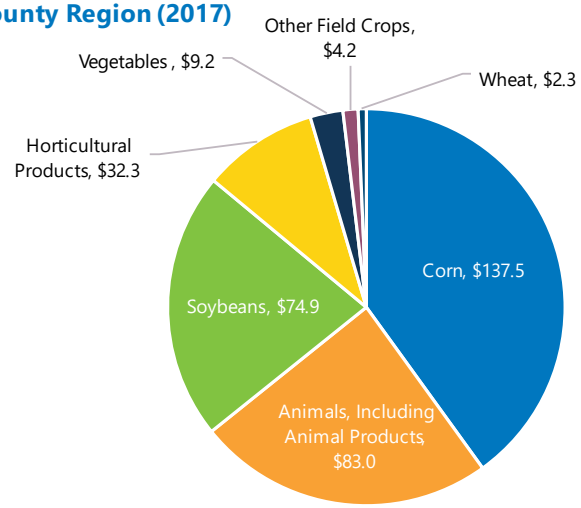


Source: Lightcast, Camoin Associates

Industry Mix (Job Share): The Tri-County Region has a higher shares of Food & Beverage Products & Processing as well as Fertilizer, Chemical, and Equipment Manufacturing than Chicago MSA or the US and lower shares of Food & Agriculture Product Wholesaling and Professional & Scientific Services.

Market Value of Agricultural Products Sold: The greatest share of market value in 2017 came from Corn ($137.5 million), Animals and Animal Products ($83 million), and Soybeans ($74.9 million).

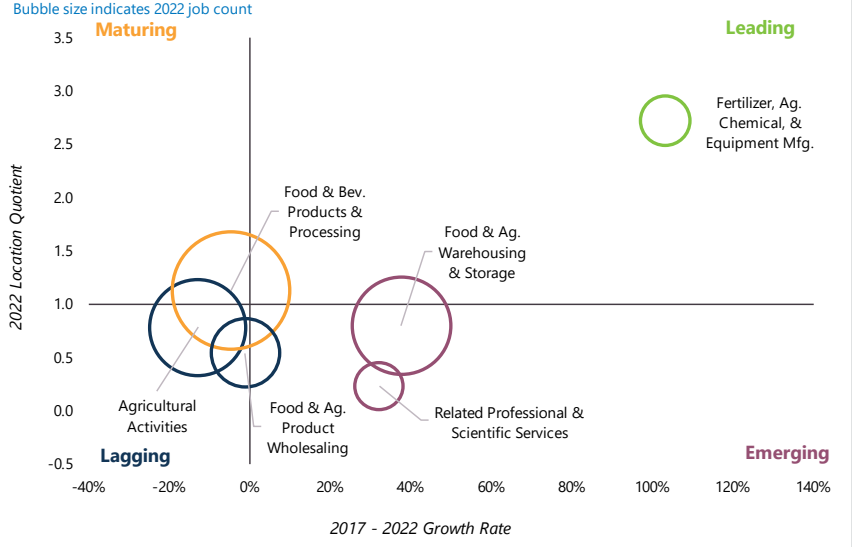
Market Value of Agricultural Products Sold (Millions of Dollars) in Tri-County Region (2017)



Source: 2017 Agricultural Census

Key Metrics by Food & Agriculture Subcluster, TriCounty Region

Bubble size indicates 2022 job count

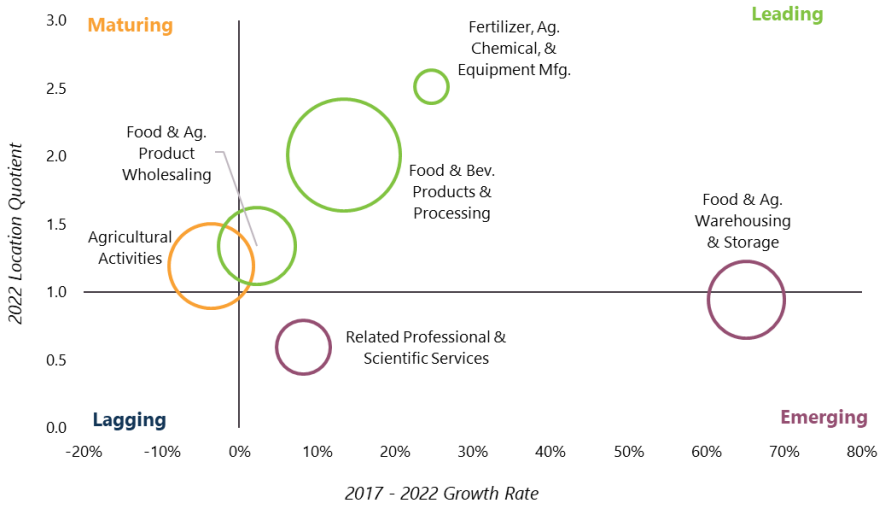


Key Metrics by Subcluster, Tri-County Region: In the Tri-County Region, Fertilizer, Agricultural Chemical, and Equipment Manufacturing is a leading subcluster, with a high location quotient and employment growth. Food & Agriculture Warehousing & Storage and Related Professional & Scientific Services are emerging in the Tri-County Region, with a low location quotient and positive growth. Food & Beverage Products & Processing is maturing in the Tri-County Region, with a higher location quotient but negative or low growth. Agricultural Activities and Food & Agriculture Product Wholesaling are lagging in the Tri-County Region, meaning they have low employment concentration and have declining jobs.

Key Metrics by Subcluster, Broader Region: In the Broader Region, Fertilizer, Agricultural Chemical, and Equipment Manufacturing is a leading subcluster, as well as Food & Beverage Products & Processing and Food & Agriculture Product, with high location quotients and positive growth. Food & Agriculture Warehousing & Storage and Related Professional & Scientific Services are emerging, with positive growth but lower location quotients and Agricultural Activities are maturing, with a higher location quotient but negative growth.

Key Metrics by Food & Agriculture Subcluster, Broader Region

Bubble size indicates 2022 job count



Sales and Demand for Food & Agriculture Cluster by Region, 2022

Region	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Tri-County Region	$3,162,581,971	70%	$3,973,584,090	76%
Broader Region	$17,474,612,454	72%	$14,123,455,493	66%
Chicago MSA	$79,945,167,456	49%	$77,273,929,054	47%

Source: Camoin Associates

Sales and Demand for Food & Agriculture Cluster by Region, 2022: The Tri-County Region meets a relatively high share of demand by imports (76%) and exports about 70% of the cluster's goods and services, slightly lower than the Broader Region (72%), but higher than the Chicago MSA (49%).

Sales and Demand for Food & Agriculture Cluster by Subcluster in Tri-County Region, 2022

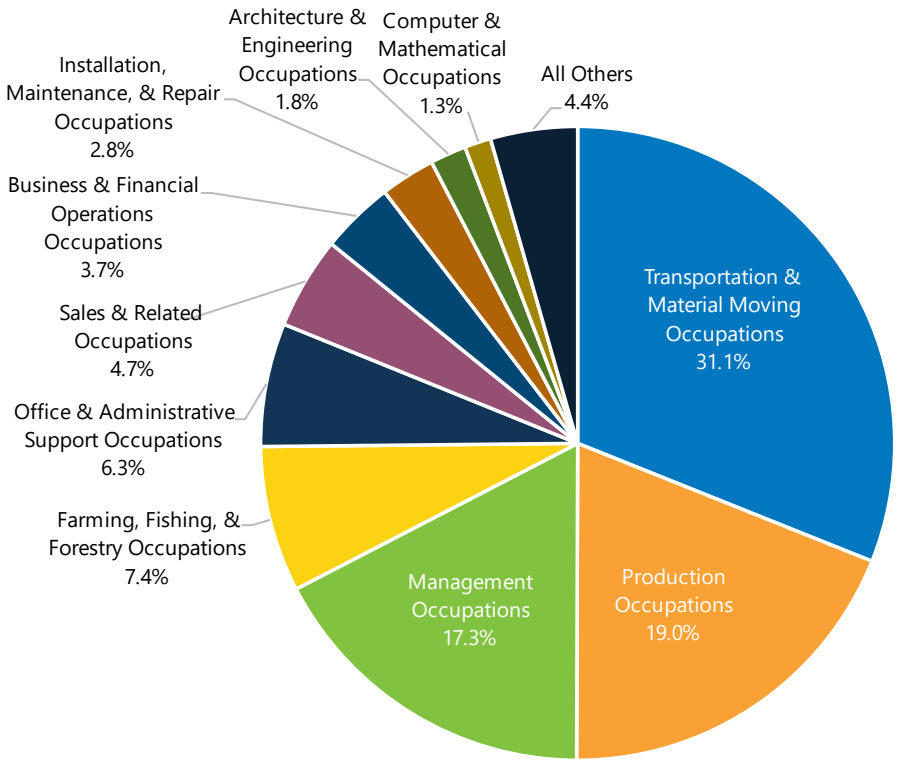
Sub-Industry	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Agricultural Activities	$638,351,632	75%	$580,001,720	73%
Food and Beverage Products & Processing	$1,563,101,367	80%	$1,660,783,719	81%
Fertilizer and Agricultural Chemical Manufacturing	$227,353,907	84%	$127,422,277	72%
Food and Agricultural Product Wholesaling	$355,338,319	41%	$651,332,412	68%
Food and Agricultural Warehousing and Storage	$265,410,568	49%	$358,822,827	62%
Professional and Scientific Services for Innovative Agriculture	$113,026,177	18%	$595,221,134	85%

Source: Camoin Associates

Sales and Demand for Food & Agriculture Cluster by Subcluster in Region, 2022: The Tri-County Region both exports a relatively small share of sales (18%) and meets a high share of demand by imports (85%) for the Related Professional & scientific Services subcluster, suggesting an opportunity to both meet more demand in-region and export more of these services outside the region. Additionally, the Tri-County Region meets a high share of demand for Food & Beverage Products & Processing by imports (81%). While grains such as corn and soybeans are among the top agricultural products in the region, there is currently no grain processing capacity in the region, representing an opportunity to fill gaps in the supply chain.

Workforce Analysis

Food & Agriculture Cluster Workforce by Occupational Group, Tri-County Region (2022)



Workforce by Occupational Group: the Tri-County Region's Food & Agriculture Cluster had 10,134 jobs in 2022 comprised of 269 occupations. Transportation and Material Moving Occupations make up almost one-third (31.1%) of the Food & Agriculture Cluster's workforce. Other major occupation groups include Production Occupations (19.0%) and Management Occupations (17.3%).

Source: Lightcast, 2023.3

Top Occupations Staffing Patterns, Food & Agriculture Cluster, Tri-County Region (2022)

SOC	Description	Employed in Cluster	Share of Total Jobs in Cluster
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,224	12.1%
11-9013	Farmers, Ranchers, and Other Agricultural Managers	1,131	11.2%
53-7065	Stockers and Order Fillers	580	5.7%
51-9111	Packaging and Filling Machine Operators and Tenders	462	4.6%
53-7064	Packers and Packagers, Hand	418	4.1%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	375	3.7%
51-3092	Food Batchmakers	352	3.5%
53-7051	Industrial Truck and Tractor Operators	337	3.3%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	254	2.5%
53-3032	Heavy and Tractor-Trailer Truck Drivers	239	2.4%
11-1021	General and Operations Managers	205	2.0%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	200	2.0%
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	186	1.8%
49-9071	Maintenance and Repair Workers, General	180	1.8%
51-1011	First-Line Supervisors of Production and Operating Workers	178	1.8%
51-3011	Bakers	166	1.6%
43-5071	Shipping, Receiving, and Inventory Clerks	148	1.5%
51-2098	Miscellaneous Assemblers and Fabricators	136	1.3%
43-9061	Office Clerks, General	112	1.1%
Top Occupations TOTAL		**6,884**	**68%**

Source: Lightcast 2023.3

Top Occupations Staffing Patterns: With almost 8,000 of the 10,134 jobs, the top 30 occupations account for 76.9% of the cluster's jobs in the Tri-County Region.

Comparison of Staffing Patterns Across Regions, Food & Agriculture Cluster, Tri-County Region (2022)

SOC	Description	Share of Total Jobs in the Cluster (2022)				Difference from Tri-County Region		
		County Region	Broader Region	Chicago MSA	US	Broader Region	Chicago MSA	US
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	12.1%	10.0%	14.9%	7.6%	-2.0%	2.8%	-4.5%
11-9013	Farmers, Ranchers, and Other Agricultural Managers	11.2%	9.9%	3.1%	6.6%	-1.3%	-8.1%	-4.6%
53-7065	Stockers and Order Fillers	5.7%	4.2%	6.1%	6.3%	-1.5%	0.4%	0.5%
51-9111	Packaging and Filling Machine Operators and Tenders	4.6%	4.4%	3.4%	2.3%	-0.1%	-1.2%	-2.3%
53-7064	Packers and Packagers, Hand	4.1%	2.9%	3.6%	2.3%	-1.2%	-0.5%	-1.8%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	3.7%	3.7%	1.1%	6.7%	0.0%	-2.6%	3.0%
51-3092	Food Batchmakers	3.5%	4.5%	3.0%	1.7%	1.0%	-0.5%	-1.8%
53-7051	Industrial Truck and Tractor Operators	3.3%	3.6%	4.9%	4.6%	0.2%	1.5%	1.3%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	2.5%	2.9%	3.4%	2.6%	0.4%	0.9%	0.1%
53-3032	Heavy and Tractor-Trailer Truck Drivers	2.4%	2.8%	3.2%	3.1%	0.5%	0.8%	0.7%
11-1021	General and Operations Managers	2.0%	1.9%	2.7%	2.0%	-0.1%	0.6%	-0.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	2.0%	1.9%	1.5%	1.1%	-0.1%	-0.4%	-0.9%
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	1.8%	1.8%	0.5%	1.8%	0.0%	-1.3%	0.0%
49-9071	Maintenance and Repair Workers, General	1.8%	1.6%	1.4%	1.3%	-0.2%	-0.3%	-0.5%
51-1011	First-Line Supervisors of Production and Operating Workers	1.8%	1.8%	1.3%	1.1%	0.0%	-0.5%	-0.7%
51-3011	Bakers	1.6%	0.7%	2.1%	1.0%	-0.9%	0.5%	-0.6%
43-5071	Shipping, Receiving, and Inventory Clerks	1.5%	1.4%	1.9%	1.7%	0.0%	0.5%	0.2%
51-2098	Miscellaneous Assemblers and Fabricators	1.3%	0.9%	0.5%	0.5%	-0.4%	-0.8%	-0.9%
43-9061	Office Clerks, General	1.1%	1.1%	1.2%	1.0%	0.0%	0.1%	-0.1%
53-3031	Driver/Sales Workers	1.0%	1.0%	1.4%	1.2%	0.1%	0.5%	0.2%
53-1047	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling	0.9%	1.0%	1.3%	1.2%	0.0%	0.4%	0.3%
43-4051	Customer Service Representatives	0.9%	0.9%	1.1%	1.0%	0.0%	0.2%	0.1%
41-2031	Retail Salespersons	0.9%	0.6%	0.8%	0.6%	-0.3%	-0.1%	-0.3%
53-3033	Light Truck Drivers	0.9%	1.0%	1.3%	1.0%	0.2%	0.4%	0.1%
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.8%	0.9%	0.9%	0.8%	0.0%	0.0%	0.0%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	0.8%	0.9%	0.8%	0.8%	0.1%	0.0%	0.1%
45-2099	Agricultural Workers, All Other	0.8%	0.8%	0.2%	0.8%	0.0%	-0.5%	0.0%
41-2011	Cashiers	0.7%	0.4%	0.7%	0.4%	-0.3%	0.0%	-0.3%
13-1111	Management Analysts	0.7%	0.6%	1.4%	1.2%	-0.1%	0.8%	0.6%
11-3051	Industrial Production Managers	0.6%	0.5%	0.4%	0.3%	-0.1%	-0.1%	-0.2%
Share of Total Staffing Pattern		**76.9%**	**70.7%**	**70.3%**	**64.4%**	**-6.2%**	**-6.6%**	**-12.4%**

Source: Lightcast 2023.3

Comparison of Staffing Patterns Across Regions: The top 30 occupations account for almost 77% of the cluster's jobs in the Tri-County Region. While there are slight variations in this cluster's staffing patterns across regions, they match fairly well. The top three occupations in the Tri-County Region make up almost 30% of the cluster's jobs in the region.

Food & Agriculture Cluster's Share of Jobs Across the Economy, Tri-County Region (2022)

SOC	Description	Employed in Cluste	Total Jobs in Economy	Cluster's Share of Total Jobs in Economy
11-9013	Farmers, Ranchers, and Other Agricultural Managers	1,131	1,136	99.6%
45-2099	Agricultural Workers, All Other	79	80	98.6%
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	186	189	98.5%
51-3092	Food Batchmakers	352	392	89.9%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	375	420	89.3%
51-9111	Packaging and Filling Machine Operators and Tenders	462	970	47.6%
51-3011	Bakers	166	415	40.0%
53-7051	Industrial Truck and Tractor Operators	337	896	37.6%
53-7064	Packers and Packagers, Hand	418	1,921	21.8%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,224	8,933	13.7%
53-7065	Stockers and Order Fillers	580	5,165	11.2%
53-1047	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Hanc	96	861	11.1%
53-3031	Driver/Sales Workers	99	910	10.8%
43-5071	Shipping, Receiving, and Inventory Clerks	148	1,425	10.4%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	254	2,630	9.7%
51-1011	First-Line Supervisors of Production and Operating Workers	178	1,877	9.5%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	200	2,108	9.5%
11-3051	Industrial Production Managers	60	681	8.8%
53-3032	Heavy and Tractor-Trailer Truck Drivers	239	3,232	7.4%
13-1111	Management Analysts	66	902	7.3%
49-9071	Maintenance and Repair Workers, General	180	3,043	5.9%
53-3033	Light Truck Drivers	91	2,183	4.2%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	79	2,489	3.2%
11-1021	General and Operations Managers	205	6,836	3.0%
43-4051	Customer Service Representatives	92	4,125	2.2%
43-9061	Office Clerks, General	112	5,077	2.2%
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	81	3,808	2.1%
51-2098	Miscellaneous Assemblers and Fabricators	136	6,567	2.1%
41-2031	Retail Salespersons	92	6,281	1.5%
41-2011	Cashiers	73	6,206	1.2%

Source: Lightcast 2023.3

Share of Jobs Across the Economy: Two of the Innovative Agriculture Cluster's top three occupations are primarily employed in other sectors. Conversely, Farmers, Ranchers, and Other Agricultural Managers, is almost entirely employed within the cluster. Overall, the top three occupations account for nearly 30% of total employment in the cluster.

Comparison of Projected Growth in Top Occupations in the Food & Agriculture Cluster Across Tri-County Region (2022)

		Tri-County Region			Broader Region			Chicago MSA			US		
			2022 - 2027			2022 - 2027			2022 - 2027			2022 - 2027	
SOC	Description	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,224	61	5.0%	4,595	511	11.1%	33,850	2,844	8.4%	667,481	91,354	13.7%
11-9013	Farmers, Ranchers, and Other Agricultural Managers	1,131	(91)	-8.1%	4,518	(140)	-3.1%	6,980	171	2.5%	576,076	12,494	2.2%
53-7065	Stockers and Order Fillers	580	36	6.1%	1,938	200	10.3%	13,987	1,220	8.7%	547,725	58,235	10.6%
51-9111	Packaging and Filling Machine Operators and Tenders	462	(21)	-4.5%	2,028	190	9.4%	7,693	430	5.6%	197,118	18,991	9.6%
53-7064	Packers and Packagers, Hand	418	10	2.5%	1,316	138	10.5%	8,265	615	7.4%	204,459	24,861	12.2%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	375	7	1.9%	1,713	98	5.7%	2,562	212	8.3%	587,549	35,894	6.1%
51-3092	Food Batchmakers	352	(5)	-1.4%	2,049	203	9.9%	6,848	345	5.0%	150,037	15,968	10.6%
53-7051	Industrial Truck and Tractor Operators	337	40	12.0%	1,625	251	15.4%	11,103	1,467	13.2%	404,796	64,784	16.0%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	254	14	5.5%	1,340	79	5.9%	7,816	441	5.6%	230,613	18,270	7.9%
53-3032	Heavy and Tractor-Trailer Truck Drivers	239	19	8.1%	1,293	130	10.0%	7,257	728	10.0%	267,200	31,984	12.0%
11-1021	General and Operations Managers	205	7	3.2%	890	87	9.8%	6,087	262	4.3%	170,860	18,443	10.8%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	200	5	2.4%	852	77	9.1%	3,495	132	3.8%	98,450	7,347	7.5%
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	186	(1)	-0.3%	834	30	3.6%	1,200	103	8.6%	157,610	6,392	4.1%
49-9071	Maintenance and Repair Workers, General	180	6	3.2%	735	76	10.4%	3,256	300	9.2%	110,884	13,399	12.1%
51-1011	First-Line Supervisors of Production and Operating Workers	178	4	2.2%	810	79	9.7%	2,925	165	5.7%	92,122	8,623	9.4%
51-3011	Bakers	166	31	18.6%	333	59	17.6%	4,852	204	4.2%	90,882	10,116	11.1%
43-5071	Shipping, Receiving, and Inventory Clerks	148	4	3.0%	660	41	6.2%	4,367	153	3.5%	145,709	9,871	6.8%
51-2098	Miscellaneous Assemblers and Fabricators	136	10	7.2%	412	(10)	-2.3%	1,145	(34)	-3.0%	40,420	1,694	4.2%
43-9061	Office Clerks, General	112	(2)	-1.3%	509	18	3.6%	2,736	42	1.5%	88,506	4,464	5.0%
53-3031	Driver/Sales Workers	99	8	7.7%	472	35	7.5%	3,268	219	6.7%	101,612	8,538	8.4%
53-1047	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling	96	9	9.0%	447	57	12.7%	3,055	361	11.8%	107,775	15,244	14.1%
43-4051	Customer Service Representatives	92	(1)	-0.7%	397	14	3.6%	2,583	96	3.7%	84,347	6,012	7.1%
41-2031	Retail Salespersons	92	1	1.2%	291	21	7.3%	1,897	80	4.2%	53,416	5,734	10.7%
53-3033	Light Truck Drivers	91	4	4.2%	481	36	7.4%	2,956	211	7.1%	84,497	8,245	9.8%
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	81	5	5.6%	390	42	10.8%	1,937	158	8.1%	66,547	7,086	10.6%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	79	(2)	-2.9%	402	7	1.8%	1,755	25	1.4%	74,409	3,214	4.3%
45-2099	Agricultural Workers, All Other	79	4	5.1%	350	24	6.9%	558	65	11.6%	67,490	4,417	6.5%
41-2011	Cashiers	73	2	2.9%	174	6	3.4%	1,568	(49)	-3.1%	37,840	554	1.5%
13-1111	Management Analysts	66	(4)	-5.5%	271	5	2%	3,223	136	4%	108,395	10,031	9.3%
11-3051	Industrial Production Managers	60	1	2.2%	248	24	9.5%	1,018	40	3.9%	30,660	3,048	9.9%

Source: Lightcast 2023.3

Comparison of Projected Growth: Laborers and Freight, Stock, and Material Movers (Hand) are expected to see the most growth between 2022-2027 (61 new jobs), followed by Industrial Truck and Tractor Operators (40), and Stockers and Order Fillers (36). These occupations are projected to grow in the Broader Region, Chicago MSA, and the US as well.

Median Hourly Earnings for the Top 30 Occupations in the Food & Agriculture Cluster (2022)

SOC	Description	Tri-County Region	Broader Region	Chicago MSA	United States	Difference from Tri-County Region		
						Broader Region	Chicago MSA	US
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	$15.84	$16.27	$18.05	$17.33	2.8%	14.0%	9.5%
11-9013	Farmers, Ranchers, and Other Agricultural Managers	$18.78	$17.53	$18.25	$16.13	(6.6%)	(2.8%)	(14.1%)
53-7065	Stockers and Order Fillers	$15.85	$16.05	$17.37	$16.45	1.2%	9.6%	3.8%
51-9111	Packaging and Filling Machine Operators and Tenders	$16.40	$16.86	$18.31	$17.66	2.8%	11.7%	7.7%
53-7064	Packers and Packagers, Hand	$15.37	$15.51	$16.96	$15.82	0.9%	10.4%	2.9%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	$13.71	$13.93	$14.55	$14.55	1.6%	6.1%	6.1%
51-3092	Food Batchmakers	$18.84	$18.39	$20.30	$17.55	(2.4%)	7.8%	(6.9%)
53-7051	Industrial Truck and Tractor Operators	$18.83	$20.30	$21.84	$19.81	7.8%	16.0%	5.2%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	$29.42	$29.11	$31.69	$30.22	(1.1%)	7.7%	2.7%
53-3032	Heavy and Tractor-Trailer Truck Drivers	$24.76	$24.46	$27.04	$23.89	(1.2%)	9.2%	(3.5%)
11-1021	General and Operations Managers	$42.69	$43.99	$50.24	$47.00	3.1%	17.7%	10.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	$18.31	$18.26	$20.34	$21.11	(0.3%)	11.1%	15.3%
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	$14.07	$13.78	$14.66	$13.78	(2.0%)	4.2%	(2.0%)
49-9071	Maintenance and Repair Workers, General	$22.27	$22.01	$23.78	$21.58	(1.2%)	6.7%	(3.1%)
51-1011	First-Line Supervisors of Production and Operating Workers	$29.03	$28.94	$30.83	$30.43	(0.3%)	6.2%	4.8%
51-3011	Bakers	$14.15	$14.39	$16.18	$15.64	1.7%	14.3%	10.6%
43-5071	Shipping, Receiving, and Inventory Clerks	$18.53	$18.70	$20.89	$18.14	0.9%	12.7%	(2.1%)
51-2098	Miscellaneous Assemblers and Fabricators	$20.26	$18.27	$17.71	$17.91	(9.8%)	(12.6%)	(11.6%)
43-9061	Office Clerks, General	$17.95	$17.87	$19.58	$18.28	(0.5%)	9.1%	1.9%
53-3031	Driver/Sales Workers	$13.34	$13.56	$16.84	$15.69	1.6%	26.2%	17.6%
53-1047	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling	$27.65	$27.34	$29.70	$27.79	(1.1%)	7.4%	0.5%
43-4051	Customer Service Representatives	$17.59	$17.62	$19.46	$18.14	0.1%	10.6%	3.1%
41-2031	Retail Salespersons	$14.27	$14.37	$15.83	$14.71	0.7%	11.0%	3.1%
53-3033	Light Truck Drivers	$22.41	$20.60	$22.41	$19.41	(8.1%)	(0.0%)	(13.4%)
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	$14.71	$14.89	$16.61	$15.36	1.2%	12.9%	4.4%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	$21.58	$21.25	$23.58	$22.02	(1.5%)	9.3%	2.1%
45-2099	Agricultural Workers, All Other	$16.92	$16.44	$17.30	$15.28	(2.8%)	2.3%	(9.7%)
41-2011	Cashiers	$13.62	$13.66	$15.19	$13.57	0.3%	11.5%	(0.4%)
13-1111	Management Analysts	$43.18	$43.86	$51.40	$45.69	1.6%	19.0%	5.8%
11-3051	Industrial Production Managers	$49.32	$49.68	$55.87	$51.35	0.7%	13.3%	4.1%

Source: Lightcast 2023.3

Median Hourly Earnings: Among the top 30 occupations in the cluster, the highest-paying in the Tri-County Region is Industrial Production Managers ($49.32), followed by Management Analysts ($43.18) and General and Operations Managers ($42.69). Earnings for these occupations in the Tri-County Region are on par with the Broader Region but tends to lag the Chicago MSA and the United States. However, the median General and Operations Manager is paid more in all other study regions.

Deviation from Regional Living Wage in Food & Agriculture Occupations

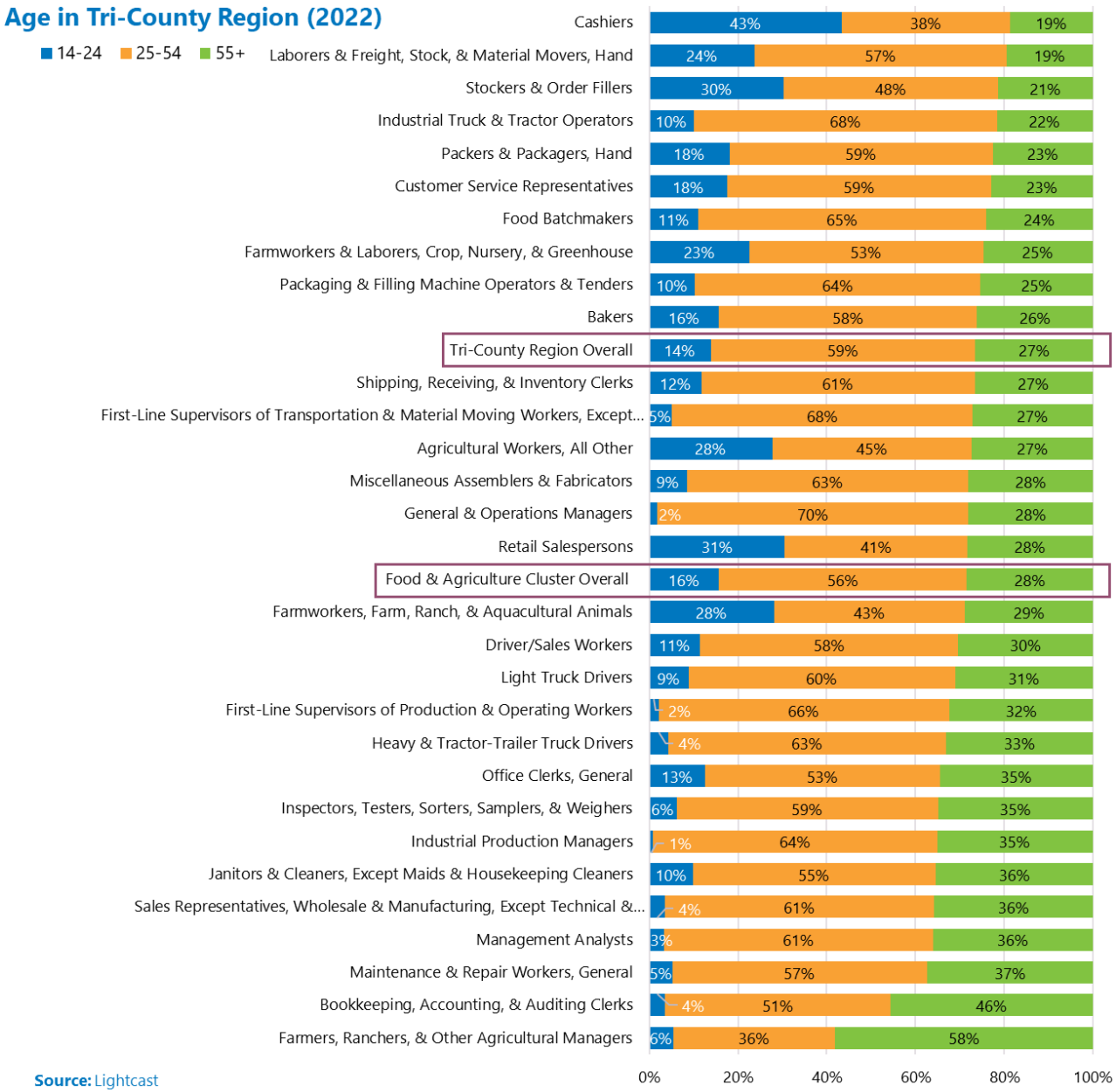
NAIC	Description	Tri-County Region: Deviation from Living Wage	Broader Region: Deviation from Living Wage	Chicago MSA: Deviation from Living Wage
53-3031	Driver/Sales Workers	($6.25)	($5.85)	($3.81)
41-2011	Cashiers	($5.97)	($5.75)	($5.46)
45-2092	Farmworkers & Laborers, Crop, Nursery, & Greenhouse	($5.88)	($5.47)	($6.10)
45-2093	Farmworkers, Farm, Ranch, & Aquacultural Animals	($5.52)	($5.62)	($5.99)
51-3011	Bakers	($5.44)	($5.02)	($4.47)
41-2031	Retail Salespersons	($5.32)	($5.04)	($4.82)
37-2011	Janitors & Cleaners, Except Maids & Housekeeping Cleaners	($4.87)	($4.51)	($4.04)
53-7064	Packers & Packagers, H&	($4.22)	($3.89)	($3.69)
53-7062	Laborers & Freight, Stock, & Material Movers, Hand	($3.75)	($3.13)	($2.60)
53-7065	Stockers & Order Fillers	($3.74)	($3.36)	($3.28)
51-9111	Packaging & Filling Machine Operators & Tenders	($3.19)	($2.54)	($2.34)
45-2099	Agricultural Workers, All Other	($2.67)	($2.96)	($3.35)
43-4051	Customer Service Representatives	($1.99)	($1.79)	($1.19)
43-9061	Office Clerks, General	($1.64)	($1.54)	($1.07)
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	($1.28)	($1.14)	($0.31)
43-5071	Shipping, Receiving, & Inventory Clerks	($1.05)	($0.70)	$0.24
11-9013	Farmers, Ranchers, & Other Agricultural Managers	($0.81)	($1.87)	($2.40)
53-7051	Industrial Truck & Tractor Operators	($0.75)	$0.89	$1.19
51-3092	Food Batchmakers	($0.75)	($1.02)	($0.35)
51-2098	Miscellaneous Assemblers & Fabricators	$0.67	($1.13)	($2.94)
43-3031	Bookkeeping, Accounting, & Auditing Clerks	$1.99	$1.84	$2.93
49-9071	Maintenance & Repair Workers, General	$2.69	$2.61	$3.13
53-3033	Light Truck Drivers	$2.82	$1.19	$1.76
53-3032	Heavy & Tractor-Trailer Truck Drivers	$5.18	$5.06	$6.39
53-1047	First-Line Supervisors of Transportation & Material Moving Workers, Except Aircraft Cargo Handling Supervisors	$8.06	$7.94	$9.05
51-1011	First-Line Supervisors of Production & Operating Workers	$9.45	$9.54	$10.18
41-4012	Sales Representatives, Wholesale & Manufacturing, Except Technical & Scientific Products	$9.83	$9.70	$11.04
11-1021	General & Operations Managers	$23.11	$24.59	$29.59
13-1111	Management Analysts	$23.59	$24.46	$30.75
11-3051	Industrial Production Managers	$29.74	$30.27	$35.22

Source: Lightcast 2023.3

Note: Deviations based on living wage data from MIT Living Wage Calculator.

Living Wage: Region 1 = $19.59, Broader Region = $19.40, Chicago MSA = $20.65

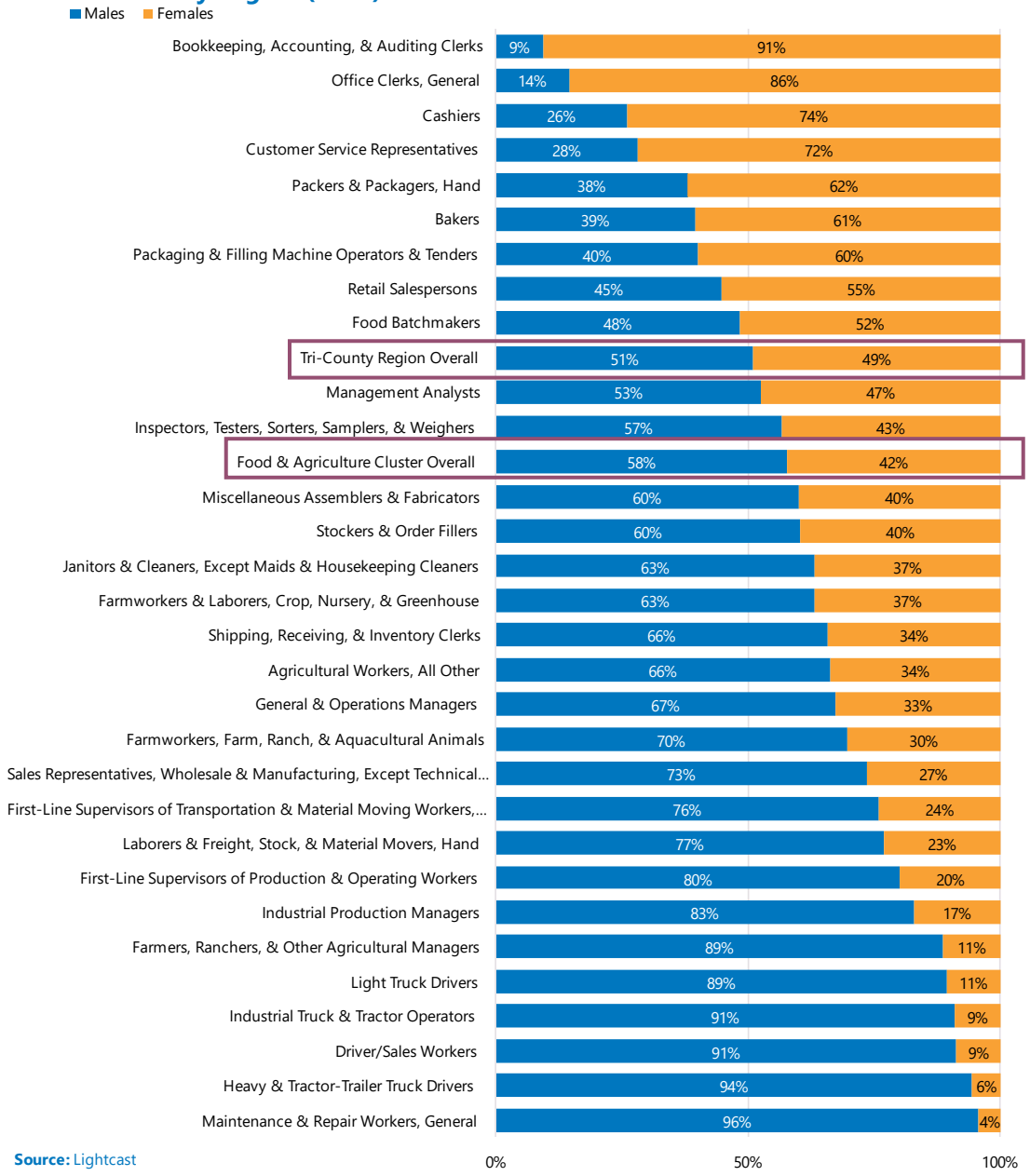
Deviation from Regional Living Wage in Food & Agriculture Occupations: 19 of the top 30 occupations pay less than a living wage in the Tri-County Region, similar to the Broader Region and the Chicago MSA. Driver/Sales Workers have the greatest deficit compared to the living wage in the Tri-County Region, with the median worker earning $6.25 per hour less than the living wage. Conversely, Industrial Production Managers have the greatest surplus, with the median worker earning $29.74 per hour more than the living wage.



Source: Lightcast

Age: The population ages 14+ in the Tri-County Region is primarily people ages 25-54 (59%). This is reflected in the top 30 Food & Agriculture occupations, where 56% of workers are between ages 25-54. The only occupation with a majority of workers age 55+ is Farmers, Ranchers & Other Agricultural Manufacturers. The occupation with the highest share of peoples ages 14-24 is cashiers.

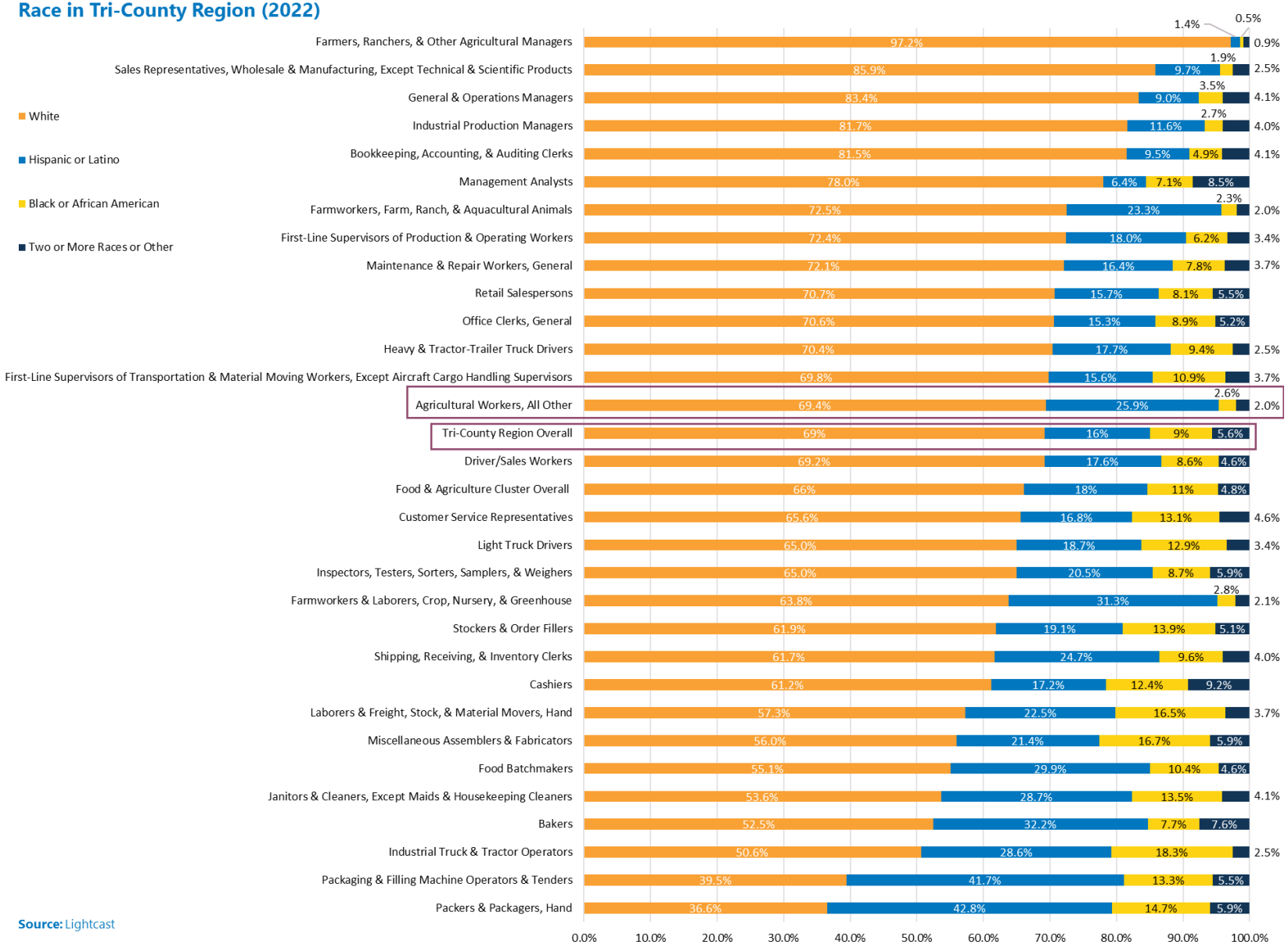
Sex in Tri-County Region (2022)



Source: Lightcast

Sex: While the Tri-County Region is almost evenly split between males and females, males make up 58% of the workers in the top 30 Food & Agriculture occupations. The majority of workers in 21 of the 30 top occupations are males. The occupation with the highest share of males is Maintenance & Repair Workers, General (96%) and the occupations with the highest share of females is Bookkeeping, Accounting, & Auditing Clerks (91%).

Race in Tri-County Region (2022)



Source: Lightcast

Race: The Tri-County Region is 69% White, 16% Hispanic or Latino, and 9% Black or African American. There are small shares of Asian individuals or people who are two or more races.

Projected Workforce Gaps, Food & Agriculture Cluster, Tri-County Region (2022 - 2027)

SOC	Description	Average Annual Openings (2022 - 202	Adjusted Completio	Estimated Workforce Surplus / (Gap)
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,353	0	(1,353)
11-9013	Farmers, Ranchers, and Other Agricultural Managers	118	16	(102)
53-7065	Stockers and Order Fillers	949	0	(949)
51-9111	Packaging and Filling Machine Operators and Tenders	113	0	(113)
53-7064	Packers and Packagers, Hand	304	0	(304)
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	69	2	(67)
51-3092	Food Batchmakers	57	0	(57)
53-7051	Industrial Truck and Tractor Operators	121	0	(121)
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	286	0	(286)
53-3032	Heavy and Tractor-Trailer Truck Drivers	441	0	(441)
11-1021	General and Operations Managers	652	197	(455)
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	255	0	(255)
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	31	0	(31)
49-9071	Maintenance and Repair Workers, General	317	131	(186)
51-1011	First-Line Supervisors of Production and Operating Workers	201	29	(172)
51-3011	Bakers	70	6	(64)
43-5071	Shipping, Receiving, and Inventory Clerks	158	0	(158)
51-2098	Miscellaneous Assemblers and Fabricators	775	0	(775)
43-9061	Office Clerks, General	641	15	(626)
53-3031	Driver/Sales Workers	125	0	(125)
53-1047	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling	119	0	(119)
43-4051	Customer Service Representatives	579	0	(579)
41-2031	Retail Salespersons	965	0	(965)
53-3033	Light Truck Drivers	327	0	(327)
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	597	0	(597)
43-3031	Bookkeeping, Accounting, and Auditing Clerks	306	55	(251)
45-2099	Agricultural Workers, All Other	14	0	(14)
41-2011	Cashiers	1,188	0	(1,188)
13-1111	Management Analysts	86	201	115
11-3051	Industrial Production Managers	50	0	(50)

Source: Lightcast 2023.3, Camoin

Completions have been adjusted to reflect the relevant programs servicing these occupations

Notes:

- Openings = New Jobs due to Growth + Replacements due to Retirement and Turnover
- Completions for "Manager" or "Supervisor" occupations are likely overstated since qualification for these positions are usually a function of years of experience rather than graduating from a management program
- Completions may be double counted (i.e., a graduate from a program may be listed for multiple occupations). For example, there are 69 completions listed for Industrial Engineers and 69 completions listed for Mechanical Engineers. These are the same individuals.
- Assumes 2021 completions levels will be consistent over the next 5 years

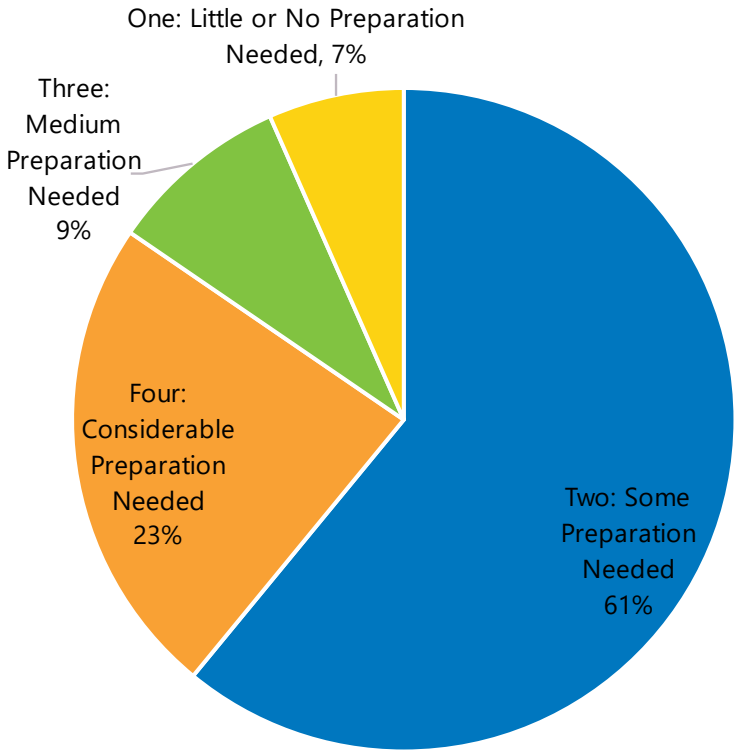
Projected Workforce Gaps: Laborers and Freight, Stock, and Material Movers are likely to be in high demand over the next 5 years, with an average annual gap of over 1,300 workers. While these workers constitute a relatively large share of the cluster's workforce, this cluster represents a small share of this occupation's workforce demand across the economy.

Preparation Required for Top Occupations, Food & Agriculture Cluster, Tri-County Region (2022)

SOC	Description	Typical Entry Level Education	Work Experience Required	Typical On-The-Job Training	Job Zone
11-1021	General and Operations Managers	Bachelor's degree	5 years or more	None	Four: Considerable Preparation Needed
13-1111	Management Analysts	Bachelor's degree	Less than 5 years	None	Four: Considerable Preparation Needed
11-3051	Industrial Production Managers	Bachelor's degree	5 years or more	None	Four: Considerable Preparation Needed
11-9013	Farmers, Ranchers, and Other Agricultural Managers	High school diploma or equivalent	5 years or more	None	Four: Considerable Preparation Needed
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	High school diploma or equivalent	None	Moderate-term on-the-job training	Four: Considerable Preparation Needed
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	No formal educational credential	None	Short-term on-the-job training	One: Little or No Preparation Needed
45-2099	Agricultural Workers, All Other	No formal educational credential	None	Short-term on-the-job training	One: Little or No Preparation Needed
49-9071	Maintenance and Repair Workers, General	High school diploma or equivalent	None	Moderate-term on-the-job training	Three: Medium Preparation Needed
51-1011	First-Line Supervisors of Production and Operating Workers	High school diploma or equivalent	Less than 5 years	None	Three: Medium Preparation Needed
53-1047	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supe	High school diploma or equivalent	Less than 5 years	None	Three: Medium Preparation Needed
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	No formal educational credential	None	Short-term on-the-job training	Three: Medium Preparation Needed
43-3031	Bookkeeping, Accounting, and Auditing Clerks	Some college, no degree	None	Moderate-term on-the-job training	Three: Medium Preparation Needed
53-7065	Stockers and Order Fillers	High school diploma or equivalent	None	Short-term on-the-job training	Two: Some Preparation Needed
51-9111	Packaging and Filling Machine Operators and Tenders	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
51-3092	Food Batchmakers	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
43-5071	Shipping, Receiving, and Inventory Clerks	High school diploma or equivalent	None	Short-term on-the-job training	Two: Some Preparation Needed
51-2098	Miscellaneous Assemblers and Fabricators	High school diploma or equivalent	None	Moderate-term on-the-job training	Two: Some Preparation Needed
43-9061	Office Clerks, General	High school diploma or equivalent	None	Short-term on-the-job training	Two: Some Preparation Needed
53-3031	Driver/Sales Workers	High school diploma or equivalent	None	Short-term on-the-job training	Two: Some Preparation Needed
43-4051	Customer Service Representatives	High school diploma or equivalent	None	Short-term on-the-job training	Two: Some Preparation Needed
53-3033	Light Truck Drivers	High school diploma or equivalent	None	Short-term on-the-job training	Two: Some Preparation Needed
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	No formal educational credential	None	Short-term on-the-job training	Two: Some Preparation Needed
53-7064	Packers and Packagers, Hand	No formal educational credential	None	Short-term on-the-job training	Two: Some Preparation Needed
53-7051	Industrial Truck and Tractor Operators	No formal educational credential	None	Short-term on-the-job training	Two: Some Preparation Needed
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	No formal educational credential	None	Short-term on-the-job training	Two: Some Preparation Needed
51-3011	Bakers	No formal educational credential	None	Long-term on-the-job training	Two: Some Preparation Needed
41-2031	Retail Salespersons	No formal educational credential	None	Short-term on-the-job training	Two: Some Preparation Needed
41-2011	Cashiers	No formal educational credential	None	Short-term on-the-job training	Two: Some Preparation Needed
53-3032	Heavy and Tractor-Trailer Truck Drivers	Postsecondary nondegree award	None	Short-term on-the-job training	Two: Some Preparation Needed

Source: Lightcast, O*Net

Job Zones for the Top Occupations in the Tri-County Region's Food & Agriculture Cluster



Source: Lightcast, O*Net

The O*Net Job Zones system has five zones, with One indicating the fewest barriers to entry and least preparation needed and Five indicating the most training and preparation needed.

The occupations that staff the Food & Agriculture Cluster have relatively low barriers to entry – 68% of the jobs in these occupations have a Job Zone at level 1 or 2.

However, nearly a quarter of these jobs lie at Job Zone 4, requiring considerable preparation. This includes Farmers and Ranchers, among other high-skill workers.

In-Demand Skills for Critical Occupations, Food & Agriculture, Tri-County Region (2022)

SOC	Description	Estimated Annual	Job Zone	In-Demand Skills		
				Necessary (1)	Defining (2)	Distinguishing (3)
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	(1,353)	Two: Some Preparation Needed	Merchandising	Warehousing	Material Handling
				General Mathematics	Forklift Truck	Order Picking
					Palletizing	Forklift Certification
					Shipping and Receiving	Cycle Counting
						Inventory Staging
11-9013	Farmers, Ranchers, and Other Agricultural Managers	(102)	Four: Considerable Preparation Needed	Irrigation	Transplanting	**Farm Management**
				Agriculture		**Fish Hatcheries**
				Pruning		
				Food Safety and Sanitation		
				Biology		
49-9071	Maintenance and Repair Workers, General	(186)	Three: Medium Preparation Needed	Machinery	Plumbing	Hydraulics
				Construction	HVAC	Equipment Repair
					Carpentry	Electrical Wiring
					Preventive Maintenance	Welding
					Field Service Management	Electrical Systems
51-2098	Miscellaneous Assemblers and Fabricators	(775)	Two: Some Preparation Needed	Power Tool Operation	Hand Tools	Riveting
				Machinery	Assembly Lines	**Mechanical Assembly**
				General Mathematics		Furniture Assembly
				Blueprinting		
				Warehousing		

Source: Lightcast, O*Net

Note: Bolded Skills indicate that they are correlated with an increase in pay

(1) The specialized skills required for that job and relevant across other similar jobs. An employee needs these skills as building blocks to perform the more complex Defining Skills.

(2) The day-to-day tasks and responsibilities of the job. An employee needs these skills to qualify for and perform successfully in this occupation.

(3) The advanced skills that are called for occasionally. An employee with these skills is likely more specialized and able to differentiate themselves from others in the same role.

IT Innovation

Information technology has experienced exponential growth in the past thirty-plus years transforming not only every industry but everything we do in our daily life from work, to education, to healthcare, to shopping, to recreation and more. The IT industry is based on core IT applications and technology (programing and software development, networking, data processing and storage) as well as supporting hardware and infrastructure (computer and electronic equipment, telecommunications equipment and infrastructure). But it is more than an isolated industry as it has currently advanced to be part of every industry and nearly every related occupation.

Emerging Trends

Trends and Factors Driving Opportunities

The technology (digitalization) of everything in industry sectors) has and will continue to impact each targeted industry. Examples include:

- Agtech – IT enabling and supporting precision agriculture, automation, robotics as well as analytics, sensors, and operations management and trade
- Cleantech – IT for sensing and measuring, monitoring controls, grid management, and more
- Manufacturing 4.0 - Like all industries, advanced manufacturing is changing rapidly as a result of increased digitalization. Known as Manufacturing 4.0 and the Internet of Things (IoT), the advancement and integration of information technologies into manufacturing production, processes, controls, and logistics is transforming the industry.
- Transportation, Warehousing, and Logistics ("Smart Logistics") IT to support processing and management of all points of the supply and value chains including tracking, automation, packing, planning, and more

These impacts are the result of enabling technologies including:

- On-demand manufacturing and additive manufacturing (3-D printing)
- Virtual reality and augmented reality - to support virtual training, maintenance, and repairs
- Artificial intelligence (AI) to support quality assurance, predictive maintenance, and inventory control
- Big data analytics to support quality assurance, supply chain efficiencies, and customer demand predictions and preferences
- Blockchain – digital ledger system for securely and accurately tracking and accounting for transactions
- Digital platforms and services (including in agriculture)

They are further enabled by infrastructure (broadband, 5G) and creating increased demand for cybersecurity, data centers, and workers. Plus, in terms of manufacturing are further being impacted by policies and programs for onshoring and expansion of US production including semiconductors moist significantly the federal CHIPS Act.

The integration of IT into all sectors is also creating the need for specific IT services including:

Cybersecurity – With so many connected people, entities, and machines along with an exponential increase in digital transaction comes the risk of cyber threats such as data breaches, ransom attacks, and viruses. Cybersecurity protects computers, networks, and company and personal data from unauthorized access by both internal and external actors.[10] It includes the protection of infrastructure, applications, cloud platforms, and Internet of Things. Cybersecurity is labor intensive, with wages accounting for nearly 50% of industry revenue due to the relatively high education and skill requirements.[11] Competition within the industry increased in the last five years due to a trend towards in-house IT departments. Some larger companies and organizations manage their own cybersecurity; however, managed IT services tend to be the most affordable option for small and mid-sized entities. Cybersecurity services can encompass the following:

Data Storage and Analytics - The ever-increasing volume of internet traffic, private investment in computers and software, and the popularity of data analytics are driving growth in data storage and analytics technology.[12] Current trends in Data Storage and Analytics include:

- Data mining- automatically extracting patterns from large data sets through statistics, AI, and database software
- Predictive analytics - provides inferences and forecasts based on the information gathered through data mining
- Software as a service (SaaS)- software delivered online (rather than the traditional licensing model) allows business intelligence apps to operate outside a company's firewalls and to be accessed by any secure internet connection
- The cloud – software publishers are moving to cloud computing, allowing for software capabilities that previously required powerful platforms to include devices that are limited by hardware but not connection speed, such as mobile phones.

Opportunities

Based on national and regional market trends and the work conducted for this strategy, specific subsector opportunities to focus on for expansion and attraction are:

- Manu 4.0 (the integration of IT and digital technologies and processing into all aspects of manufacturing industries – including within the merging targeted sectors as well as existing manufacturing base industries (automotive and EV's, aerospace, etc.), and the manufacturing of IT part and equipment including computer chips/semiconductors.
- Supply chain, transportation, and logistics – sensors, systems, and related for tracing, processing, safety, and more all to make transportation and logics more efficient, safe, and accountable
- Clean energy and related cleantech – grid management, sensors, controls, and systems for energy distribution as well as technologies for EV charging systems
- Agtech - Precision agriculture (spaying, planting, and more), automation, robotics, sensors, data and analytics systems

[10] What is Cybersecurity? | Accenture
[11] Ibid
[12] IBISWorld

- Small companies and entrepreneurs particularly in Cybersecurity, Software, Networks, and with manufacturing, aerospace, agtech, renewable energy, and automotive expertise/experience.

Challenges

Growing and sustaining IT industry and workforce faces several specific challenges and these are intensified in nun-major metro areas. They include:

- Workforce – attracting and retaining professional workforce and related skills
- Competition – the need in every part of the country and within all industries for IT businesses and workforce
- Training and education – cab quickly become outdated creating a need for easily accessible education and training options and regular re-tooling of education and training programing

Relevant Projects and Companies in the US

The following are examples of recent investment projects and companies broken out by State Sponsored Projects, Cybersecurity, Artificial Intelligence, and IT Related Manufacturing.

State Sponsored Projects

- *Ohio Approves Assistance for Two IT Projects* – In 2023, Governor Mike DeWine and Lt. Governor Jon Husted approved assistance for six projects aimed at creating 332 new jobs and retaining 926 jobs across the state. These projects include:
  - *Dine Development Corporation; DDC IT Services, LLC; Dine Source LLC*- This expansion project in Dayton, OH is expected to create 100 full-time positions, with $12 million in new annual payroll and $22 million in existing payroll retention. DDC delivers IT, professional, and environmental services to government agencies and commercial firms.
  - *Aligned Data Centers (NEO) Propco, LLC*- This project in Perkins Township, OH is expected to create 18 full-time positions, generating $1.6 million in new annual payroll. Aligned provides hyperscale data centers and received a 75% 15-year Data Center Tax Exemption from the state.

  (https://www.expansionsolutionsmagazine.com/new-projects-expected-to-create-more-than-300-jobs/)
- *Future Innovation Infrastructure Pilot Program*- In 2023, Maryland Governor Wes Moore launched a grant program, which will provide financial support for innovation infrastructure projects in the technology sectors. The pilot program has been funded with $10 million and will offer matching grants of up to $2 million to projects related to the state's strategic industry sectors, including cybersecurity, manufacturing, quantum, and drug discovery, among others. (https://www.expansionsolutionsmagazine.com/gov-moore-announces-10m-build-our-future-innovation-infrastructure-pilot-program/)

Cybersecurity

Despite recent trends, during the last week of October 2023, several cybersecurity startups secured substantial funding. These investments align with the industry's demand for more and better online security https://news.crunchbase.com/cybersecurity/big-rounds-venture-startups-unicorn-island/).

- *Twist Lock*- The global security technology start-up out of Silicon Valley has raised $51 million in seed money for their new security company, Gutsy, which will have headquarters in Baton Rouge, LA. (https://www.expansionsolutionsmagazine.com/global-security-technology-start-up-establishes-headquarters-in-baton-rouge/)
- *Epsilon, Inc-The IT provider is opening a n*ew operation in Greenville County, SC. The tech company plans to invest over $2.6 million and create 145 new jobs. Epsilon, Inc. offers managed IT services, consulting, cloud hosting, network design, cybersecurity, and call center support.
- https://www.expansionsolutionsmagazine.com/information-technology-operations-greenville/
- *Island*- Dallas-based cybersecurity startup raised $100 million in a Series C round, led by Prysm Capital, valuing the company at $1.5 billion. (https://news.crunchbase.com/cybersecurity/big-rounds-venture-startups-unicorn-island/)
- *Censys*- And Ann Arbor, MI-based threat hunting and exposure management startup raised $75 million. (https://news.crunchbase.com/cybersecurity/big-rounds-venture-startups-unicorn-island/)
- *Adlumin*- The Washington, D.C. based detection and response startup, raised $70 million in a Series B round led by SYN Ventures. (https://news.crunchbase.com/cybersecurity/big-rounds-venture-startups-unicorn-island/)
- *Keyfactor*- A Cleveland, OH-based identity startup received a minority investment from Sixth Street Growth, valuing the company at approximately $1.3 billion. Keyfactor also announced a merger with PrimeKey. (https://news.crunchbase.com/cybersecurity/big-rounds-venture-startups-unicorn-island/)
- *Group-IB*- the global cybersecurity company that helps organizations and governments investigate cyberattacks and online fraud plans to raise its first funding in seven years and expand into the United States.
- (https://techcrunch.com/2023/11/01/group-ib-united-states-expansion/)
- *SYN Ventures*- the venture capital firm, revealed the first closing of a $75 million cybersecurity seed fund, the largest seed fund dedicated to cybersecurity in the United States. **(**https://www.securityweek.com/syn-ventures-announces-75-million-seed-fund-for-us-cybersecurity-firms/)

Artificial Intelligence

- *Apple*- the tech company is expanding operations in the US. Between 2021 and 2026, Apple anticipates investing over $430 billion and adding 20,000 new jobs across the country. The new investments include:
  - $1 billion in North Carolina which is expected to directly create at least 3,000 new jobs in machine learning, artificial intelligence, and software engineering.
  - The creation of over 20,000 additional jobs through team expansions in California, Colorado, Massachusetts, Texas, Washington, Iowa, Florida, Pennsylvania, New York, and Oregon.

  - New/additional investments in Indiana and Kentucky will be used to build new facilities and support R&D, creating hundreds of new jobs.
  - Ongoing investments in silicon engineering and 5G technology across nine states. These investments will contribute to the expansion and adoption of 5G technology and help prepare students for careers in hardware engineering and silicon chip design.
  - Significant investments in a new US energy storage project in Monterey County, CA.

  (https://www.apple.com/newsroom/2021/04/apple-commits-430-billion-in-us-investments-over-five-years/)

- *The House Fund*- In 2023, the venture capital fund affiliated with UC Berkeley generated another $115 million for Fund III. The fund will invest in AI startups connected to UC Berkeley. The House Fund currently has $330 million under management and provides its startups with access to tech, mentorship, and talent from UC Berkeley's campus and alumni base. (https://techcrunch.com/2023/10/25/the-house-fund-aims-to-invest-a-fresh-115m-in-berkeley-affiliated-startups/)

Related Manufacturing

The US semiconductor industry has seen $231 billion in new investments since the enactment of the CHIPS and Science Act. However, labor shortages may limit operations at these semiconductor manufacturing facilities once they are online. Issue related to the labor supply has already affected the construction of a major project in Phoenix, AZ. This national shortfall of skilled workers may complicate efforts by Intel, Micron, and other new projects across the country. The Biden administration allocated $200 million for workforce development efforts, but it remains unclear whether this will be sufficient. Estimates suggest a semiconductor worker shortfall in the hundreds of thousands by 2030. (https://finance.yahoo.com/news/chipmakers-have-plans-for-new-us-factories-but-not-enough-workers-to-run-them-113827037.html). The CHIPS Act and the Inflation Reduction Act have also spurred investment in other types of IT related manufacturing.

- *Cnano Technology USA*- The international company, is planning to invest $94.7 million in a 333,000-square-foot manufacturing facility at the New Century Commerce Center in Johnson County, KS. The new facility is expected to create 112 jobs with a payroll of $7.1 million. Cnano will use the facility to produce liquid conductive paste, a component used in various electronic applications, including electric vehicle batteries, cell phones, and power tools. (https://www.expansionsolutionsmagazine.com/cnano-technology-usa-selects-kansas-city-region/)
- *Yield Engineering Systems (YES)* - In 2023, YES opened a new 123,000-square-foot facility in Chandler, AZ. The company invested roughly $25 million in the new facility which is designed to enhance semiconductor manufacturing and strengthen the U.S.-based semiconductor ecosystem. By the end of 2023, YES expects to employ around 100 workers at the new site. (https://www.expansionsolutionsmagazine.com/yield-engineering-systems-opens-new-advanced-technology-center-in-chandler/)

Relevant Projects and Companies in Illinois

In 2023, Illinois was home to more than 30 tech incubators and accelerators which produced numerous startups (https://www.failory.com/startups/illinois-accelerators-incubators). The state has also been experiencing a significant boom in data center investment, driven by the cloud ecosystem and state-level incentives enacted in 2019. These incentives have been credited with helping to rejuvenate the Greater Chicago market, which includes clusters of data centers both in the city and the suburbs near O'Hare Airport. A study by Magnum Economics found that since 2020, tech companies have announced plans for $4.3 billion in new data center project (https://silkstart.s3.amazonaws.com/61a3ebd3-0738-4137-bad8-f2419433401e.pdf).

Tech Startups

- *Tempus*- They are working to incorporate AI into healthcare and provide personalized care and targeted therapies for patients. (https://thetechtribune.com/10-best-tech-startups-in-illinois/)
- *project44*- A startup that optimizes the movement of products globally, providing end-to-end visibility for supply chains to deliver resiliency, sustainability, and value. (https://thetechtribune.com/10-best-tech-startups-in-illinois/)
- *Loadsmart*- The company uses innovative technology to reinvent the future of freight, optimizing the movement of products and reducing inefficiencies in the industry. (https://thetechtribune.com/10-best-tech-startups-in-illinois/)
- *FourKites*- A supply chain intelligence platform that provides real-time visibility and execution for companies and logistics firms, to improve on-time performance and customer relationships. (https://thetechtribune.com/10-best-tech-startups-in-illinois/)

Data Centers

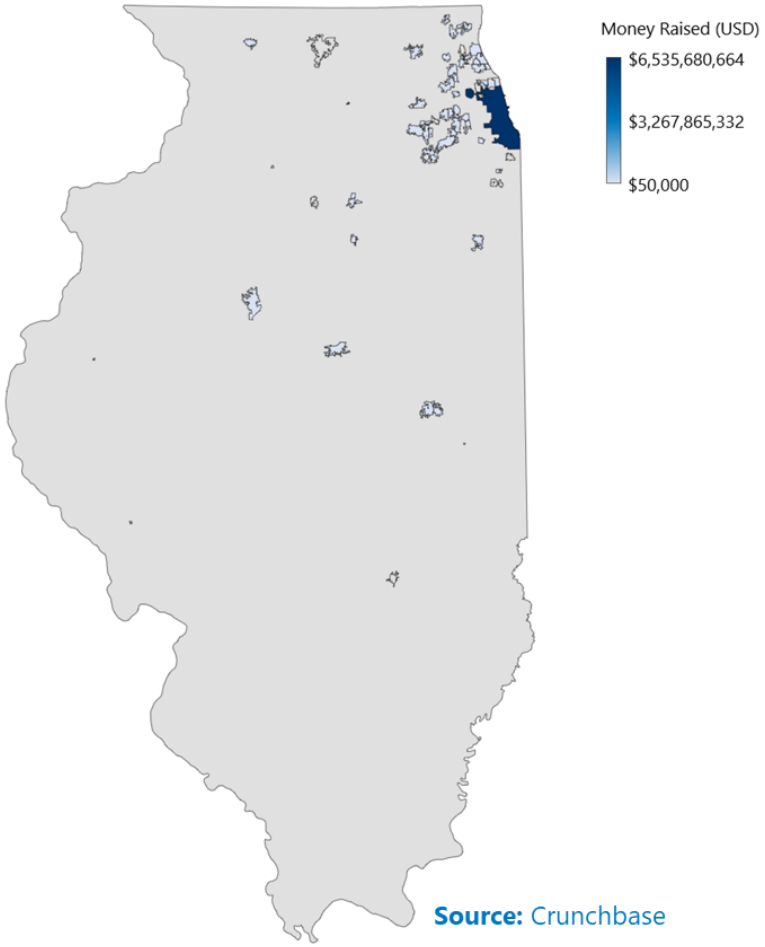
- *Microsoft*-The tech company paid $41.5 million to acquire a 30-acre industrial site adjacent to its existing 53-acre site in Hoffman Estates in Cook County, IL. The new investment will allow Microsoft to expand its data center operations in the Chicagoland region. (https://therealdeal.com/chicago/2023/03/17/microsoft-pays-42m-for-hoffman-estates-spec-industrial-site/)
- *Prime Data Center*- Recently the tech company made substantial investments in data center expansion projects in Elk Grove Village in Cook County, IL. (https://therealdeal.com/chicago/2023/03/17/microsoft-pays-42m-for-hoffman-estates-spec-industrial-site/)
- *Digital Realty's 350*- The Cermak Road Data Center near Chicago, IL is one of the largest data centers in the world, with 1.1 million square feet of data center space and more than 109 megawatts of mission-critical power infrastructure. (https://repkeicher.com/2023/10/18/data-centers-are-booming-business-in-illinois/)
- *Meta*- The Facebook parent company is investing $1 billion to expand a data center in DeKalb County, IL. (https://repkeicher.com/2023/10/18/data-centers-are-booming-business-in-illinois/)

Innovation & Investment

IT represents relatively new emerging technology and systems, and innovation capacity and performance are critical to regional economic competitiveness. The following is an overview of innovation performance and capacity in the region.

Venture capital for IT activity in Illinois in the past five has spanned multiple technologies and sectors including AI and analytics in life sciences, digital technologies for healthcare, AI and digital technologies for logistics, and software and applications for finance, management, and marketing. The overwhelming number of deals and associated dollars occurred in Cook County tied to the Chicago MSA representing over 90% of all VC investment dollars in the period.

Total Venture Capital in IT Categories, 2017-2023



Source: Crunchbase

Top 15 Information Technology Companies by VC Raised, Illinois, 2017-2023

Organization	Total Raised	Related Industries
Tempus	$890,000,000	Artificial Intelligence, Biotechnology, Health Care, Machine Learning, Medical
ActiveCampaign	$340,000,000	Apps, Email Marketing, Marketing Automation, Software
Copado	$270,832,372	Collaboration, Developer Platform, Developer Tools, IT Management, Software
G2	$242,000,000	B2B, Business Intelligence, Consumer Reviews, Enterprise Software, Marketing Automation, Marketplace, Software
Atlas	$220,000,000	Financial Services, Management Consulting, Software
FourKites	$215,000,000	Enterprise Software, Logistics, Machine Learning, Software, Supply Chain Management
Pixis	$209,000,000	Artificial Intelligence, Brand Marketing, Cloud Computing, Digital Marketing, Machine Learning
Uptake Technologie	$167,000,000	Analytics, Artificial Intelligence, Industrial, Machine Learning, SaaS, Software
Cameo	$165,710,000	Information Technology, Marketplace, Media and Entertainment, Social Media
FarEye	$147,313,000	Artificial Intelligence, Delivery, Enterprise Software, Last Mile Transportation, Logistics, Supply Chain Management
Evozyne	$144,367,382	Artificial Intelligence, Biotechnology, Life Science, Medical, Therapeutics
Nerdio	$125,000,000	Cloud Computing, Information Services, Information Technology, Software
Fly.io	$110,500,000	Apps, Computer, PaaS, Software, Web Hosting
HealthJoy	$105,500,000	Artificial Intelligence, Employee Benefits, Health Care, Hospital, Medical
Fyllo	$98,000,000	Advertising, Cannabis, Cloud Computing, Cloud Data Services, Compliance, Enterprise Software, Marketing

Source: Crunchbase

Illinois Venture Capital Funding in IT Categories, 2017-2023

	2017	2018	2019	2020	2021	2022	2023	Total
Bureau		$7,707,000			$1,700,000	$3,750,000		$13,157,000
Champaign	$12,085,000	$2,352,923	$1,115,000	$4,583,796	$10,149,952	$2,730,934		$33,017,605
Cook	$682,774,838	$747,418,612	$784,510,509	$944,246,100	$1,761,745,965	$1,452,594,217	$430,570,146	$6,803,860,387
Cook, Will		$330,000						$330,000
DeKalb	$114,245	$225,000						$339,245
DuPage	$11,410,000	$74,615,000	$26,665,000	$5,366,055	$89,542,366	$7,712,000	$502,250	$215,812,671
Kane		$4,000,000		$5,999,981		$20,000,000		$29,999,981
Kankakee							$1,000,000	$1,000,000
Lake	$83,824,095	$5,502,500	$15,200,000	$1,312,500	$20,450,324	$20,000,000	$5,302,646	$151,592,065
LaSalle				$847,502		$500,002	$12,500,000	$13,847,504
McDonough		$50,000						$50,000
McHenry						$75,000		$75,000
McLean							$1,000,000	$1,000,000
Peoria	$450,000		$3,000,000	$250,000				$3,700,000
Stephenson	$788,500	$649,000	$210,000	$225,000				$1,872,500
Will						$3,000,000		$3,000,000
Will, Kendall	$523,358							$523,358
Total	**$791,970,036**	**$842,850,035**	**$830,700,509**	**$962,830,934**	**$1,883,588,607**	**$1,510,362,153**	**$450,875,042**	**$7,273,177,316**

Source: Crunchbase

Over $1.9 Billion has been invested into Illinois' IT Sector by Foreign Entities since 2017

- Japanese ($463 million) and German ($407 million) made the greatest investments in Illinois since 2017
- Overall, this foreign investment in the state has created an estimated 6,221 jobs. About 44% of this was in Custom Computer Programming Services.
- Foreign investment in Illinois during this period included within data processing and hosting, telecommunications, custom computer services, and electrical equipment and components.
- All investments in the sector were made by foreign sources. No investments from companies headquartered in other states were tracked during this time period.

Foreign Direct Investment in Information Technology Sector, Illinois (2017-2023)

Investing Company	Date	Investing Country	Destination County	Subsector	Jobs Created	Capital Investment ($M)
Foreign Investments						
Internet Vikings	January 2022	Sweden	Not Specified	Data processing, hosting, & related services	53	$148.3
NTT Ltd	February 2021	Japan	Cook County (IL)	Data processing, hosting, & related services	53	$148.3
DE-CIX	February 2021	Germany	Cook County (IL)	Data processing, hosting, & related services	53	$148.3
DE-CIX	December 2020	Germany	Cook County (IL)	Data processing, hosting, & related services	53	$148.3
NTT Ltd	August 2020	Japan	Cook County (IL)	Data processing, hosting, & related services	53	$148.3
EdgeCore Digital Infrastructure	August 2018	Singapore	Cook County (IL)	Data processing, hosting, & related services	53	$148.3
RagingWire Data Centers (RagingWire Enterprise Solutions)	January 2018	Japan	DuPage County (IL)	Data processing, hosting, & related services	53	$148.3
Accenture	July 2019	Ireland	Cook County (IL)	Custom computer programming services	600	$105.3
Prysmian Group North America	August 2023	Italy	Perry County (IL)	Communication & energy wires & cables	80	$63.8
Everstream	January 2020	Australia	Cook County (IL)	Wired telecommunication carriers	20	$50.0
Other Investments in Broader Region						
Harting Americas	October 2018	Germany	Kane County (IL)	All other electrical equipment & components	50	$6.0
				Total	**6,221**	**$1,910.5**

Source: fDi Markets, from the Financial Times

National Outlook

Compound Annual Growth Rate of Key Indicators

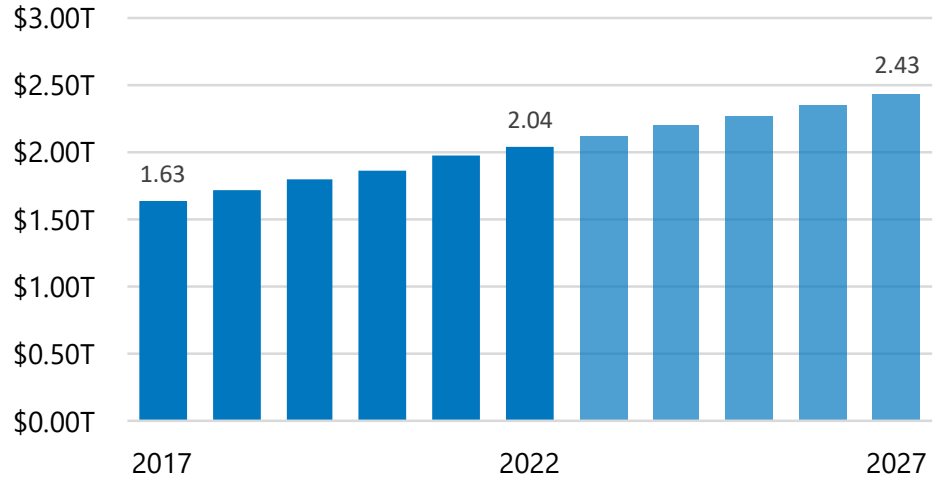
	Revenue	Val. Added	Exports	Imports
2017-2022	4.5%	5.3%	-2.5%	1.7%
2022-2027	3.6%	3.8%	2.4%	-1.4%

Source: IBISWorld

Compound Annual Growth: At an annual rate, Value Added is the indicator that grew the fastest from 2017-2022, increasing 5.3% annually. Revenue grew at a slightly slower rate of 4.5%, while Exports declined. In the next five years through 2027, Revenue, Value Added, and Exports are projected to increase, while Imports are projected to decline at an annual rate of -1.4%.

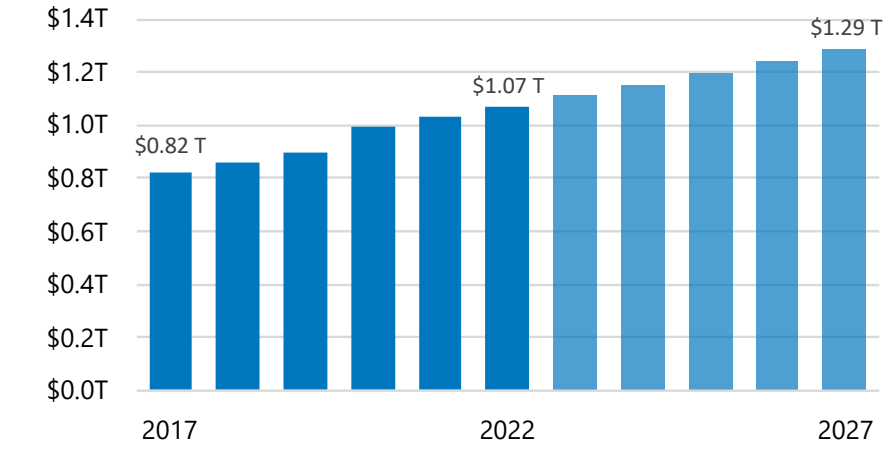
Revenue: Total Revenue for the cluster is approx. $2 trillion in 2022. Revenue has been climbing consistently over the last five years, and the trend is projected to continue over the next 5. Software Publishing, Data Processing & Hosting, and Search Engines combined accounted for over 75% of the cluster's revenue growth from 2017-2022. These three sectors, along with Graphic Designers, are projected to drive revenue growth through 2027.

IT & Related Manufacturing Revenue



Source: IBISWorld

Value Added

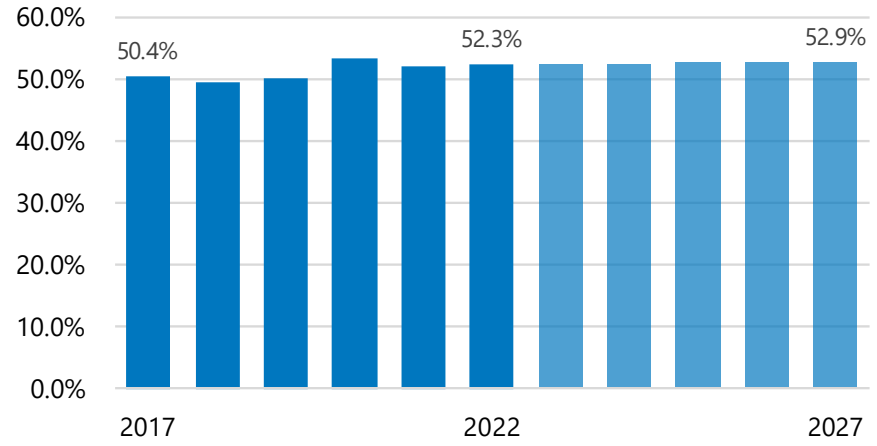


Source: IBISWorld

Value Added: Value added has risen consistently over the last five years, with this trend continuing through 2027. Overall, value added for the cluster will have grown from $820 Billion in 2017 to $1.29 Trillion in 2027.

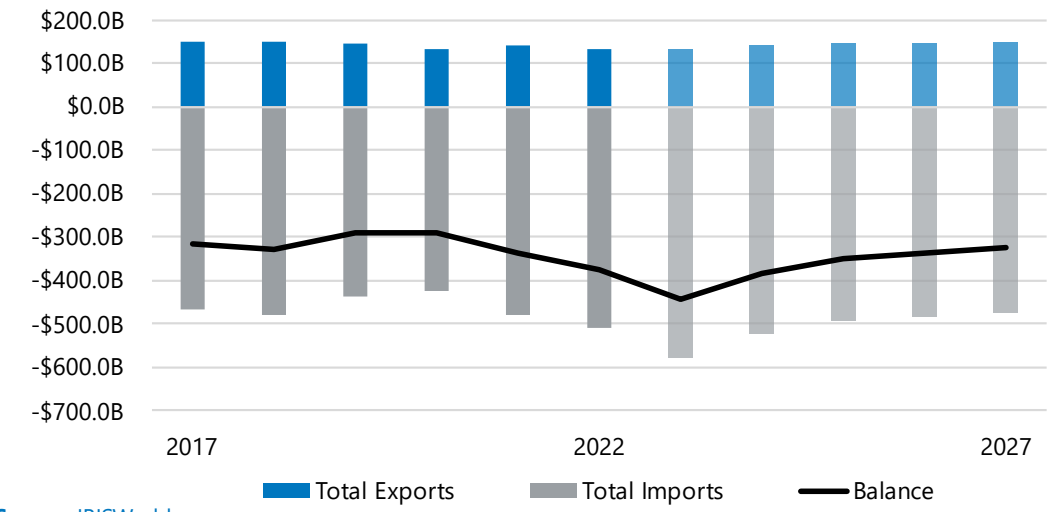
Value Added Share: Value added accounts for 52.3% of revenue in 2022. This share is expected to increase by 0.6% between 2022 and 2027. This ratio is projected to remain stable and consistent over the next five years.

Value Added Share of Revenue



Source: IBISWorld

Exports and Imports (Billions of Dollars)



Source: IBISWorld

Exports & Imports: The cluster imports far more than it exports, with about $375B more imports than exports in 2022. The trade balance is projected to be greatest in 2023 after leveling off slightly through 2027. There are no industries in the cluster that had a trade surplus in 2022. The industries with the largest trade deficits are Communications Equipment Manufacturing (-$131 B) and Computer Manufacturing (-$98B).

Top Export Countries (2022)

Country	Share of Total Cluster Exports
Mexico	20%
Canada	11%
China	9%
Hong Kong	5%
Taiwan	4%

Source: USA Trade Online

Top Exporting Countries: Mexico and Canada are the cluster's largest export destinations. Otherwise, top export destinations are concentrated in Asia.

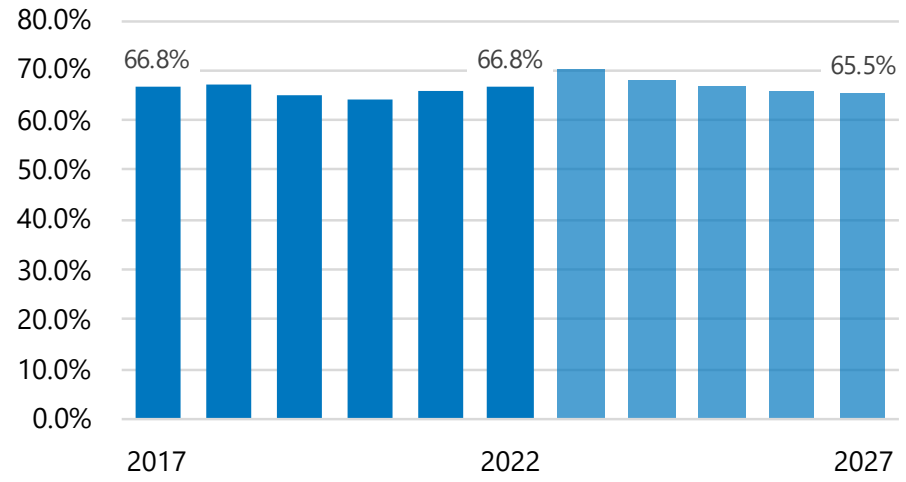
Top Import Countries (2022)

Country	Share of Total Cluster Imports
China	32%
Mexico	16%
Vietnam	9%
Taiwan	9%
Malaysia	6%

Source: USA Trade Online

Top Exporting Countries: China accounts for nearly a third of imports for the cluster. Aside from Mexico (16%), the top 5 import countries are in Asia.

Import's Share of Domestic Demand

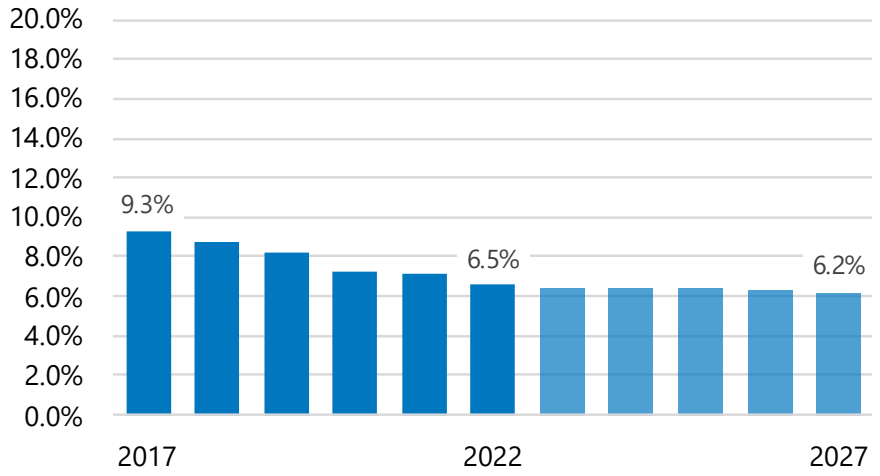


Source: IBISWorld

Import's Share of Domestic Demand: Imports share of domestic demand is 66.8% in 2022 and remained consistent over the last five years. Over the next five years, the United States' reliance on imports is projected to decline slightly.

Export's Share of Revenue: Exports share of Revenue is 6.5% in 2022 but has declined from 9.3% in 2017. Over the next five years, this ratio will remain stable.

Export's Share of Revenue



Source: IBISWorld

Top 20 Products and Services of the IT & Related Manufacturing Cluster

Product/Service	2022 Revenue (Millions)
Other services	$273,814
Application software publishing	$227,281
Custom services	$173,462
System software publishing	$102,346
Paid search	$99,130
Technical consulting	$78,730
Computer systems development	$70,409
Paid placement: banner ads	$69,842
Web hosting services	$69,092
Business process management	$68,785
All others	$68,230
Search, detection and navigation instruments	$65,909
Application service provisioning	$65,100
Technical support	$58,887
IT infrastructure	$56,327
Paid placement: video ads	$38,300
Data storage and management services	$32,550
Technology consulting and training	$32,271
Semiconductor products and parts (including microprocessors)	$31,037
Printed circuit assembly	$25,686

Source: IBISWorld

Top Products: The top products and services in the cluster are application software publishing, custom services, system software publishing, and other services.

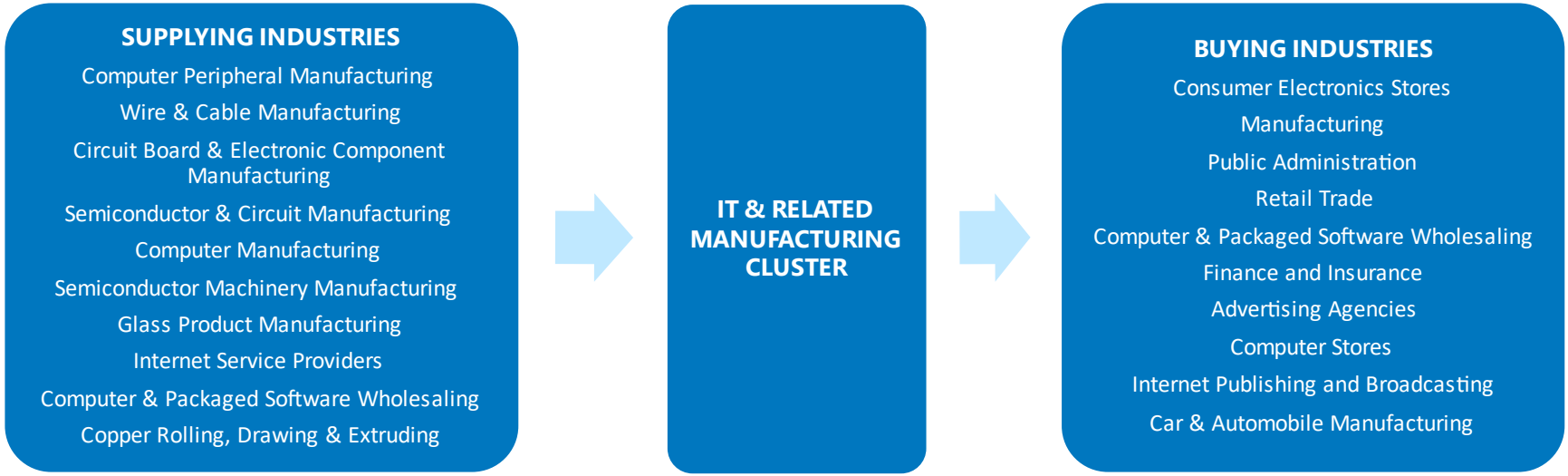
Top 10 Companies in the IT & Related Manufacturing Cluster in the US, 2022

Company	Approximate Market Share
Microsoft Corporation	4.5%
Alphabet Inc.	2.6%
International Business Machines Corporation	2.0%
Samsung Electronics Co Ltd	1.7%
Medtronic Plc	0.9%
Amazon.Com, Inc.	0.8%
Salesforce.Com, Inc.	0.8%
Texas Instruments Incorporated	0.8%
Apple Inc.	0.7%
Dell Technologies Inc.	0.7%

Source: IBISWorld, Camoin Associates

Top Companies: The cluster's market is relatively concentrated, with the top 10 companies accounting for 15.5% of revenue in the cluster. Microsoft, Alphabet, and IBM are the three largest players in the market, and account for a combined 9.1% market share.

IT & Related Manufacturing Supply Chain



Regional Trends

IT & Related Manufacturing Summary, 2022

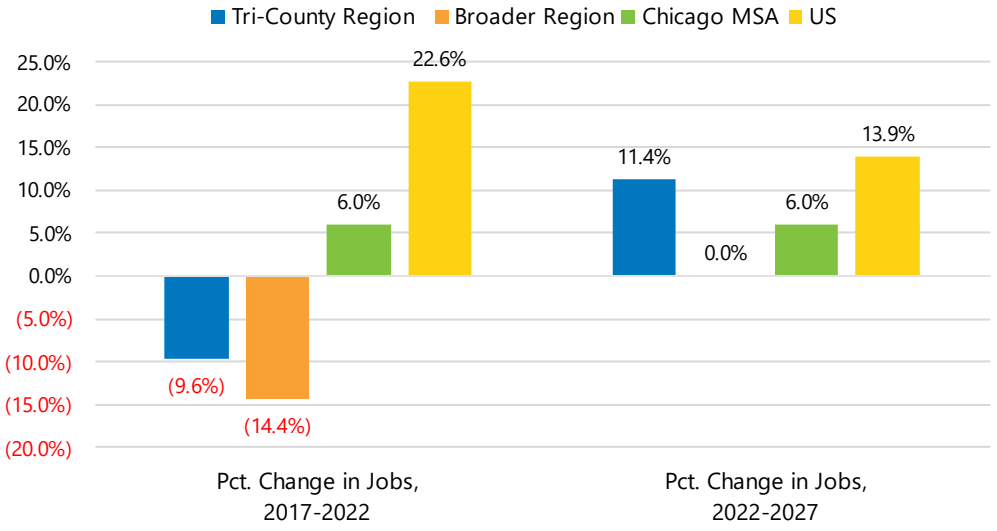
Region	2022 Jobs	Cluster Share of Total Jobs	Change in Jobs, 2017-2022	Pct. Change in Jobs, 2017-2022	Change in Jobs, 2022-2027	Pct. Change in Jobs, 2022-2027
Tri-County Region	2,670	1.0%	(284)	(9.6%)	303	11.4%
Broader Region	9,161	1.3%	(1,537)	(14.4%)	0	0.0%
Chicago MSA	125,333	2.6%	7,120	6.0%	7,522	6.0%
US	5,195,458	3.1%	959,050	22.6%	723,844	13.9%

Source: Lightcast, Camoin Associates

The Tri-County Region accounts for just under a third of the Broader Region's total employment in the IT & Related Manufacturing sector, with 2,670 jobs in 2022. The sector makes up 1.0% of the Tri-County Region's total workforce, a lower concentration compared to the Broader Region, Chicago MSA, and United States.

The Tri-County Region's employment in IT & Related Manufacturing declined by almost 10% from 2017-2022, less of a decline compared to the Broader Region but significantly lagging the 6.0% and 22.6% growth in the Chicago MSA and US, respectively. In the next five years from 2022-2027, employment in the sector is projected to grow significantly, by 11.4% in the Tri-County Region, outpacing the Broader Region and Chicago MSA and nearing the US projected growth rate of 13.9%.

Historic and Projected Growth in the IT & Related Manufacturing Sector



Source: Lightcast

IT & Related Manufacturing Summary, 2022

Region	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (Millions)	Share of Total GRP	Productivity (GRP Per Job)
Tri-County Region	0.34	(608)	387	$465	1.6%	$174,336
Broader Region	0.43	(2,774)	1,025	$1,639	2.1%	$178,964
Chicago MSA	0.83	(27,148)	10,785	$36,194	4.8%	$288,780
US	N/A	N/A	564,628	$1,433,623	6.2%	$275,938

Source: Lightcast, Camoin Associates

IT & Related Manufacturing Summary, 2022: The Tri-County Region's employment in the cluster is approximately a third as concentrated as the national average. In the Broader Region and the Chicago MSA, employment in the cluster has relatively low concentration. The Tri-County Region 's negative competitive effect indicates that job growth underperformed expectations given national trends in the overall economy as well as national cluster trends. In the Tri-County Region, the cluster generates $174,336 of GRP per job. While productivity is high compared to other emerging clusters, it lags the Chicago MSA and the US by over $100,000 per job.

Tri-County Region IT & Related Manufacturing Summary, 2022

Sub-Industry	2022 Location Quotient	Competitive Effect	Payrolled Business Locations	2022 GRP (Millions)	Cluster Share of Total GRP	Productivity (GRP Per Job)
Computer & Telecommunications Equipment Mfg.	0.38	(83)	6	$36	7.7%	$229,477
Semiconductor and Other Electronic Component Mfg.	0.85	207	16	$61	13.1%	$119,770
Medical, Navigation, and Control Instruments Mfg.	0.50	(301)	28	$78	16.8%	$234,332
Related Scientific and Professional Services	0.27	(431)	337	$290	62.4%	$173,764

Source: Lightcast, Camoin Associates

Tri-County Region IT & Related Manufacturing Summary, 2022: The subclusters that are most productive in the Tri-County Region are Medical, Navigation, and Control Instruments Manufacturing along with Computer & Telecommunications Equipment Manufacturing, which each contributed around $230,000 of GRP per job in 2022. Notably, the only subcluster with a positive competitive effect in the Tri-County Region is Semiconductor & Other Electronic Equipment Manufacturing. This indicates that the subcluster grew by 207 jobs more than expected given national economic & industry trends, while the other subclusters underperformed expectations.

Average Annual Pay in the IT & Related Manufacturing Cluster and Deviation from Regional Living Wage

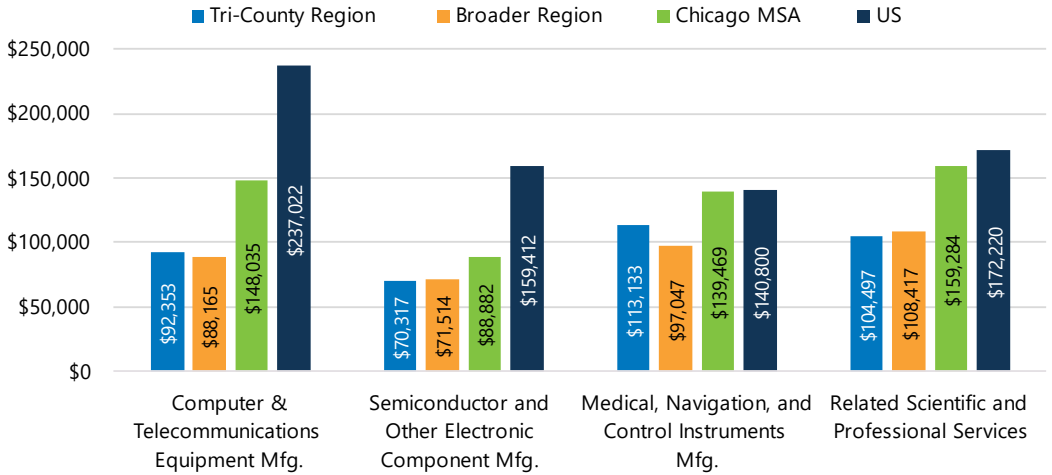
Sub-Industry	Tri-County Region		Broader Region		Chicago MSA	
	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage	Avg. Earnings Per Job	Deviation from Living Wage
Computer & Telecommunications Equipment Mfg.	$92,353	$51,613	$88,165	$47,806	$148,035	$105,083
Semiconductor and Other Electronic Component Mfg.	$70,317	$29,577	$71,514	$31,155	$88,882	$45,930
Medical, Navigation, and Control Instruments Mfg.	$113,133	$72,393	$97,047	$56,688	$139,469	$96,517
Related Scientific and Professional Services	$104,497	$63,757	$108,417	$68,058	$159,284	$116,332

Source: Lightcast, MIT Living Wage Calculator, Camoin Associates

Average Annual Pay and Deviation from Regional Living Wage: Average earnings per job in the cluster for the Tri-County Region were high at $98,366 in 2022. The subcluster with the highest average earnings was Medical, Navigation, and Control Instruments Mfg. Overall, jobs in the IT & Related Manufacturing cluster have earnings well above regional living wages.

Average Earnings Per Job: Generally, average earnings in the Tri-County Region tend to be on par if not higher than in the Broader Region, though consistently lagging the Chicago MSA and the US average.

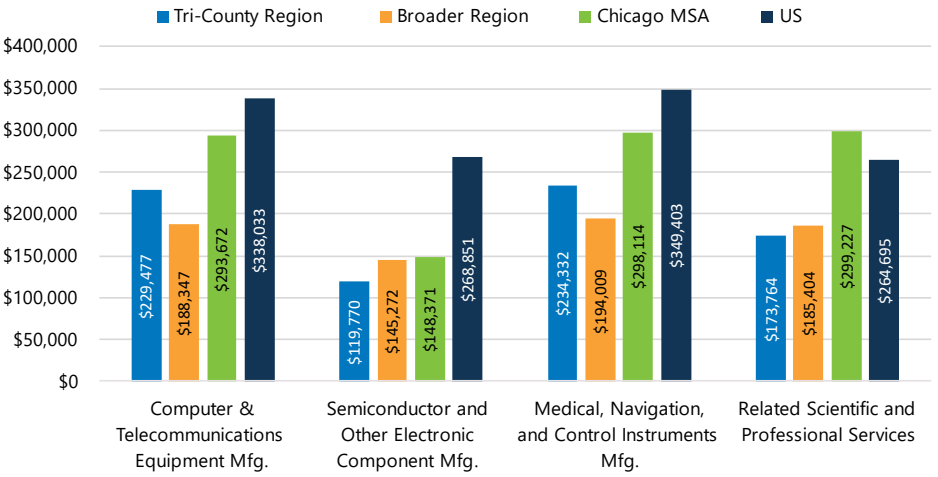
Average Earnings Per Job in IT & Related Manufacturing Cluster, 2022



Source: Lightcast, Camoin Associates

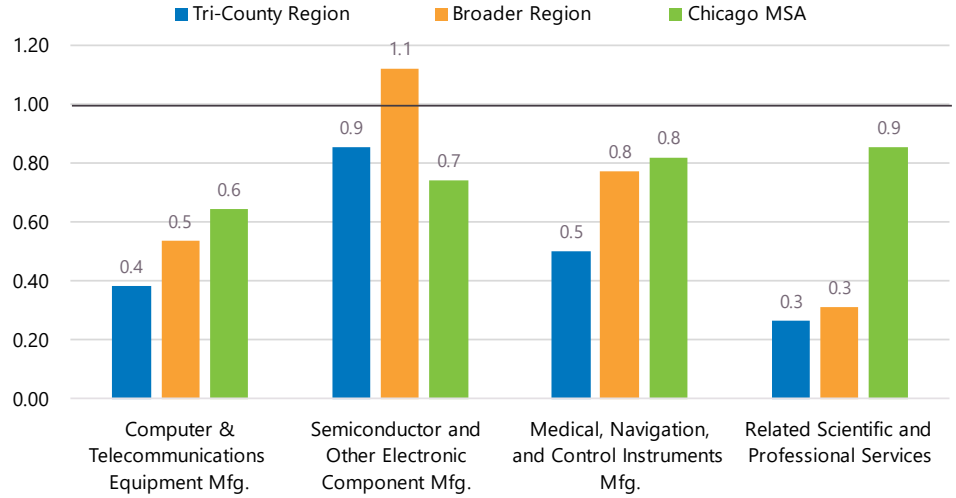
GRP Per Job: The United States tends to have higher productivity in all sub clusters compared to the comparison regions, though the Chicago MSA is highly productive in Scientific & Professional Services. The Tri-County Region outpaces the Broader Region in Computer & Telecommunications Equipment Mfg. and Medical, Navigation, and Control Instruments Mfg.

GRP Per Job in IT & Related Manufacturing Agriculture Cluster, 2022



Source: Lightcast, Camoin Associates

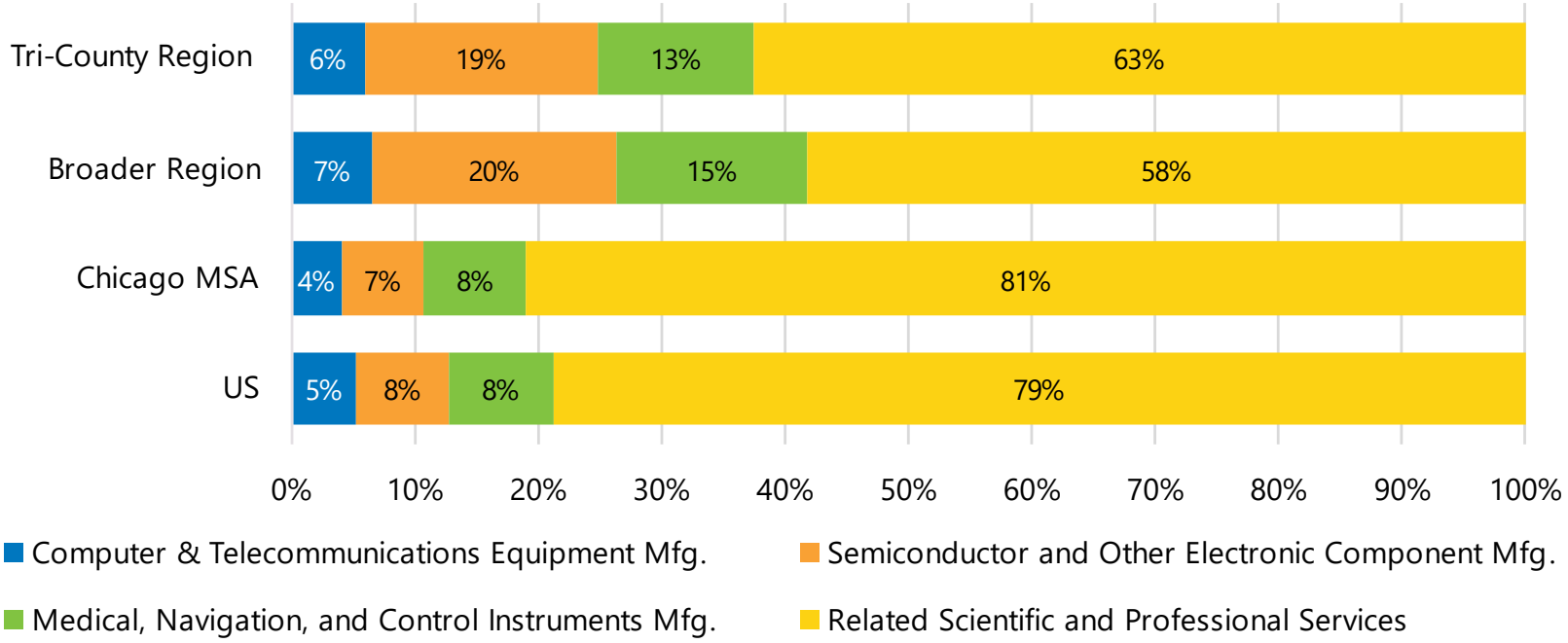
Location Quotients in IT & Related Manufacturing Cluster, 2022



Source: Lightcast, Camoin Associates

Location Quotient: The Tri-County Region has relatively low employment concentration in all four subclusters. Moreover, all local regions have location quotients below 1.0 in the IT & Related Manufacturing subclusters, except for the Broader Region in Semiconductor & Other Electronic Component Mfg. This indicates that the overall region is not specialized in the cluster.

Industry Mix of the IT & Related Manufacturing Sector, 2022 (Job Share)

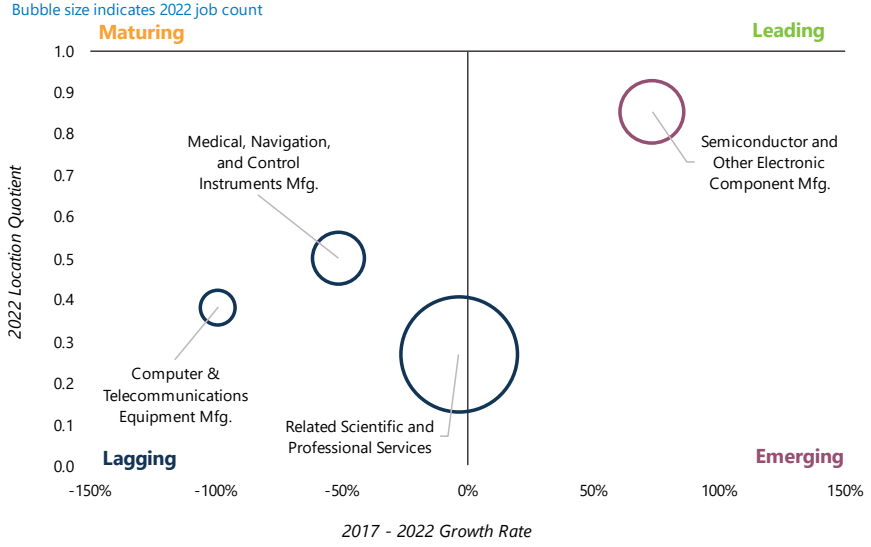


Source: Lightcast, Camoin Associates

Industry Mix (Job Share): The Tri-County Region and the Broader Region have lower shares of related Scientific and Professional Services in the IT cluster compared to the Chicago MSA and the United States. The Tri-County Region and the Broader Region instead have higher shares of medical, navigation, and control instruments manufacturing as well as semiconductor and electronic component manufacturing.

Key Metrics by IT & Related Manufacturing Subcluster, Tri-County Region

Bubble size indicates 2022 job count

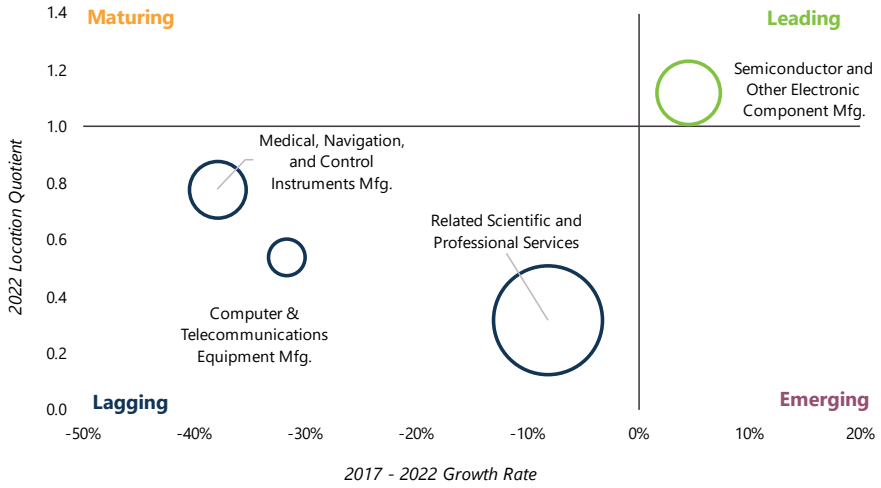


Key Metrics by Subcluster, Tri-County Region: In the Tri-County Region, three of the four subclusters are lagging, meaning they have both low employment concentration relative to the US and they have seen employment decline in the last five years. Semiconductor & Other Electronic Manufacturing is the only subcluster classified as emerging, meaning that although it has low employment concentration, it has seen strong growth in recent years.

Key Metrics by Subcluster, Broader Region: In the broader region, the same three subclusters as in Region1are classified as lagging. Semiconductor & Other Electronic Component Mfg. is leading, meaning that it both has employment concentration greater than the US average and has seen growth in the last five years.

Key Metrics by IT & Related Manufacturing Subcluster, Broader Region

Bubble size indicates 2022 job count



Sales and Demand for the IT & Related Manufacturing Cluster by Region, 2022

Region	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Tri-County Region	$623,979,176	46%	$2,397,557,551	86%
Broader Region	$2,261,088,738	48%	$6,438,174,856	82%
Chicago MSA	$50,222,579,805	23%	$52,657,084,402	27%

Source: Camoin Associates

Sales and Demand for IT & Related Manufacturing Cluster by Region, 2022: The Tri-County Region exports about 46% of the cluster's goods and services, on par with the Broader Region and about twice as much as the Chicago MSA. Additionally, the Tri-County Region meets a slightly higher share of demand by imports, at 86%, compared to 82% in the Broader Region only 27% in the

Sales and Demand for IT & Manufacturing Cluster by Subcluster in Tri-County Region, 2022

Sub-Industry	Total Sales	Pct. Exported	Total Demand	Pct. Met by Imports
Computer & Telecommunications Equipment Mfg.	$46,131,005	92%	$115,312,306	97%
Semiconductor and Other Electronic Component Mfg.	$90,920,738	84%	$192,342,838	92%
Medical, Navigation, and Control Instruments Mfg.	$94,725,495	87%	$209,438,843	94%

Source: Camoin Associates

Sales and Demand for IT & Related Manufacturing Cluster by Subcluster in Region, 2022: Computer & Telecom Equipment Mfg. has the highest share of demand met by imports (97%), representing an opportunity for the Tri-County Region to improve intra-region supply chain. While only 21% of the region's related Scientific and Professional Services are exported, this is on par with the other comparison regions. However, it may still represent an opportunity to expand on exports. Additionally, the Tri-County Region exports a relatively small share of sales (21%) and imports a relatively high share of its demand (84%) of Related Professional Scientific and Technical Services, representing an opportunity for Tri-County Region to fill supply chain gaps. Meanwhile, Nearly 100% of demand for Computer & Telecommunications Equipment is met by imports (97%), driven by a lack of existing production capacity for Electronic Computer Manufacturing. The Tri-County Region can take advantage of opportunities within this industry to grow the IT sector.

Workforce Analysis

While the Information Techology cluster has relatively low concentration and growth, these occupations provide critical support to sectors throughout the economy. The following workforce analysis focuses on a subset of IT-related occupations, rather than the occupations that specifically staff the IT & Related Manufacturing cluster.

IT-Related Occupations, Tri-County Region (2022)

SOC	Description	Employed in Region
11-3021	Computer and Information Systems Managers	417
15-1211	Computer Systems Analysts	382
15-1212	Information Security Analysts	91
15-1221	Computer and Information Research Scientists	43
15-1231	Computer Network Support Specialists	248
15-1232	Computer User Support Specialists	797
15-1241	Computer Network Architects	150
15-1242	Database Administrators	111
15-1243	Database Architects	23
15-1244	Network and Computer Systems Administrators	279
15-1251	Computer Programmers	77
15-1252	Software Developers	1,012
15-1253	Software Quality Assurance Analysts and Testers	108
15-1254	Web Developers	91
15-1255	Web and Digital Interface Designers	86
15-1299	Computer Occupations, All Other	187
15-2011	Actuaries	23
15-2021	Mathematicians	0
15-2031	Operations Research Analysts	61
15-2041	Statisticians	9
15-2051	Data Scientists	100
15-2099	Mathematical Science Occupations, All Other	30
17-2061	Computer Hardware Engineers	25
Top Occupations TOTAL		**4,350**

Source: Lightcast 2023.3

Workforce by Occupational Group: The Tri-County Region had 4,350 jobs in 2022 across 23 IT-specific occupations. Software Developers is the largest occupation within this subset, accounting for nearly a quarter of the overall jobs. Other large occupations include Computer User Support Specialists, Computer and Information Systems Managers, and Computer Systems Analysts.

Comparison of Staffing Patterns across Regions, IT-Related Occupations (2022)

SOC	Description	Share of Total Jobs in Region (2022)				Difference from Tri-County Region		
		Tri-County Region	Broader Region	Chicago MSA	US	Broader Region	Chicago MSA	US
15-1252	Software Developers	0.4%	0.2%	0.4%	0.3%	-0.2%	0.0%	-0.1%
15-1232	Computer User Support Specialists	0.3%	0.2%	0.3%	0.3%	-0.1%	0.0%	0.0%
11-3021	Computer and Information Systems Managers	0.2%	0.0%	0.1%	0.1%	-0.1%	-0.1%	-0.1%
15-1211	Computer Systems Analysts	0.1%	0.0%	0.0%	0.0%	-0.1%	-0.1%	-0.1%
15-1244	Network and Computer Systems Administrators	0.1%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%
15-1231	Computer Network Support Specialists	0.1%	0.3%	0.4%	0.4%	0.2%	0.3%	0.3%
15-1299	Computer Occupations, All Other	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	0.0%
15-1241	Computer Network Architects	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
15-2051	Data Scientists	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15-1253	Software Quality Assurance Analysts and Testers	0.0%	0.1%	0.2%	0.2%	0.1%	0.1%	0.2%
15-1242	Database Administrators	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
15-1254	Web Developers	0.0%	0.4%	0.9%	1.0%	0.4%	0.8%	0.9%
15-1212	Information Security Analysts	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%
15-1255	Web and Digital Interface Designers	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
15-1251	Computer Programmers	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
15-2031	Operations Research Analysts	0.0%	0.1%	0.2%	0.3%	0.1%	0.1%	0.3%
15-1221	Computer and Information Research Scientists	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
17-2061	Computer Hardware Engineers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15-2099	Mathematical Science Occupations, All Other	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
15-1243	Database Architects	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15-2011	Actuaries	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%
15-2041	Statisticians	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15-2021	Mathematicians	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total, All IT-Related Occupations		1.7%	2.7%	4.9%	4.7%	**1.0%**	**3.3%**	**3.0%**

Source: Lightcast 2023.3

Comparison of Staffing Patterns Across Regions: IT-related occupations account for 1.7% of total employment in the Tri-County Region, compared to 2.7% in the Broader Region, 4.9% in the Chicago MSA, and 4.7% in the US.

Comparison of Projected Growth in IT-Related Occupations Across Regions (2022)

		Tri-County Region			Broader Region			Chicago MSA			US			Difference from Tri-County Region		
			2022 - 2027			2022 - 2027			2022 - 2027			2022 - 2027		Broader	Chicago	
SOC	Description	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate	Jobs	Change	Rate	Region	MSA	US
15-1252	Software Developers	1,012	144	14.2%	2,955	474	16.1%	42,831	4,589	10.7%	1,615,162	306,300	19.0%	1.8%	-3.5%	4.7%
15-1232	Computer User Support Specialists	797	30	3.7%	2,257	79	3.5%	21,710	411	1.9%	749,218	63,514	8.5%	-0.2%	-1.8%	4.8%
11-3021	Computer and Information Systems Managers	417	42	10.0%	1,296	128	9.9%	18,831	877	4.7%	560,547	75,555	13.5%	-0.1%	-5.4%	3.5%
15-1211	Computer Systems Analysts	382	20	5.3%	1,210	61	5.1%	14,811	396	2.7%	535,516	52,190	9.7%	-0.2%	-2.6%	4.5%
15-1244	Network and Computer Systems Administrators	279	9	3.1%	957	24	2.5%	8,834	19	0.2%	344,392	22,688	6.6%	-0.6%	-2.9%	3.5%
15-1231	Computer Network Support Specialists	248	5	1.9%	695	13	1.8%	7,364	(75)	-1.0%	179,420	14,994	8.4%	-0.1%	-3.0%	6.4%
15-1299	Computer Occupations, All Other	187	16	8.7%	628	48	7.6%	7,763	453	5.8%	476,658	47,664	10.0%	-1.1%	-2.8%	1.3%
15-1241	Computer Network Architects	150	(0)	-0.2%	496	(4)	-0.8%	6,255	(186)	-3.0%	180,968	12,065	6.7%	-0.6%	-2.7%	6.9%
15-2051	Data Scientists	100	22	21.9%	358	73	20.3%	5,195	736	14.2%	166,387	39,095	23.5%	-1.6%	-7.8%	1.6%
15-1253	Software Quality Assurance Analysts and Testers	108	11	9.8%	382	45	11.8%	5,953	439	7.4%	202,483	32,484	16.0%	2.1%	-2.4%	6.3%
15-1242	Database Administrators	111	4	3.3%	326	8	2.4%	3,908	21	0.5%	83,650	7,305	8.7%	-0.9%	-2.7%	5.5%
15-1254	Web Developers	91	15	16.9%	345	40	11.5%	2,874	261	9.1%	107,910	16,777	15.5%	-5.4%	-7.8%	-1.3%
15-1212	Information Security Analysts	91	13	13.9%	286	46	16.1%	3,809	522	13.7%	177,161	36,487	20.6%	2.2%	-0.2%	6.6%
15-1255	Web and Digital Interface Designers	86	15	17.2%	244	39	16.1%	2,826	273	9.7%	118,819	19,363	16.3%	-1.2%	-7.6%	-0.9%
15-1251	Computer Programmers	77	(3)	-3.6%	232	(7)	-3.1%	2,421	(40)	-1.6%	153,668	1,310	0.9%	0.6%	2.0%	4.5%
15-2031	Operations Research Analysts	61	8	13.7%	267	32	12.1%	3,354	273	8.1%	110,674	17,334	15.7%	-1.5%	-5.6%	2.0%
15-1221	Computer and Information Research Scientists	43	8	18.1%	56	11	19.0%	273	36	13.2%	37,858	6,196	16.4%	0.9%	-4.9%	-1.7%
17-2061	Computer Hardware Engineers	25	5	20.4%	95	16	16.5%	827	13	1.6%	80,351	6,323	7.9%	-3.9%	-18.8%	-12.6%
15-2099	Mathematical Science Occupations, All Other	30	0	1.1%	59	2	2.9%	671	(13)	-2.0%	4,784	245	5.1%	1.8%	-3.0%	4.0%
15-1243	Database Architects	23	2	8.3%	74	5	6.5%	1,275	70	5.5%	64,374	7,071	11.0%	-1.8%	-2.8%	2.7%
15-2011	Actuaries	23	1	3.2%	131	6	4.9%	2,560	61	2.4%	32,444	3,886	12.0%	1.6%	-0.8%	8.8%
15-2041	Statisticians	9	2	23.6%	55	9	17.1%	394	63	16.0%	34,416	6,810	19.8%	-6.5%	-7.6%	-3.8%
15-2021	Mathematicians	0	(0)	-5.3%	3	(0)	-2.3%	51	(2)	-3.1%	2,872	120	4.2%	3.1%	2.2%	9.5%

Source: Lightcast 2023.3

Comparison of Projected Growth: Growth is being driven by Software Developers (+144), Computer and Information Systems Managers (+42), and Computer User Support Specialists (+30). These occupations are projected to grow in the Broader Region, Chicago MSA, and the US, although the latter is projected to decline slightly in the Chicago MSA. None of the occupations are projected to decline significantly. From 2022-2027, the largest loss in the Tri-County Region is for Computer Programmers, which is set to decline by 3 jobs, or -3.6%. This is the case throughout all study regions. In the United States, all but two of the IT Occupations will see growth of more than 5%. This highlights the critical need for these positions throughout the economy.

Median Hourly Earnings in IT-Related Occupations (2022)

SOC	Description	Tri-County Region	Broader Region	Chicago MSA	United States	Difference from Tri-County Region		
						Broader Region	Chicago MSA	US
15-1252	Software Developers	$51.25	$67.71	$78.16	$78.59	32.1%	52.5%	53.4%
15-1232	Computer User Support Specialists	$24.37	$41.54	$48.80	$49.03	70.5%	100.3%	101.2%
11-3021	Computer and Information Systems Managers	$66.45	$45.99	$51.89	$53.80	(30.8%)	(21.9%)	(19.0%)
15-1211	Computer Systems Analysts	$40.18	$55.22	$57.05	$65.69	37.4%	42.0%	63.5%
15-1244	Network and Computer Systems Administrators	$38.13	$30.23	$33.20	$32.71	(20.7%)	(12.9%)	(14.2%)
15-1231	Computer Network Support Specialists	$29.67	$24.90	$28.08	$27.81	(16.1%)	(5.4%)	(6.3%)
15-1299	Computer Occupations, All Other	$37.35	$53.29	$63.90	$60.89	42.7%	71.1%	63.0%
15-1241	Computer Network Architects	$52.93	$40.07	$48.45	$47.90	(24.3%)	(8.5%)	(9.5%)
15-2051	Data Scientists	$45.25	$58.74	$63.79	$64.67	29.8%	41.0%	42.9%
15-1253	Software Quality Assurance Analysts and Testers	$43.52	$37.56	$42.02	$43.40	(13.7%)	(3.5%)	(0.3%)
15-1242	Database Administrators	$38.91	$35.83	$38.47	$45.95	(7.9%)	(1.2%)	18.1%
15-1254	Web Developers	$34.96	$52.02	$60.31	$60.98	48.8%	72.5%	74.4%
15-1212	Information Security Analysts	$40.91	$40.55	$45.67	$47.86	(0.9%)	11.6%	17.0%
15-1255	Web and Digital Interface Designers	$24.48	$32.95	$38.36	$35.43	34.6%	56.7%	44.7%
15-1251	Computer Programmers	$33.45	$25.90	$27.30	$37.11	(22.6%)	(18.4%)	10.9%
15-2031	Operations Research Analysts	$45.67	$37.63	$43.20	$46.80	(17.6%)	(5.4%)	2.5%
15-1221	Computer and Information Research Scientists	$55.20	$45.28	$52.41	$54.80	(18.0%)	(5.1%)	(0.7%)
17-2061	Computer Hardware Engineers	$52.60	$44.41	$45.79	$53.86	(15.6%)	(12.9%)	2.4%
15-2099	Mathematical Science Occupations, All Other	$29.35	$42.50	$48.63	$41.21	44.8%	65.7%	40.4%
15-1243	Database Architects	$63.91	$40.70	$49.26	$47.39	(36.3%)	(22.9%)	(25.8%)
15-2011	Actuaries	$46.78	$44.69	$49.98	$49.59	(4.5%)	6.8%	6.0%
15-2041	Statisticians	$43.27	$31.65	$38.40	$34.40	(26.8%)	(11.2%)	(20.5%)
15-2021	Mathematicians	$41.98	$51.51	$58.41	$63.43	22.7%	39.1%	51.1%

Source: Lightcast 2023.3

Median Hourly Earnings: Median hourly earnings tend to be lower nearly across the board than the Chicago MSA and the US average, but on par or higher than in the Broader Region. Among this set of IT-related occupations, the highest-paying in the Tri-County Region is Computer and Information Systems Managers ($66.45), followed by Database Architects ($63.91). While earnings for Database Architects are on par with the Chicago MSA and the US, earnings for Computer and Information Systems Managers significantly lag the MSA and nation by about 18%. Median earnings in those regions are above $78 per hour, compared to $66.45 in the Tri-County Region.

Deviation from Living Wage in IT-Related Occupations (2022)

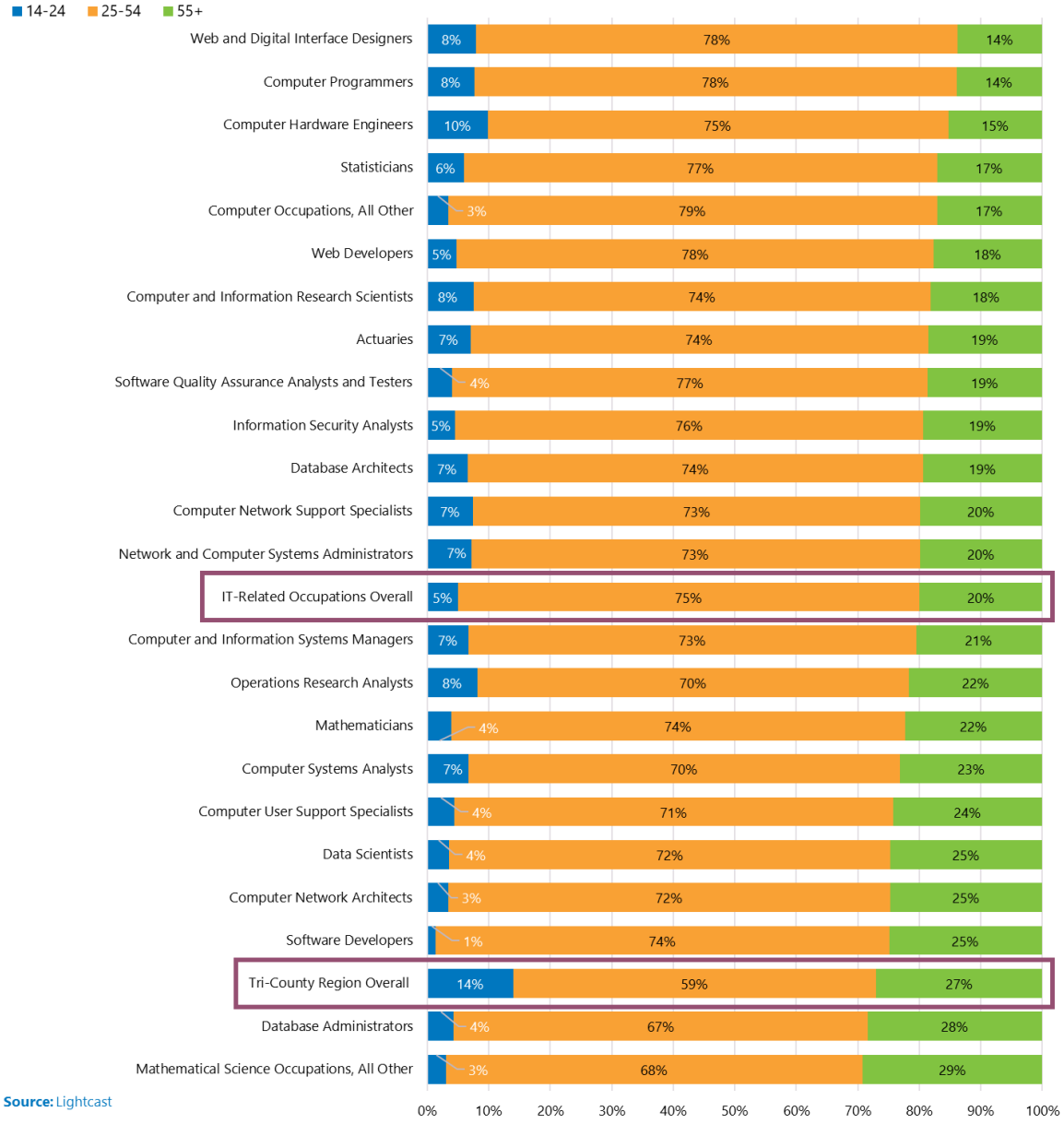
NAICS	Description	Tri-County Region	Broader Region	Chicago MSA
15-1252	Software Developers	$31.66	$48.30	$57.51
15-2051	Data Scientists	$25.66	$39.34	$43.14
15-1211	Computer Systems Analysts	$20.60	$35.81	$36.40
15-1299	Computer Occupations, All Other	$17.76	$33.88	$43.25
15-2021	Mathematicians	$22.40	$32.10	$37.76
15-1254	Web Developers	$15.38	$32.62	$39.66
15-1221	Computer and Information Research Scientists	$35.61	$25.87	$31.76
15-2099	Mathematical Science Occupations, All Other	$9.77	$23.09	$27.98
15-2011	Actuaries	$27.19	$25.29	$29.33
15-1212	Information Security Analysts	$21.32	$21.14	$25.02
15-1243	Database Architects	$44.32	$21.30	$28.61
17-2061	Computer Hardware Engineers	$33.01	$25.00	$25.14
11-3021	Computer and Information Systems Managers	$46.86	$26.59	$31.24
15-1232	Computer User Support Specialists	$4.78	$22.14	$28.15
15-1241	Computer Network Architects	$33.34	$20.66	$27.80
15-1253	Software Quality Assurance Analysts and Testers	$23.94	$18.16	$21.37
15-2031	Operations Research Analysts	$26.08	$18.23	$22.55
15-1255	Web and Digital Interface Designers	$4.89	$13.54	$17.71
15-1242	Database Administrators	$19.33	$16.43	$17.82
15-1244	Network and Computer Systems Administrators	$18.54	$10.83	$12.55
15-2041	Statisticians	$23.68	$12.25	$17.75
15-1251	Computer Programmers	$13.86	$6.49	$6.65
15-1231	Computer Network Support Specialists	$10.09	$5.49	$7.43

Source: Lightcast 2023.3

Note: Deviations based on living wage data from MIT Living Wage Calculator.
Living Wage: Region 1 = $19.59, Broader Region = $19.40, Chicago MSA = $20.65

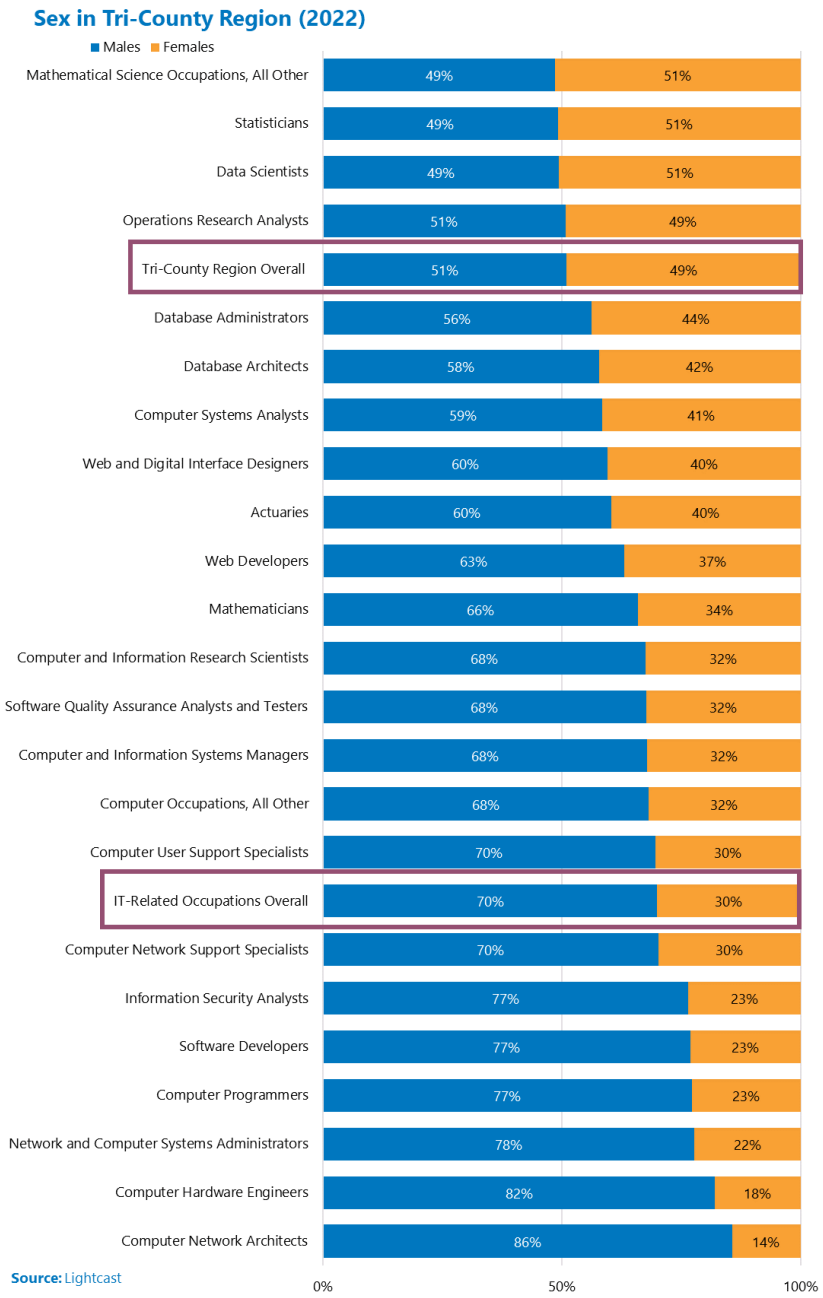
Deviation from Regional Living Wage in IT-related Occupations: IT-related occupations pay well above living wages in the Tri-County Region, the Broader Region, and the Chicago MSA. Earnings surpluses range from $46.86 per hour for Computer and Information Systems Managers to $4.78 for Computer User Support Specialists.

Age in Tri-County Region (2022)



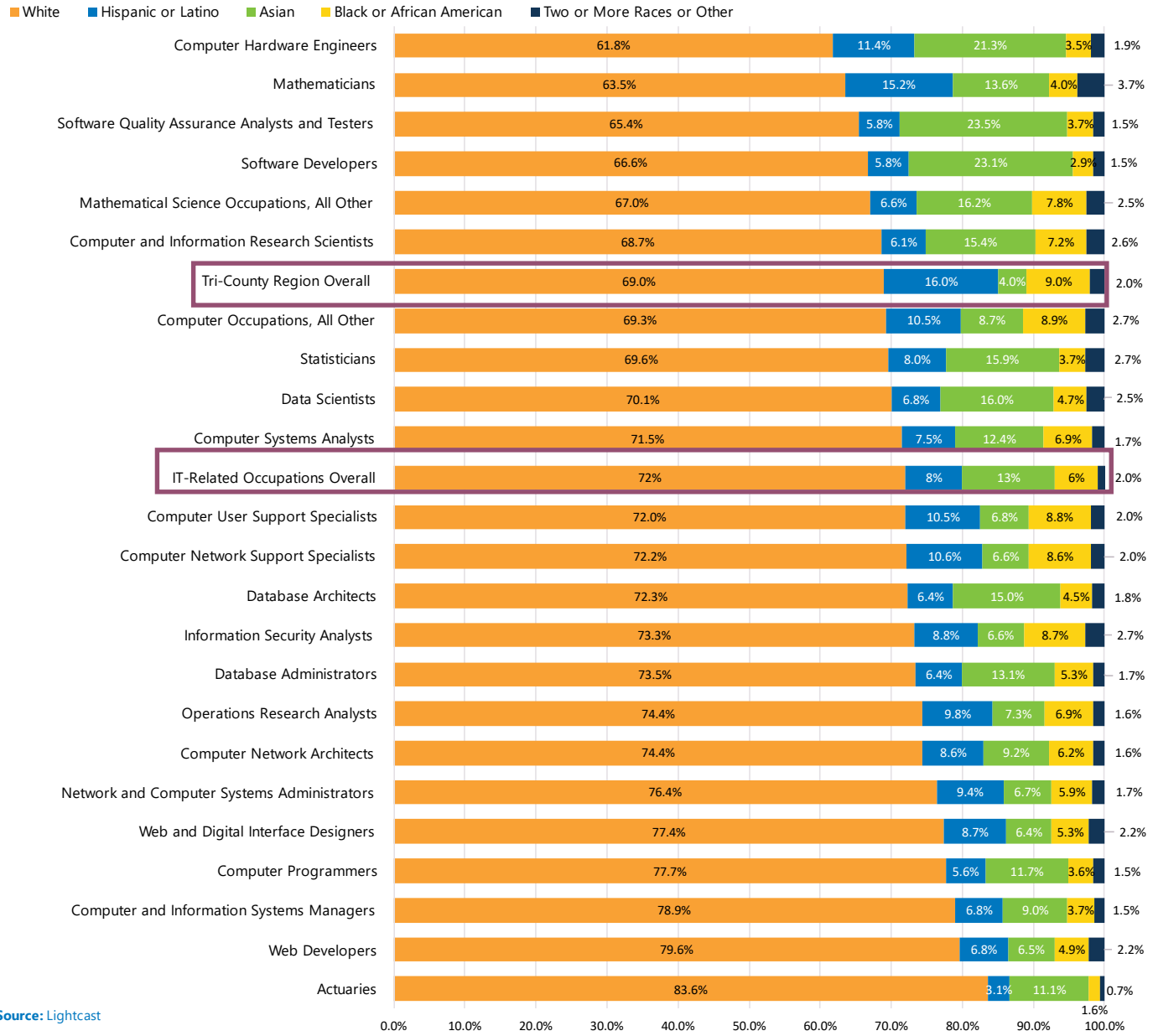
Source: Lightcast

Age: The population ages 14+ in the Tri-County Region is primarily people ages 25-54 (59%). This is reflected in the top 30 Food & Agriculture occupations, where 56% of workers are between ages 25-54. The only occupation with a majority of workers age 55+ is Farmers, Ranchers & Other Agricultural Manufacturers. The occupation with the highest share of peoples ages 14-24 is cashiers.



Sex: IT occupations are more male dominated than the overall economy. Only 30% of these jobs are staffed by women, compared to 49% for the overall economy. Some occupations, such as Mathematical Science, Statisticians, Data Scientists, and Operations Research Analysts, have better gender balance than the overall economy, while the vast majority underperform.

Race in Tri-County Region (2022)



Source: Lightcast

Race: The Tri-County Region workers are 69% White, 16% Hispanic or Latino, and 9% Black or African American. Compared to the overall economy, IT workers have a larger share of White (72%) and Asian (13%) workers, and lower shares of Hispanic (8%) and Black or African American.

Projected Workforce Gaps, IT-Related Occupations, Tri-County Region (2022 - 2027)

SOC	Description	Average Annual Openings (2022 - 202	Adjusted Completio	Estimated Workforce Surplus / (Gap)
15-1252	Software Developers	100	107	7
15-1232	Computer User Support Specialists	69	107	38
11-3021	Computer and Information Systems Managers	40	92	52
15-1211	Computer Systems Analysts	32	0	(32)
15-1244	Network and Computer Systems Administrators	21	81	60
15-1231	Computer Network Support Specialists	21	35	14
15-1299	Computer Occupations, All Other	17	76	59
15-1241	Computer Network Architects	10	89	79
15-2051	Data Scientists	12	67	55
15-1253	Software Quality Assurance Analysts and Testers	10	44	34
15-1242	Database Administrators	9	97	88
15-1254	Web Developers	10	57	47
15-1212	Information Security Analysts	9	63	54
15-1255	Web and Digital Interface Designers	11	50	39
15-1251	Computer Programmers	5	53	48
15-2031	Operations Research Analysts	6	10	4
15-1221	Computer and Information Research Scientists	5	0	(5)
17-2061	Computer Hardware Engineers	3	3	0
15-2099	Mathematical Science Occupations, All Other	2	32	30
15-1243	Database Architects	2	50	48
15-2011	Actuaries	1	3	2
15-2041	Statisticians	1	3	2
15-2021	Mathematicians	0	60	60

Source: Lightcast 2023.3

Completions have been adjusted to reflect the relevant programs servicing these occupations

Projected Workforce Gaps: Most occupations related to IT are projected to meet workforce demand in the next five years given current completion rates at regional educational institutions. Software Developers and Computer User Support Specialists are projected to see the largest gaps, at 43 workers and 34 workers per year, respectively.

Notes:

- Openings = New Jobs due to Growth + Replacements due to Retirement and Turnover
- Completions for "Manager" or "Supervisor" occupations are likely overstated since qualification for these positions are usually a function of years of experience rather than graduating from a management program
- Completions may be double counted (i.e., a graduate from a program may be listed for multiple occupations). For example, there are 69 completions listed for Industrial Engineers and 69 completions listed for Mechanical Engineers. These are the same individuals.
- Assumes 2021 completions levels will be consistent over the next 5 years
- Assumes occupations that require only a high school diploma or equivalent do not have completions
- These completions are across the entire economy
- Completions for occupations that typically require a union apprenticeship are likely understated since they are not included in higher educational institution data
- Assumes no completions for first-line supervisors as they are likely a function of being promoted from within or years of experience

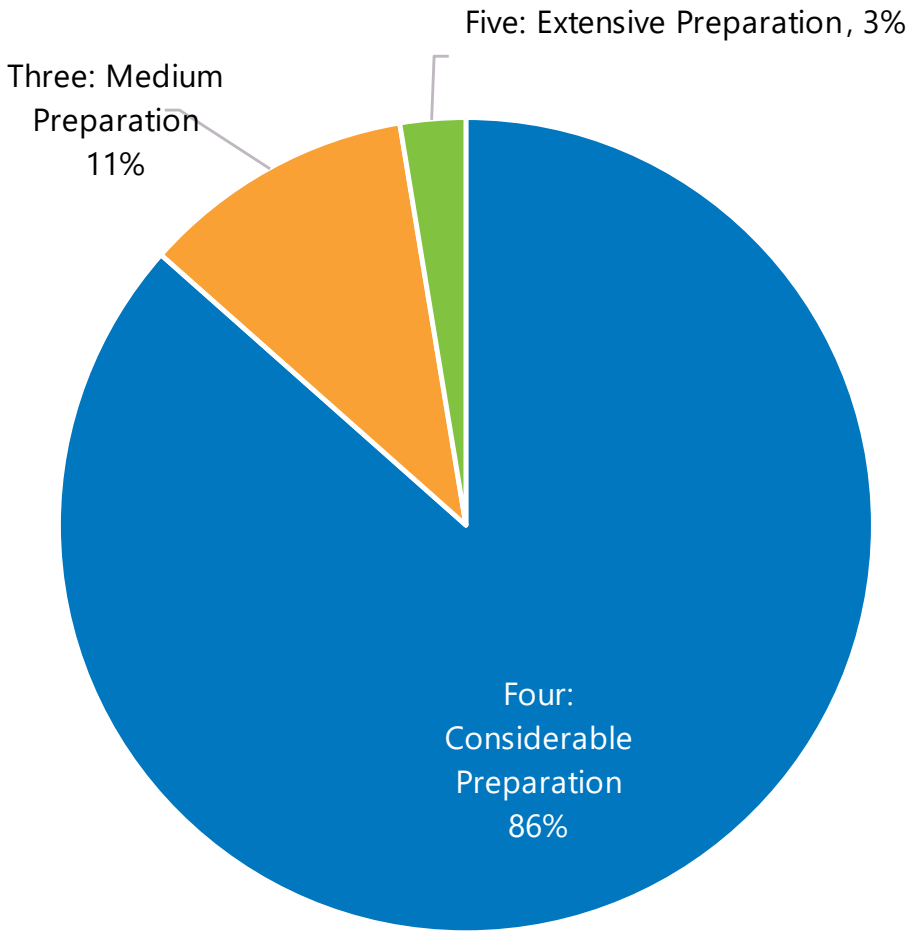
Preparation Required for IT-Related Occupations, Tri-County Region (2022)

SOC	Description	Typical Entry Level Education	Work Experience Required	Typical On-The-Job Training	Job Zone
15-1252	Software Developers	Bachelor's degree	None	None	Four: Considerable Preparation Needed
15-1232	Computer User Support Specialists	Some college, no degree	None	None	Three: Medium Preparation Needed
11-3021	Computer and Information Systems Managers	Bachelor's degree	5 years or more	None	Four: Considerable Preparation Needed
15-1211	Computer Systems Analysts	Bachelor's degree	None	None	Five: Extensive Preparation Needed
15-1244	Network and Computer Systems Administrators	Bachelor's degree	5 years or more	None	Four: Considerable Preparation Needed
15-1231	Computer Network Support Specialists	Associate's degree	None	None	Four: Considerable Preparation Needed
15-1299	Computer Occupations, All Other	No formal educational credential	None	Short-term on-the-job training	Four: Considerable Preparation Needed
15-1241	Computer Network Architects	Bachelor's degree	None	None	Four: Considerable Preparation Needed
15-2051	Data Scientists	High school diploma or equivalent	None	Moderate-term on-the-job training	Four: Considerable Preparation Needed
15-1253	Software Quality Assurance Analysts and Testers	No formal educational credential	None	Short-term on-the-job training	Four: Considerable Preparation Needed
15-1242	Database Administrators	High school diploma or equivalent	None	Apprenticeship	Four: Considerable Preparation Needed
15-1254	Web Developers	Bachelor's degree	None	None	Four: Considerable Preparation Needed
15-1212	Information Security Analysts	High school diploma or equivalent	None	Moderate-term on-the-job training	Four: Considerable Preparation Needed
15-1255	Web and Digital Interface Designers	Associate's degree	None	None	Three: Medium Preparation Needed
15-1251	Computer Programmers	Bachelor's degree	Less than 5 years	None	Four: Considerable Preparation Needed
15-2031	Operations Research Analysts	High school diploma or equivalent	Less than 5 years	None	Four: Considerable Preparation Needed
15-1221	Computer and Information Research Scientists	Doctoral or professional degree	None	None	Four: Considerable Preparation Needed
17-2061	Computer Hardware Engineers	High school diploma or equivalent	None	Moderate-term on-the-job training	Five: Extensive Preparation Needed
15-2099	Mathematical Science Occupations, All Other	High school diploma or equivalent	None	Moderate-term on-the-job training	Five: Extensive Preparation Needed
15-1243	Database Architects	High school diploma or equivalent	None	Short-term on-the-job training	Five: Extensive Preparation Needed
15-2011	Actuaries	Bachelor's degree	None	None	Four: Considerable Preparation Needed
15-2041	Statisticians	Bachelor's degree	None	None	Four: Considerable Preparation Needed
15-2021	Mathematicians	High school diploma or equivalent	None	Moderate-term on-the-job training	Four: Considerable Preparation Needed

Source: Lightcast, O*Net

Skill Requirements: Extensive preparation is required for several IT-related occupations, including Information Security Analysts, Mathematicians, Operations Research Analysts, and Data Scientists. These occupations will require the most training and education to prepare workforce. Otherwise, many of the other occupations require considerable preparation, with a minority requiring medium preparation.

Job Zones for the Tri-County Region's IT-Related Occupations



Source: Lightcast, O*Net

Job Zones: The O*Net Job Zones system has five zones, with One indicating the fewest barriers to entry and least preparation needed and Five indicating the most training and preparation needed.

The occupations related to IT have relatively high barriers to entry, with the vast majority of jobs (86%) in these occupations at a Job Zone level 4. Another 11% are at Job Zone level 3, with 3% at level 5. None of the occupations have low barriers to entry (level 1-2).

In-Demand Skills for Critical IT-Related Occupations, Tri-County Region (2022)

SOC	Description	Estimated Annual	Job Zone	In-Demand Skills		
				Necessary (1)	Defining (2)	Distinguishing (3)
15-1252	Software Developers	(43)	Four: Considerable Preparation Needed	Project Management	Software Enginering	Model View Controller
				Workflow Management	Computer Science	Web Applications
					SQL (Programming Language)	NoSQL
					Java (Programming Language)	Extensible Markup Language
					Agile Methodology	Software Design
15-1232	Computer User Support Specialists	(34)	Four: Considerable Preparation Needed	Customer Support	Technical Support	Microsoft Windows 7
				Computer Science	CompITA A+	Technical Assistance
				Project Management	Operating Systems	Software Installation
					Computer Hardware	End-User Training and Support
					Active Directory	**Network Troubleshooting**
15-2051	Data Scientists	(9)	Four: Considerable Preparation Needed	Project Management	Data Analysis	Advanced Analytics
				Workflow Management	SQL (Programming Language)	Statistical Modeling
				SAP Applications	Business Intelligence	Big Data
				Finance	Computer Science	Data Governance
				Data Management	Data Science	Predictive Analytics
15-1221	Computer and Information Research Scientists	(5)	Five: Extensive Preparation Needed	Project Management	Data Analysis	
				New Product Development	Computer Science	
				Data Science	**Artificial Intelligence**	
				Statistics	**Algorithms**	
				Java and C++ (Prog. Language)	**Python (Programming Language)**	

Source: Lightcast, O*Net

Note: Bolded Skills indicate that they are correlated with an increase in pay

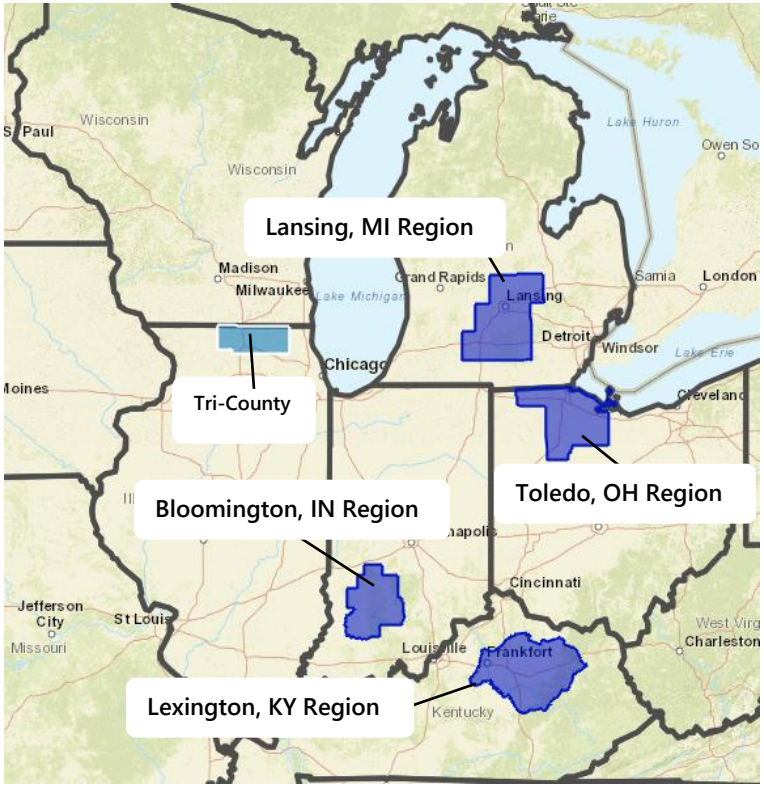
(1) The specialized skills required for that job and relevant across other similar jobs. An employee needs these skills as building blocks to perform the more complex Defining Skills.

(2) The day-to-day tasks and responsibilities of the job. An employee needs these skills to qualify for and perform successfully in this occupation.

(3) The advanced skills that are called for occasionally. An employee with these skills is likely more specialized and able to differentiate themselves from others in the same role.

APPENDIX C: ASPIRATIONAL REGION PROFILES

Benchmarking the Tri-County Region against "aspirational regions" with successful emerging industry clusters is useful for understanding the Tri-County Region's competitive strengths and weaknesses and devising strategies that promote the growth of each cluster. One aspirational region was selected for each of the four emerging industry clusters. These regions were selected to exemplify success in each cluster, while also being comparable to the Tri-County Region in terms of size, general location, and assets. The analysis prioritized secondary metros in the Midwest that are satellites of major metros, as the Tri-County Region is to the Chicago metro and avoided selecting multiple metros in the same state to offer variety. All aspirational regions have been successful in attracting recent investment in their respective emerging industry clusters. Regions are defined as follows and shown on the map at right:



- **Electric Vehicles: Lansing, MI Region**
  Michigan Counties: Calhoun, Clinton, Eaton, Ingham, Jackson, Shiawassee
- **Renewable Energy: Toledo, OH Region**
  Ohio Counties: Fulton, Hancock, Lucas, Ottawa, Sandusky, Seneca, Wood
- **Innovative Agriculture: Lexington, KY Region**
  Kentucky Counties: Anderson, Bath, Bourbon, Clark, Estill, Fayette, Fleming, Franklin, Harrison, Jessamine, Madison, Menifee, Montgomery, Nicholas, Powell, Rowan, Scott, Woodford
- **IT Innovation: Bloomington, IN Region**
  Indiana Counties: Daviess, Greene, Lawrence, Martin, Monroe, Owen

In selecting aspirational regions, it was important to distinguish between R&D versus production, i.e., regions where innovative technology is being invented and developed versus regions where such technology is being produced and manufactured. The Tri-County Region has historically been and continues to be a manufacturing region; the manufacturing sector comprises the greatest share of both the region's employment base and its gross regional product (GRP). Therefore, the Tri-County Region is well positioned to attract further manufacturing investment. Conversely, the Tri-County Region lacks major research institutions and a strong concentration of research occupations and would be less competitive than other regions that are established

hotbeds of innovation. Accordingly, this analysis of aspirational regions focuses on manufacturing-oriented regions where new technologies are produced at scale, rather than those where emerging technologies are initially developed.

Electric Vehicles | Lansing, MI Region

Michigan has historically been a hub for the automobile industry, and the state as a whole has been successful in attracting recent Electric Vehicles industry investment. The two major sub-categories of production facilities in this cluster are EV battery production facilities and EV assembly plants. In Michigan, the assembly plants tend to be clustered in Detroit aligned with the original footprint of the auto industry while the battery plants are more dispersed across the state. Lansing was selected as an aspirational region given its position as a satellite of Detroit, comparable to the Tri-County Region's position as a satellite of Chicago.

Recent investments in the Lansing area include:

- Lansing, MI: $2.6B GM investment in EV battery facility. Joint venture with LG Energy Solutions to build Ultium Cells battery cell mfg site. 1,700 jobs to be created.
- Marshall Township, MI: - $3.5B BlueOval Battery Park Michigan. Lithium-ion battery plant on a mega site. 2,500 jobs to be created.

Compared to the Lansing Region, the Tri-County Region has:

- a somewhat smaller population that is expected to grow rather than decline as in Lansing
- a slightly higher proportion of working-age population
- a slightly higher proportion of retirement-age population
- about a third as many Automotive Sector jobs that make up a smaller share of the overall economy
- higher average earnings in the Automotive Sector
- a smaller share of Automotive Sector employment in Electric Motor and Battery Manufacturing (1% in the Tri-County Region versus 11% in the Lansing Region)
- higher FDI attractiveness
- a lower rate of STEM graduates
- higher office availability rate and higher office rents
- higher industrial availability rate and lower industrial rents

Sources:

- https://techcrunch.com/2023/08/16/tracking-the-ev-battery-factory-construction-boom-across-north-america/
- https://www.mlive.com/public-interest/2023/05/see-where-billon-dollar-electric-vehicle-projects-are-landing-in-michigan.html
- https://www.americanprogress.org/article/gm-ev-and-battery-investment-in-michigan/
- https://www.cnbc.com/2023/01/05/map-which-states-will-build-the-most-ev-batteries-in-2030.html

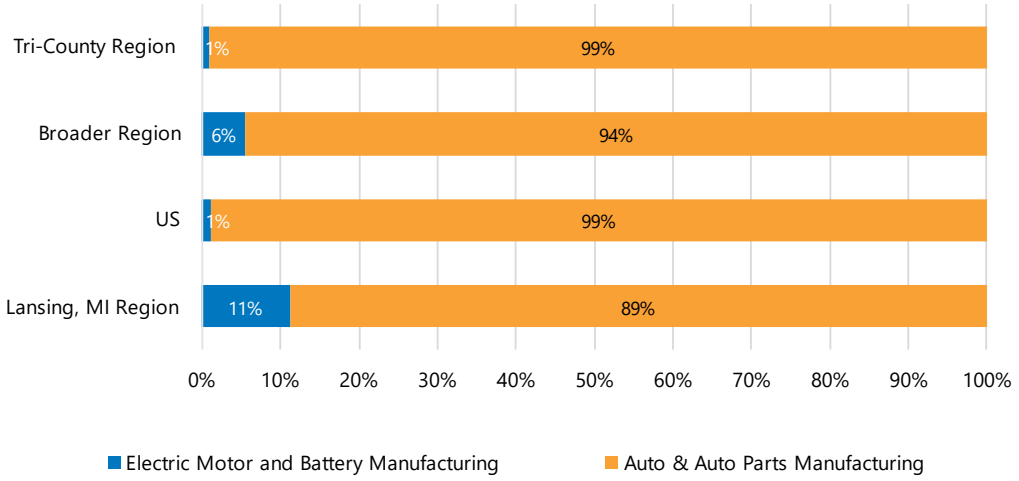
Cluster Analysis

Lansing, MI Aspirational Geography Summary

Region	Total Population	Projected Population Growth 2022-2027	% of Population Age 25-55	% of Population Age 55-65	Automotive Sector Jobs	Automotive Sector Share of Total Jobs	Average Earnings in Automotive Sector
Tri-County Region	649,826	1.2%	37.4%	13.8%	4,432	1.7%	$93,851
Broader Region	1,664,522	-1.3%	37.1%	13.5%	6,325	0.9%	$92,068
United States	334,161,482	2.6%	39.0%	12.7%	746,010	0.4%	$94,042
Lansing, MI Region	832,810	-1.4%	36.9%	12.8%	13,988	3.9%	$86,112

Source: Lightcast

Industry Mix of Automotive Cluster, 2022 (Job Share)

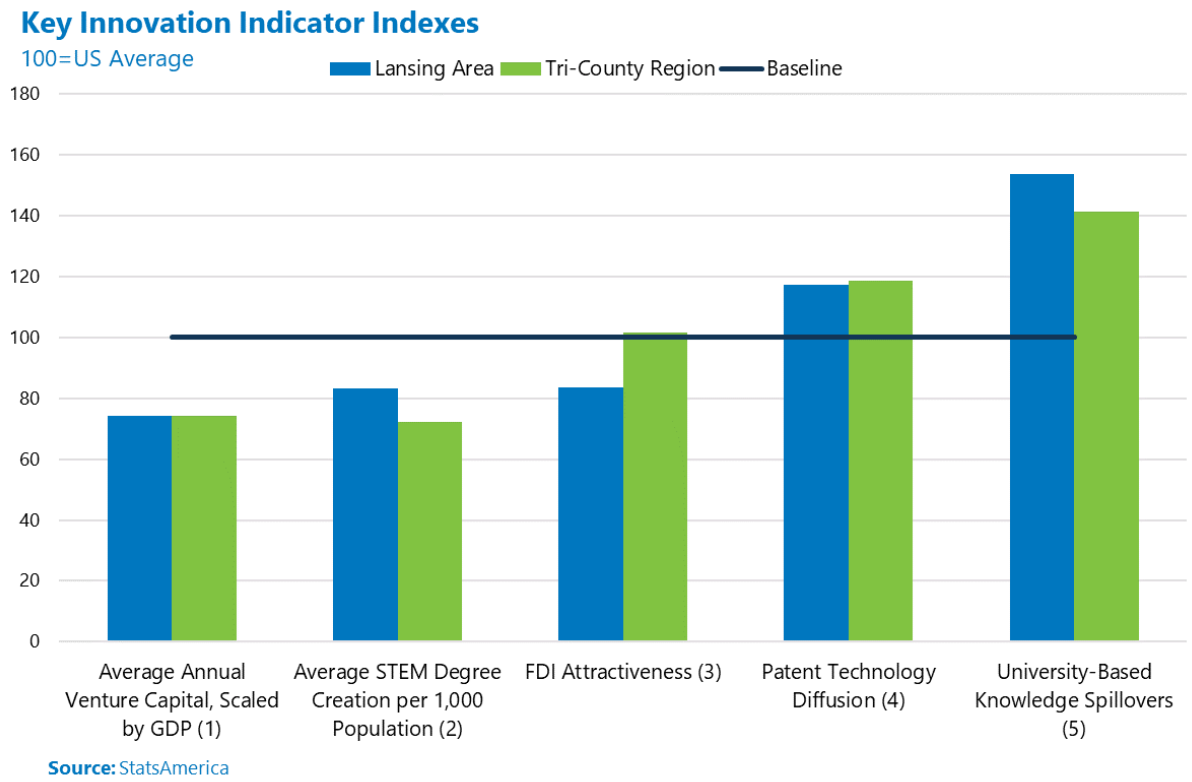


Source: Lightcast, Camoin Associates

The Automotive cluster plays a critical role in the Lansing Region's economy

- The cluster makes up 3.9% of the region's total employment, compared to 1.7% in the Tri-County Region
- Compared to the Tri-County Region, the broader Region, and the United States, Lansing's Automotive cluster has a higher share of employment in Electric Motor and Battery Manufacturing, primarily in the Motor and Generator Manufacturing industry
- Lansing has a similar age breakdown as the Tri-County Region, with a similar share of the population of prime working age (25-55) and slightly lower share of the population that is likely to retire soon (55-65
- Average earnings in the Automotive sector are lower in Lansing than in the Tri-County Region, Broader Region, and US, averaging $86,112 per year

Innovation and Investment



Source: StatsAmerica

Note: A value of 100 is equal to the US Baseline. Therefore, values above 100 indicate the region performs better than the nation, while values under 100 indicate the region underperforms the national average.

(1) Venture capital funding, averaged over 5 years and scaled by the region's average GDP

(2) The number of STEM degree graduates (at the bachelor's, master's and doctorate level) per 1,000 individuals from colleges and universities in the region, averaged across the last three years available.

(3) Measures the degree to which foreign or domestic companies are investing in the region relative to the US average.

(4) Measures the degree to which a technology spreads and is adopted. It is based on a region's volume of patents and the technology classes of those patents.

(5) Calculated using university R&D spending and the distance between the university and the region selected. It incorporates R&D spending in engineering, geosciences, life sciences, math and computer science, and physical science. Higher scores indicate regions close to universities with high R&D spending in science and engineering.

Lansing is strongest in Patent Technology Diffusion and University-Based Knowledge Spillover indexes, scoring well above the national baseline on both. This indicates that Lansing has a high volume of high-tech patents and sits in close proximity to universities with strong R&D in science and engineering.

Lansing performs slightly better than the Tri-County Region at STEM Degree creation but is less attractive to FDI.

Slightly over half of Lansing's foreign investments in the automotive sector was for electric vehicle expansion, with one EV-specific investment of $12.6 million from Eaton (Ireland) in June of 2023.

Overall, the Automotive sector has seen relatively little foreign investment activity in Lansing, with a total of $23.3 million since 2017. There were no investments from entities in other states in the US during this time frame.

Foreign Direct Investment in Automotives Sector, Lansing, MI Region (2017-2023)

Investing Company	Date	Investing Country	Destination County	Subsector	Jobs Created	Capital Investment ($M)
Foreign Investments						
Electric Vehicles					**34**	**$12.6**
Eaton	June 2023	Ireland	Calhoun County (MI)	Power transmission	34	$12.6
General Automotives					**77**	**$10.7**
Bleistahl North America	May 2022	Germany	Calhoun County (MI)	Motor vehicle transmission & power train parts	69	$8.7
Denso	June 2019	Japan	Calhoun County (MI)	Other motor vehicle parts	8	$2.0
				Total	**111**	**23**

Source: fDi Markets, from the Financial Times

Real Estate

Compared to the Lansing Region, the Tri-County Region has a significantly larger inventory of flex and industrial space and a smaller inventory of office space.

Tri-County Region office space has a higher availability rate and commands a higher average rent.

Industrial space availability is constrained in the Lansing Region with an availability rate of 2.9% compared to 5.8% in the Tri-County Region.

Industrial and flex space rents are slightly higher in the Lansing Region than they are in the Tri-County Region, though well below US averages.

Office Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,245	14,614,644	1,382,633	9.5%	$18.89
Broader Region	3,112	37,759,856	4,146,891	11.0%	$19.36
Lansing Region	1,664	25,485,176	1,593,039	6.3%	$15.47
US	348,936	8,421,890,055	1,421,468,468	16.6%	$28.28

Source: Costar

Flex Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	134	5,344,223	371,458	6.9%	$8.67
Broader Region	418	13,819,089	828,041	6.0%	$9.85
Lansing Region	88	1,441,381	99,623	6.9%	$10.83
US	48,132	1,874,999,663	166,874,970	8.9%	$18.16

Source: Costar

Industrial Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,657	77,132,848	4,552,667	5.8%	$6.02
Broader Region	4,568	252,201,183	18,262,473	7.0%	$5.85
Lansing Region	1,745	52,444,511	1,644,825	2.9%	$6.85
US	429,430	16,728,603,964	1,392,251,875	8.3%	$11.04

Source: Costar

Renewable Energy | Toledo, OH Region

The Toledo region, located in northwest Ohio about 70 miles southwest of Detroit has a high concentration of solar manufacturing. The region's history in glassmaking (Toledo is nicknamed "Glass City") makes it a logical fit for solar panel manufacturing. First Solar and Toledo Solar are leading companies in the region's solar industry with recent plans for expansion and investment.

First Solar will create a dedicated research and development innovation center to advance thin film technologies. The new facility in Perrysburg will also host a pilot manufacturing line for thin film PV modules. The new facility is expected to be completed in 2024 and will be co-located near First Solar's existing manufacturing plant. Toledo Solar was a partner on the team that recently won a proposal to establish a Cadmium Telluride Accelerator Consortium with a funding from a $20M program that was established by the U.S. Department of Energy's Solar Energy Technologies Office to hasten the development of cheaper, more efficient cadmium telluride (CdTe) solar cells.

The two companies' growth also attracts other businesses to Ohio. NSG Pilkington opened a new float glass line in Luckey in 2020, creating about 150 new jobs. Ice Industries announced last year that it will build a 150,000-square-foot plant in Bowling Green to make steel back rails for solar panels, providing about 120 new jobs.

Compared to the Toledo Region, the Tri-County Region has:

- a somewhat smaller population is expected to grow rather at a slightly faster pace
- a slightly higher proportion of working-age population
- a slightly higher proportion of retirement-age population
- fewer Energy & Utilities Sector jobs that comprise a larger share of regional employment
- higher average earnings in the Energy & Utilities Sector
- a substantially smaller share of Energy & Utilities Sector employment in the Professional & Technical Services subsector (12% in the Tri-County Region versus 26% in the Toledo Region)
- higher FDI attractiveness
- a higher rate of STEM graduates
- lower patent technology diffusion and lower university-based knowledge spillovers
- lower office availability rate and higher office rents
- higher industrial availability rate and higher industrial rents

Sources:

- https://spectrumnews1.com/oh/columbus/news/2023/05/06/solar-panel-manufacturing-booming-in-ohio
- https://www.prnewswire.com/news-releases/toledo-solar-announces-investment-for-us-manufacturing-expansion-301627497.html
- https://www.canarymedia.com/articles/solar/thin-film-solar-sparks-a-manufacturing-boom-in-the-midwest
- https://jdrm.com/study/first-solar-breaks-ground-on-1-million-square-foot-facility

Cluster Analysis

Toledo, OH Aspirational Geography Summary

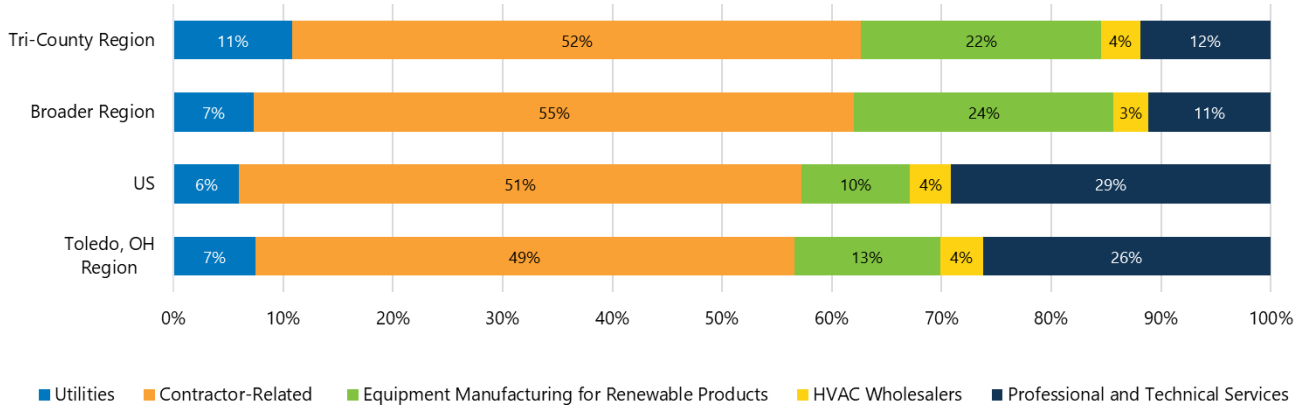
Region	Total Population	Projected Population Growth 2022-2027	% of Population Age 25-55	% of Population Age 55-65	Energy & Utilities Sector Jobs	Energy & Utilities Sector Share of Total Jobs	Average Earnings in Energy & Utilities Sector
Tri-County Region	649,826	1.2%	37.4%	13.8%	9,035	3.5%	$108,983
Broader Region	1,664,522	-1.3%	37.1%	13.5%	23,358	3.3%	$104,540
United States	334,161,482	2.6%	39.0%	12.7%	5,284,391	3.1%	$104,807
Toledo, OH Region	833,812	0.0%	36.7%	13.2%	11,029	2.6%	$100,153

Source: Lightcast

The Toledo Region has similar performance as Tri-County Region in the Energy & Utilities Cluster

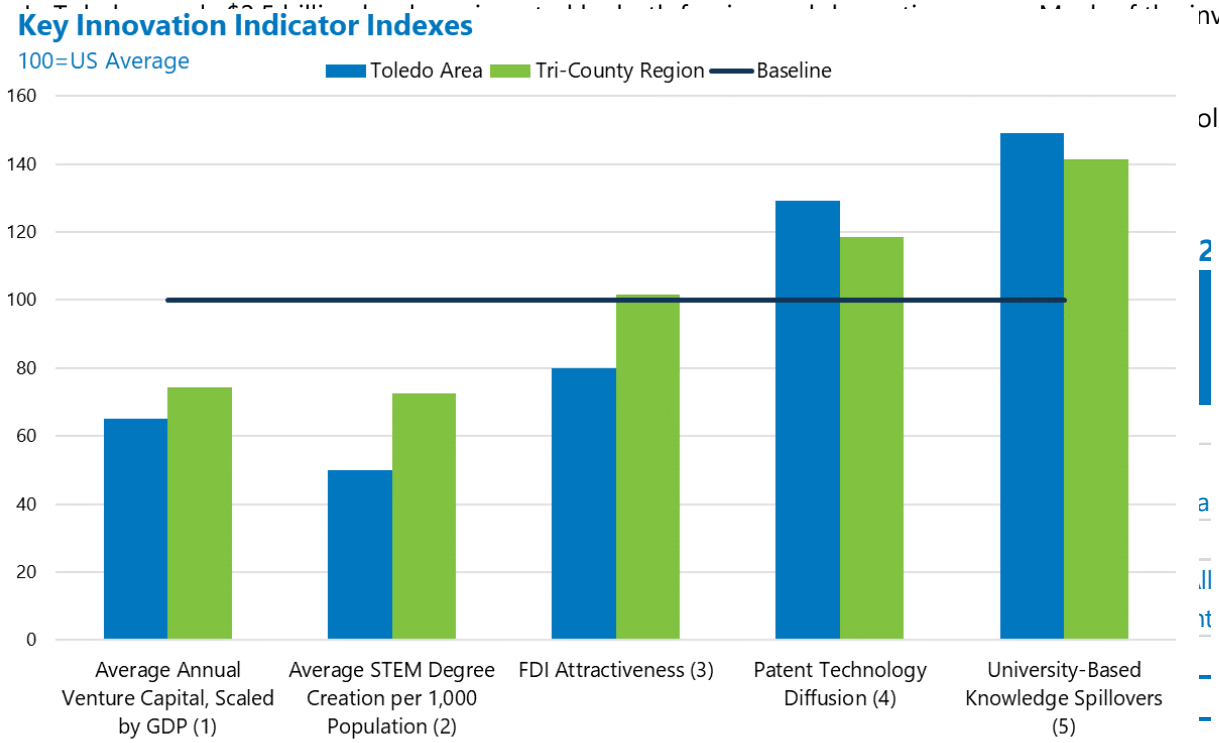
- The cluster makes up 2.6% of the region's total employment, lower than the 3.5% share in the Tri-County Region
- Toledo's industry mix is similar to the United States. Compared to the Tri-County Region and the Broader Region, Toledo has a higher share of related Professional and Technical Services such as Engineering Services or Scientific Consulting and a relatively low share of Equipment Manufacturing for Renewable Products
- Toledo has a similar age breakdown as the Tri-County Region, with a similar share of the population of prime working age (25-55) and likely to retire soon (55-65)

Industry Mix of the Energy & Utilities Cluster, 2022 (Job Share)



Source: Lightcast, Camoin Associates

- Average earnings in the sector are lower in Toledo than in the Tri-County Region but are more similar to the Broader Region and US average, at $100,153 per year



Source: StatsAmerica

Note: A value of 100 is equal to the US Baseline. Therefore, values above 100 indicate the region performs better than the nation, while values under 100 indicate the region underperforms the national average.

(1) Venture capital funding, averaged over 5 years and scaled by the region's average GDP

(2) The number of STEM degree graduates (at the bachelor's, master's and doctorate level) per 1,000 individuals from colleges and universities in the region, averaged across the last three years available.

(3) Measures the degree to which foreign or domestic companies are investing in the region relative to the US average.

(4) Measures the degree to which a technology spreads and is adopted. It is based on a region's volume of patents and the technology classes of those patents.

(5) Calculated using university R&D spending and the distance between the university and the region selected. It incorporates R&D spending in engineering, geosciences, life sciences, math and computer science, and physical science. Higher scores indicate regions close to universities with high R&D spending in science and engineering.

Toledo is strongest in Patent Technology Diffusion and University-Based Knowledge Spillover indexes, scoring well above the national baseline on both. This indicates that Toledo has a high volume of high-tech patents and sits in close proximity to universities with strong R&D in science and engineering. Toledo also performs better than the Tri-County Region in both of these indexes.

Toledo performs well below baseline for Average Annual Venture Capital, STEM Degree Creation, and FDI attractiveness indexes. The Tri-County Region has an advantage over Toledo on all three of these indexes.

Innovation and Investment

Real Estate

Compared to the Toledo Region, the Tri-County Region has a larger inventory of flex and industrial space and a slightly smaller inventory of office space.

Tri-County Region office space has a slightly lower availability rate and commands a higher average rent.

The industrial space availability rate is similar in the Tri-County Region and the Toledo Region.

Industrial and flex space rents are 60-80% higher in the Tri-County Region as compared to the Toledo Region.

Office Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,245	14,614,644	1,382,633	9.5%	$18.89
Broader Region	3,112	37,759,856	4,146,891	11.0%	$19.36
Toledo Region	1,017	17,996,786	1,964,336	10.9%	$16.10
US	348,936	8,421,890,055	1,421,468,468	16.6%	$28.28

Source: Costar

Flex Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	134	5,344,223	371,458	6.9%	$8.67
Broader Region	418	13,819,089	828,041	6.0%	$9.85
Toledo Region	172	2,596,242	180,872	7.0%	$5.26
US	48,132	1,874,999,663	166,874,970	8.9%	$18.16

Source: Costar

Industrial Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,657	77,132,848	4,552,667	5.8%	$6.02
Broader Region	4,568	252,201,183	18,262,473	7.0%	$5.85
Toledo Region	1,098	48,348,992	2,159,857	4.5%	$3.42
US	429,430	16,728,603,964	1,392,251,875	8.3%	$11.04

Source: Costar

Innovative Agriculture | Lexington, KY Region

The state of Kentucky as a whole has a strong agritech initiative. There has been investment throughout the state, with the Lexington region in particular bringing several strengths, including legacy industries of advanced manufacturing and food and agriculture specialization, a central location within the eastern US, well developed distribution infrastructure, and the University of Kentucky College of Agriculture.

Examples of innovative agriculture businesses in the Lexington region include:

- Alltech (HQ: Nicholasville, KY) – international animal nutrition and crop sciences company
- AppHarvest (Morehead, KY) – high-tech greenhouse startup
- SmartFarm Systems (Nicholasville, KY) – precision irrigation monitoring and control systems
- Neogen (Lexington, KY) – manufacturer of animal and safety products

Compared to the Lexington Region, the Tri-County Region has:

- a somewhat smaller population is expected to grow at a slightly slower pace
- a slightly lower proportion of working-age population
- a slightly higher proportion of retirement-age population
- fewer Food & Agriculture sector jobs that comprise a smaller share of regional employment
- higher average earnings in the Food & Agriculture Sector
- a substantially smaller share of Food & Agriculture Sector employment in the Agricultural Activities subsector (22% in the Tri-County Region versus 42% in the Lexington Region)
- higher venture capital per dollar of GDP and higher FDI attractiveness
- a higher rate of STEM graduates
- lower patent technology diffusion and lower university-based knowledge spillovers
- a higher office availability rate and slightly higher office rents
- a higher industrial availability rate and lower industrial rents

Sources:

- https://agritech.ky.gov/Pages/index.aspx
- https://siteselection.com/cc/kentucky/2020/agritech-rises-in-kentucky.cfm
- https://www.lanereport.com/163022/2023/02/neogen-adding-70-jobs-with-6m-expansion-in-lexington/

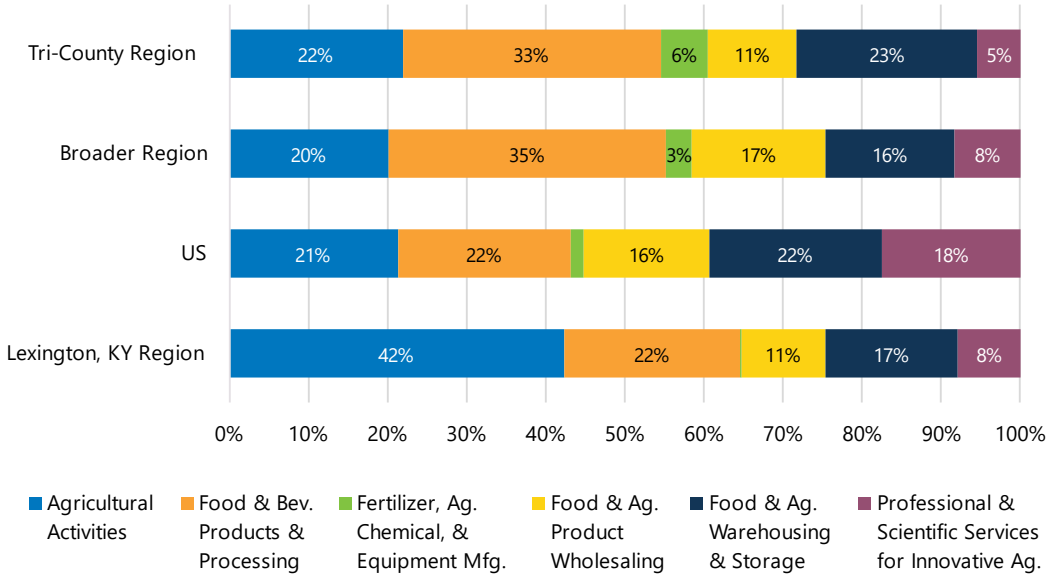
Cluster Analysis

Lexington, KY Aspirational Geography Summary

Region	Total Population	Projected Population Growth 2022-2027	% of Population Age 25-55	% of Popula Age 55-65
Tri-County Region	649,826	1.2%	37.4%	
Broader Region	1,664,522	-1.3%	37.1%	
United States	334,161,482	2.6%	39.0%	
Lexington, KY Region	834,048	1.9%	38.2%	

Source: Lightcast

Industry Mix of Food & Agriculture Cluster, 2022 (Job Share)



Source: Lightcast, Camoin Associates

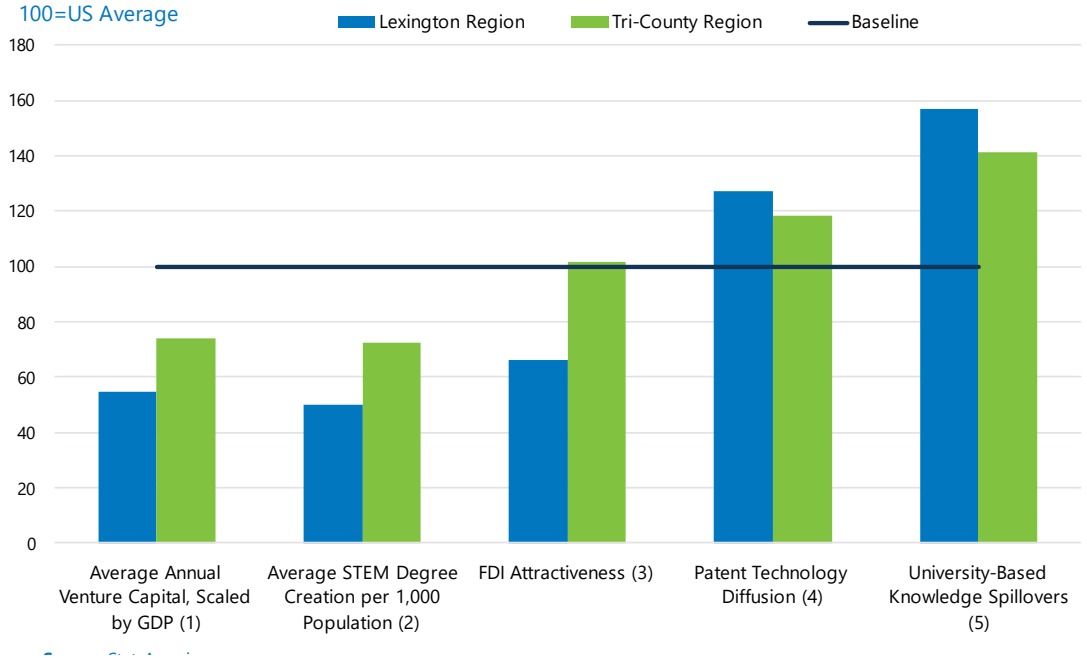
The Food & Agriculture cluster plays a major role in the Lexington Region's economy

- The cluster makes up 6.3% of the region's total employment, lower than the 3.9% share in the Tri-County Region and similar to the Broader Region's 6.5%
- Lexington's cluster has a much larger share of Agricultural Activities than the Tri-County Region, the Broader Region, and the US, with about double the concentration of jobs (42%)
- Lexington has a slightly higher share of the population of prime working age (25-55 years old) and slightly lower share of those likely to retire soon (55-65 years old)
- Average earnings in the sector are lower in Lexington than in the Tri-County Region, the Broader Region, and the US, likely due to its heavy concentration in Agricultural Activities, a lower-wage segment of the cluster

Innovation and Investment

Key Innovation Indicator Indexes

100=US Average



Note: A value of 100 is equal to the US Baseline. Therefore, values above 100 indicate the region performs better than the nation, while values under 100 indicate the region underperforms the national average.

(1) Venture capital funding, averaged over 5 years and scaled by the region's average GDP

(2) The number of STEM degree graduates (at the bachelor's, master's and doctorate level) per 1,000 individuals from colleges and universities in the region, averaged across the last three years available.

(3) Measures the degree to which foreign or domestic companies are investing in the region relative to the US average.

(4) Measures the degree to which a technology spreads and is adopted. It is based on a region's volume of patents and the technology classes of those patents.

(5) Calculated using university R&D spending and the distance between the university and the region selected. It incorporates R&D spending in engineering, geosciences, life sciences, math and computer science, and physical science. Higher scores indicate regions close to universities with high R&D spending in science and engineering.

Lexington is strongest in Patent Technology Diffusion and University-Based Knowledge Spillover indexes, scoring well above the national baseline on both. This indicates that Lexington has a high volume of high-tech patents and sits in close proximity to universities with strong R&D in science and engineering. Lexington also performs better than the Tri-County Region in both of these indexes.

Lexington performs well below baseline for Average Annual Venture Capital, STEM Degree Creation, and FDI attractiveness indexes. The Tri-County Region has an advantage over Lexington on all three of these indexes.

The Lexington Region has received $403.1 million and 909 jobs created since 2017. Six of Lexington's eight investments have been from domestic sources within the US, rather than foreign entities

Foreign Direct Investment in Agriculture Sector, Lexington, KY Region (2017-2023)

Investing Company	Date	Investing Country (State)	Destination County	Subsector	Jobs Created	Capital Investment ($M)
Foreign Investments						
Campari	March 2023	Italy	Anderson County (KY)	Breweries & distilleries	31	161
State-to-State Investments						
Bespoken Spirits	August 2023	California	Lexington-Fayette County (KY)	Breweries & distilleries	16	3.2
Neogen	June 2021	Michigan	Montgomery County (KY)	Animal food	79	9.8
Wilde Brands	September 2020	Colorado	Clark County (KY)	Snack food	50	$9.8
Walmart	September 2018	Arkansas	Franklin County (KY)	Food & beverage Stores	400	$141.5
The Legacy Companies	June 2018	Florida	Bourbon County (KY)	Commercial & service industry machinery	60	$6.7
Independent Stave Company	April 2018	Missouri	Rowan County (KY)	Wood products	220	$66.5
				Total	**856**	**$398.5**

Source: fDi Markets, from the Financial Times

Real Estate

Compared to the Lexington Region, the Tri-County Region has a somewhat larger inventory of flex and industrial space and a smaller inventory of office space.

Tri-County Region has higher availability rates across property types, as compared to the Lexington Region.

Industrial and flex space rents are slightly higher in the Lexington Region than they are in the Tri-County Region, though well below US averages.

Office Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,245	14,614,644	1,382,633	9.5%	$18.89
Broader Region	3,112	37,759,856	4,146,891	11.0%	$19.36
Lexington Region	1,398	21,743,465	1,831,018	8.4%	$17.99
US	348,936	8,421,890,055	1,421,468,468	16.6%	$28.28

Source: Costar

Flex Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	134	5,344,223	371,458	6.9%	$8.67
Broader Region	418	13,819,089	828,041	6.0%	$9.85
Lexington Region	202	4,047,360	251,596	6.0%	$9.02
US	48,132	1,874,999,663	166,874,970	8.9%	$18.16

Source: Costar

Industrial Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,657	77,132,848	4,552,667	5.8%	$6.02
Broader Region	4,568	252,201,183	18,262,473	7.0%	$5.85
Lexington Region	1,390	56,255,415	2,230,821	4.0%	$7.21
US	429,430	16,728,603,964	1,392,251,875	8.3%	$11.04

Source: Costar

IT Innovation | Bloomington, IN Region

Odon, Indiana, located about 40 minutes from Bloomington and 90 minutes from Indianapolis is emerging as a semiconductor hub as a result of Science & CHIPS Act investment. WestGate Technology Park in Odon is home to four semiconductor companies. Indiana was recently selected as one of eight regional semiconductor production hubs, known as "Microelectronics Commons," that received funding awards through the CHIPS for America Defense Fund. These hubs will be responsible for working with member organizations to develop the physical, digital, and workforce infrastructure needed to support microelectronics R&D especially as related to defense applications. The Naval Surface Warfare Center in Crane (adjacent to Odon) will be one of the locations in Indiana's network.

Companies located in WestGate Technology Park account for a combined $300M in investment and 550 new jobs and include the following:

- NHanced Semiconductors (anchor)
- Everspin Technologies
- Trusted Semiconductor Solutions
- Reliable MicroSystems

Compared to the Bloomington Region, the Tri-County Region has:

- over twice the population and is projected to grow rather than lose population
- a higher proportion of working-age population
- a higher proportion of retirement-age population
- double the IT & Related Manufacturing Sector jobs, with those jobs comprising a comparable share of regional employment
- lower average earnings in the IT & Related Manufacturing Sector
- a larger share of IT sector employment in related manufacturing subsectors (37% in the Tri-County Region versus 21% in the Bloomington Region) and a smaller share in related scientific and professional services
- higher venture capital per dollar of GDP and higher FDI attractiveness
- a higher rate of STEM graduates
- lower patent technology diffusion and higher university-based knowledge spillovers
- a higher office availability rate and substantially higher office rents
- a comparable industrial availability rate and higher industrial rents

Sources:

- https://www.semiconductors.org/the-chips-act-has-already-sparked-200-billion-in-private-investments-for-u-s-semiconductor-production/
- https://westgatecrane.com/future-is-very-bright-for-indiana-uplands/
- https://www.nytimes.com/2023/08/06/technology/indiana-chips-act.html
- https://www.insideindianabusiness.com/articles/ground-broken-on-84m-semiconductor-campus-at-westgate
- https://evertiq.com/design/53117

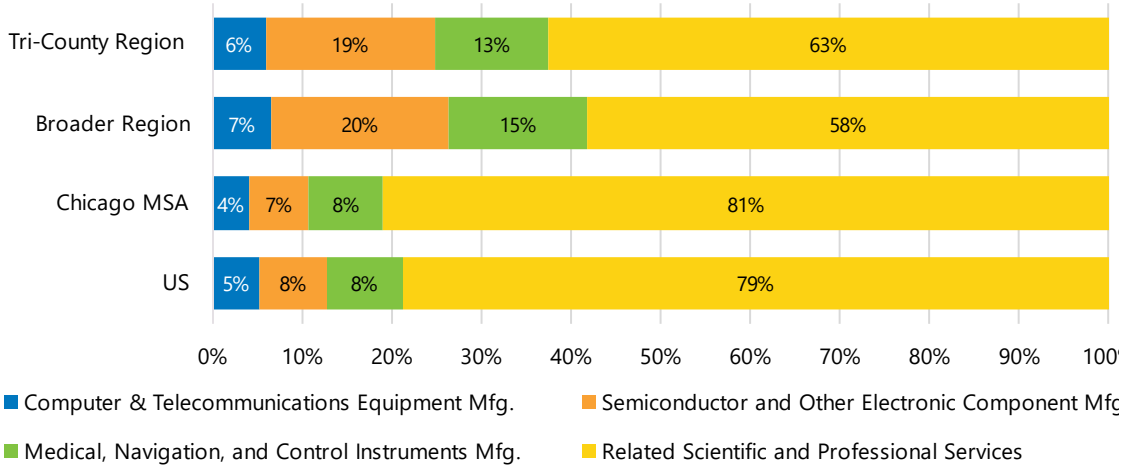
Cluster Analysis

Bloomington, IN Aspirational Geography Summary

Region	Total Population	Projected Population Growth 2022-2027	% of Population Age 25-55	% of Population Age 55-65	IT & Related Manufacturing Sector Jobs	IT & Related Manufacturing Sector Share of Total Jobs	Average Earnings in IT & Related Manufacturing Sector
Tri-County Region	649,826	1.2%	37.4%	13.8%	2,670	1.0%	$98,366
Broader Region	1,664,522	-1.3%	37.1%	13.5%	9,161	1.3%	$98,021
United States	334,161,482	2.6%	39.0%	12.7%	5,195,458	3.1%	$152,466
Bloomington, IN Region	277,607	-4.9%	34.9%	12.0%	1,399	1.1%	$171,954

Source: Lightcast

Industry Mix of the IT & Related Manufacturing Sector, 2022 (Job Share)



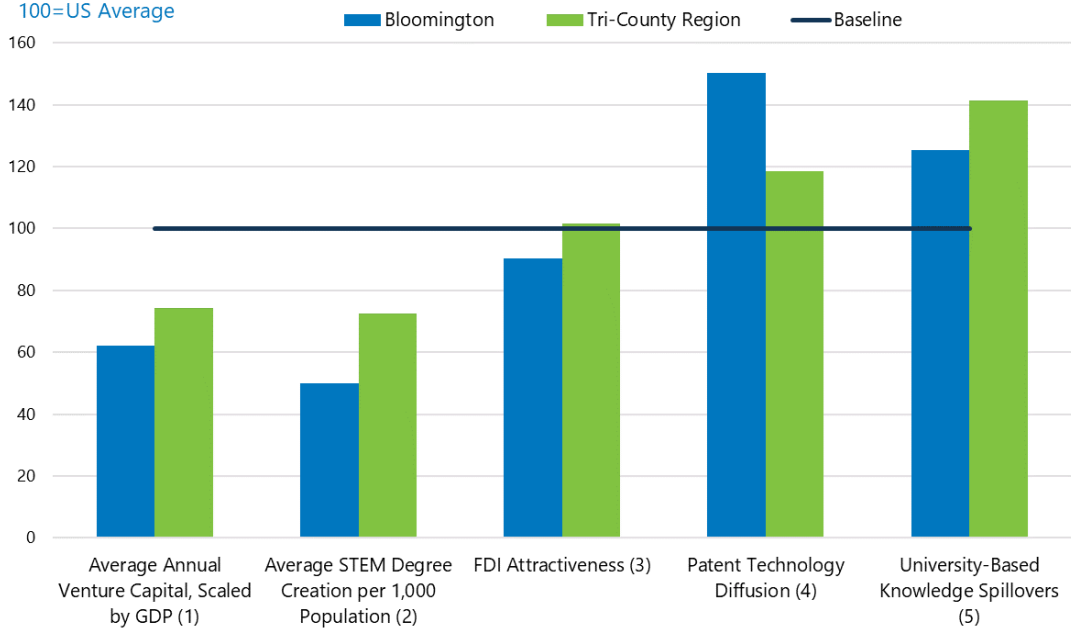
Source: Lightcast, Camoin Associates

- The cluster makes up 1.1% of the region's total employment, similar to the Tri-County Region and The Broader Region, but lower than the US average
- Bloomington's industry mix is similar to the United States. Compared to the Tri-County Region and the Broader Region, Bloomington has a higher share of related Professional and Technical Services, driven by Computer Systems Design and Custom Computer Programming Services
- Bloomington has a smaller share of prime working-aged population (25-55 years old) and a smaller share of the population likely to retire soon (55-65 years old)
- Average earnings in the sector are significantly higher in Bloomington than in the Tri-County Region, the Broader Region, and the United States, at $171,954 per year compared to $98,366 in the Tri-County Region

Innovation and Investment

Key Innovation Indicator Indexes

100=US Average



Source: StatsAmerica

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(4) Measures the degree to which a technology spreads and is adopted. It is based on a region's volume of patents and the technology classes of those patents.

(5) Calculated using university R&D spending and the distance between the university and the region selected. It incorporates R&D spending in engineering, geosciences, life sciences, math and computer science, and physical science. Higher scores indicate regions close to universities with high R&D spending in science and engineering.

Bloomington is strongest in Patent Technology Diffusion and University-Based Knowledge Spillover indexes, scoring well above the national baseline on both. This indicates that Bloomington has a high volume of high-tech patents and sits in close proximity to universities with strong R&D in science and engineering. Bloomington performs better than the Tri-County Region on the Patent Technology Diffusion index, but slightly underperforms the Tri-County Region on the University-Based Knowledge Spillovers index.

Bloomington performs well below baseline for the Average Annual Venture Capital and STEM Degree Creation index and slightly below baseline on the FDI Attractiveness index.

The Bloomington Region has received $829.5 million and 2,960 jobs created since 2017. Nine of the ten investments into Bloomington's IT Sector have been from domestic sources, primarily in the Semiconductors & Other Electric Components subsector.

Foreign Direct Investment in Information Technology Sector, Bloomington IN Region (2017-2023)

Investing Company	Date	Investing Country (State)	Destination County	Subsector	Jobs Created	Capital Investment ($M)
Foreign Investments						
Infosys Technologies	May 2017	India	Greene County (IN)	Other (Software & IT services)	2000	$350.9
State-to-State Investments						
SkyWater Technology	November 2021	Minnesota	Daviess County (IN)	Semiconductors & other electronic components	113	$95.2
BrightVolt	September 2017	Washington	Greene County (IN)	Batteries	5	$1.1
The Charles Stark Draper Laboratory (Draper)	March 2023	Massachusetts	Daviess County (IN)	Other (Space & defence)	123	$29.5
Reliable MicroSystems	November 2022	Tennessee	Daviess County (IN)	Semiconductors & other electronic components	61	$7.3
Trusted Semiconductor Solutions	November 2022	Minnesota	Daviess County (IN)	Semiconductors & other electronic components	40	$34.0
EverSpin Technologies	November 2022	Arizona	Daviess County (IN)	Semiconductors & other electronic components	35	$62.0
NHanced Semiconductors	November 2022	Illinois	Daviess County (IN)	Semiconductors & other electronic components	413	$236.0
Halvik	September 2022	Virginia	Greene County (IN)	programming services	70	$6.6
MetroStar	February 2022	Virginia	Monroe County (IN)	Custom computer programming services	100	$6.9
				Total	**2,960**	**$829.5**

Source: fDi Markets, from the Financial Times

Real Estate

Compared to the Bloomington Region, the Tri-County Region has a significantly larger inventory of space across office, flex, and industrial property types.

The Tri-County Region also has higher availability rates across property types, with the highest spread for office space and lowest spread for industrial space.

Office rents are about 50% lower in the Bloomington Region compared to the Tri-County Region. Industrial rents are about 12% lower.

Flex space comprises a small proportion of space inventory in the Bloomington Region. Rates for flex space are about 24% higher than in the Tri-County Region.

Office Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,245	14,614,644	1,382,633	9.5%	$18.89
Broader Region	3,112	37,759,856	4,146,891	11.0%	$19.36
Bloomington Region	346	7,781,491	316,107	4.1%	$11.86
US	348,936	8,421,890,055	1,421,468,468	16.6%	$28.28

Source: Costar

Flex Space Market Fundamentals, 2023Q3

	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	134	5,344,223	371,458	6.9%	$8.67
Broader Region	418	13,819,089	828,041	6.0%	$9.85
Bloomington Region	68	942,557	45,714	4.8%	$10.72
US	48,132	1,874,999,663	166,874,970	8.9%	$18.16

Source: Costar

Industrial Space Market Fundamentals, 2023Q3

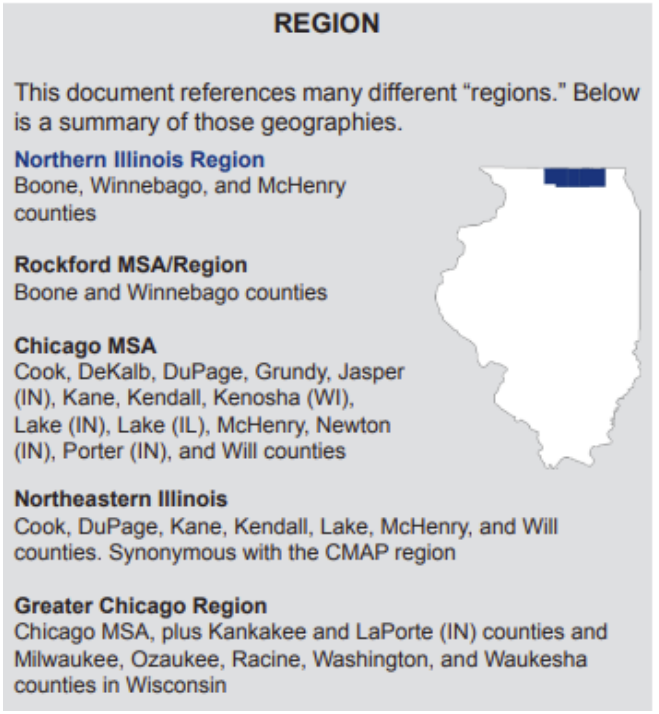
	Inventory Bldgs	Inventory SF	Total Available SF	Availability Rate	Rent per SF
Tri-County Region	1,657	77,132,848	4,552,667	5.8%	$6.02
Broader Region	4,568	252,201,183	18,262,473	7.0%	$5.85
Bloomington Region	218	12,167,345	689,684	5.7%	$5.32
US	429,430	16,728,603,964	1,392,251,875	8.3%	$11.04

Source: Costar

APPENDIX D: TRI-COUNTY REGION CEDS SUMMARY

CEDS Geography

1. Second CEDS for Boone and Winnebago Counties
2. First CEDS for McHenry County-McHenry joined the Northern Region.
    a. Investing in Manufacturing Communities Partnership federal grant applications connected a 4- and 6-county region and directly caused McHenry County to be added to the Northern CEDS.
3. Rockford MSA in Boone and Winnebago counties
4. Chicago MSA in McHenry County
5. Peer Comparison Groups
    a. Canton, OH
    b. Dayton, OH
    c. Fort Wayne, IN
    d. Peoria, IL
    e. Janesville-Beloit, WI



Clusters, Key Companies and Development Strategies Related to the Emerging Clusters

1. Advanced Manufacturing
    a. Automotive
        i. Key Companies-Fiat Chrysler Automobiles (FCA) and its suppliers; Accuride Wheel End Solutions, Bergstrom, Charter Dura-Bar
        ii. Development strategies are focused on maintaining FCA's successful operation of its Belvidere facility – including providing incentives and responsive government permitting for expansions and upgrades and providing a robust workforce pipeline – and identifying additional supplier opportunities. Additionally, the region's other automotive suppliers not related to FCA show potential for supplying other Original Equipment Manufacturers in the Midwest.
    b. Aerospace and Defense Production
        i. Key Companies-UTC Aerospace Systems, Woodward, GE Aviation, B/E Aerospace
        ii. Development strategies are focused on bolstering the cluster's workforce – particularly within engineering and related fields – and assisting small and mid-sized manufacturers in joining or expanding their participation in the supply chain.

c. Production Technology and Heavy Machinery
    i. Key Companies-Unicarriers Americas, Taylor Company, Mechanical Tool and Engineering, Parker Hannifin
    ii. The region's manufacturers serve a variety of industries in this cluster – including agricultural and construction equipment, industrial machinery and process equipment and components. It also includes a particular expertise in hydraulics.
    iii. Development strategies are focused on expanding the hydraulics sector, promoting export growth to avoid domestic downturns, and bolstering the region's workforce.
d. Metalworking Technology
    i. Key Companies-Ingersoll Cutting Tool, Ingersoll Machine Tools, Greenlee Textron, Regal Cutting Tool.
    ii. Development strategies are focused on connecting companies in Boone and Winnebago counties with the Metal cluster in McHenry County and northeastern Illinois, promoting export growth to avoid domestic downturns, and bolstering the region's workforce.
e. Metal and Metal Products
    i. Key Companies-Scot Forge, Knaack Manufacturing, Rockford Toolcraft, Southern Imperial, Franklin Display Group
    ii. Development strategies are focused on implementing the CMMC plan, better connecting the rest of the Northern Illinois Region with those metal manufacturers and assisting smaller metal products manufacturers with diversifying into new industries.
f. Plastic Products
    i. Key Companies-AptarGroup, JL Clark, Filtertek, Fabrik Molded Plastics
    ii. Development strategies are focused on connecting existing plastics companies with supply chains in the region and attracting additional plastics manufacturers to grow the cluster.
g. Chemical Products
    i. Key Companies-Chemtool, Rust-oleum, Rock Valley Oil and Chemical.
    ii. This is a cluster targeted for more study to understand how it fits into the regional economy and what opportunities exist. It is particularly strong in McHenry County

2. Transportation Logistics and Distribution
    a. Key Companies- Packaging Coordinators, UPS, Lowe's, FedEx
    b. Development strategies include the identified I-90 interchange projects, developing logistics parks and investing in the airport and the region's rail lines.
3. Agriculture and Food Processing
    a. Production Agriculture
        i. Development strategies include farmland preservation efforts, use of zoning and land-use planning to protect agricultural areas, seeking opportunities for FFA programs, coordinating distribution of products to customers in surrounding urban areas, and supporting business development of vital farm services to ensure that the infrastructure for farm success remains in place in the region.

b. Food Processing and Manufacturing
    i. Key Companies-General Mills, Mondelez International, Dean Foods
    ii. Development strategies include identifying buildings that could be converted to food-grade (or assisting developers with build-to-suit projects), assisting existing companies with expansion needs, and improving rail and highway access for current and potential employers.

Assets

1. Tax Code
    a. Lack of an inventory tax and personal property tax benefits the warehousing/distribution and manufacturing sectors.
    b. While parts of the region have high property tax rates, relative lower land values reduce business costs.
2. Transportation
    a. The top asset noted in the previous CEDS was the region's "location in the central US at the junction of major highways, rail, and air with proximity to Chicago, Madison and Milwaukee."
        i. I-90 (the Jane Addams Memorial Tollway) runs through the entire region, connecting it to Chicago and the rest of the Midwest.
    b. The region is also home to Chicago Rockford International Airport (RFD),
        i. The 28th largest cargo airport in the country.
        ii. UPS's second-largest air hub in North America
        iii. 10,000-foot runway can land any aircraft flying today
    c. The region has significant rail assets, all of which augment regional freight movement capacity.
        i. Several Class 1 railroads
        ii. A short-line railroad
        iii. Union Pacific Global III Intermodal Facility in Rochelle is south of the region but is a key asset.
3. Land and Location
    a. The Northern Illinois Region has ample land suited for and zoned for industrial and commercial development.
        i. These parcels are placed near major transportation corridors, and accessible to the region's workforce.
    b. The 2010-15 CEDS identified "proximity to Chicago, Madison, and Milwaukee" as an asset.
    c. The region has active Farm Bureaus, conservation organizations and relationships with the U.S. Department of Agriculture that help preserve farmland.
        i. Region's cities provide a strong, accessible market for locally grown goods.
        ii. Larger markets such as Chicago, Madison, and Milwaukee are easily reachable by highway.
        iii. Support for locally grown foods, as well as interest in urban agriculture and farmers markets, are also strengths.
4. Quality of Life - These assets grow with the inclusion of McHenry County
    a. Affordable housing and real estate,

   b. Low cost of living
   c. Parks, rivers, and green space
5. Workforce and Education
   a. McHenry County stakeholders ID the local workforce combined with the ability to pull from the larger Chicago regional labor pool, when necessary, as assets.
   b. The two community colleges – McHenry County College (MCC) and Rock Valley College (RVC) – run training programs geared toward manufacturing, healthcare, and other key sectors within the region.
   c. Belvidere School District 100 has developed the STEM-based Washington Academy, and Huntley School District 158 has a Medical Academy. These programs can serve as models for the region to develop its workforce.

Trends

1. Graduation rates at Rockford Public Schools rose from 62% in 2012 to 68% in 2014.
2. Belvidere North, Hononegah, and South Beloit High Schools named in U.S. News and World Report's best high schools rankings.
3. The percentage of high school graduates living in the region has increased faster than state and national percentages, now slightly ahead of the national percentage.
4. Significant redevelopment of downtown Rockford buildings is underway, including planned hotel, sports complex, and housing units.

ACRES OF FARMLAND (Table 7)

	2002	2007	2012
Boone County	146,940	137,162	134,759
McHenry County	233,458	215,584	234,211
Winnebago County	191,455	183,615	182,905
Northern Illinois Region	571,853	536,361	551,875

Source: USDA Agricultural Census 2002-12

EDUCATION ATTAINMENT INDICATORS (Table 4)

Indicator	Time Period	Northern Illinois Region	Greater Chicago Region	State of Illinois
Some College (no Degree) per 10,000 Population*	**2013**	2,529.8	2,191.7	2,191.3
	2010-2013 Trend	6.5%	3.6%	0.8%
Associate Degree per 10,000 Population*	**2013**	756.8	793.9	726.3
	2010-2013 Trend	-1.8%	1.8%	0.8%
College Graduates per 10,000 Population*	**2013**	2,551.7	2,844.1	3,177.8
	2010-2013 Trend	-1.9%	2.2%	0.8%

**Based on population 25 years of age and older, Source: EASI Analytics, Inc., 2013.*

CORE TRENDS (Table 1)

Indicator	Time Period	Northern Illinois Region	Greater Chicago Region	State of Illinois
Population	2014	649,694	11,544,825	12,880,580
	2010-2014 Trend	-1.30%	0.90%	0.40%
Employment	2014	311,607	6,923,233	7,557,969
	2010-2014 Trend	3.40%	5.90%	4.80%
Unemployment Rate	2010	12.7%	10.2%	10.5%
	2014	7.8%	6.9%	7.2%
	2010-2014 Trend	-4.9	-3.3	-3.3
Per Capita Income (2009 $)	2014	$40,914	$45,772	$41,479
	2010-2014 Trend	7.4%	9.2%	7.7%
GRP per capita (2009 $)	2014	$37,239	$60,591	$56,810
	2010-2014 Trend	5.1%	5.6%	5.8%

BUSINESS VITALITY METRICS FOR THE NORTHERN ILLINOIS REGION AND PEERS (Table 13)

Region/Metropolitan Area	New Business Starts[1] per 10,000 Population (2013)	Expansion Starts[2] per 10,000 Population (2013)
Northern Illinois	37.6	3.2
Canton, OH	43.8	3.6
Dayton, OH	29.5	3.5
Fort Wayne, IN	42.3	3.7
Peoria, IL	33.6	4.3
Janesville-Beloit, WI	31.0	3.3

PROGRAM COMPLETIONS (Table 6)

PROGRAM	2010	2013	CHANGE
Health Professions	1,330	1,736	30.5%
Business, Management and Related Services	380	562	47.9%
Computer and Information Services	58	155	167.2%
Mechanic and Repair Technologies	56	136	142.9%
Precision Production	40	50	25.0%
Engineering and Engineering Technologies	34	37	8.8%
Agriculture	14	33	135.7%
All Programs	**3,982**	**5,022**	**26.1%**

Source: Integrated Postsecondary Education Data System database.

BUSINESS VITALITY INDICATORS (TABLE 3)

Indicator	Time Period	Northern Illinois Region	Greater Chicago Region	State of Illinois
Business Establishments	**2013**	38,143	658,209	756,404
	2010	45,568	792,777	920,906
Startups per 10,000 Population	**2013**	36.3	39.6	38.9
	2010	159.7	158.9	158.8
Closures per 10,000 Population	**2013**	98.1	101.1	102.0
	2010	39.8	41.9	40.4
Patents per 10,000 Population	**2013**	5.1	3.9	3.6
	2010	3.3	3.1	2.8

Source: Nation Employment Time Series (NETS) database, 2015; Patent information taken from the U.S. Patent and Trademark Office (http://www.uspto.gov/web/offices/ac/ido/oeip/taf/countyall/usa_county_gd.htm), 2013.

MEDIAN HOME PRICE 2015 YTD THROUGH SEPTEMBER (Table 8)

BOONE COUNTY	MCHENRY COUNTY	WINNEBAGO COUNTY	CHICAGO METRO
$120,000	$176,000	$88,000	$213,500

Source: Illinois Association of Realtors

WORKING-AGE POPULATION TRENDS (Table 5)

Indicator	Time Period	Northern Illinois Region	Greater Chicago Region	State of Illinois
18 to 24 Years of Age	2014	57,147	1,087,447	1,256,307
	2010-2014 Trend	7.6%	1.4%	0.8%
25 to 44 Years of Age	2014	157,550	3,170,247	3,464,460
	2010-2014 Trend	-7.7%	-0.6%	-1.0%
45 to 64 Years of Age	2014	185,253	3,019,391	3,377,759
	2010-2014 Trend	1.3%	1.9%	0.8%

Source: Adjusted U.S. Census Bureau population estimates 2010-2014

DEMOGRAPHIC AND ECONOMIC PERFORMANCE METRICS FOR THE NORTHERN ILLINOIS REGION AND PEERS (Table 11)

Region/Metropolitan Area	Population (2014)	Population Age 25-39 Years (2014)[1]	GRP per Capita[2] (2014)	Mean Household Income[2] (2014)
Northern Illinois	649,694	17.6%	$37,239	$90,820
Canton, OH	403,923	16.9%	$35,202	$80,041
Dayton, OH	800,836	18.5%	$43,092	$82,233
Fort Wayne, IN	427,183	19.2%	$44,217	$81,767
Peoria, IL	380,040	19.3%	$50,449	$97,180
Janesville-Beloit, WI	161,188	18.5%	$33,685	$80,246

LABOR MARKET PERFORMANCE METRICS FOR THE NORTHERN ILLINOIS REGION AND PEERS (Table 12)

Region/Metropolitan Area	Total Employment (2014)	Earnings per Worker[1] (2014)	New Hires and Recalls per 10,000 Jobs (2014)	Manufacturing L.Q.[2] (2014)
Northern Illinois	311,447	$42,282	15.5%	2.2
Canton, OH	224,352	$39,054	12.8%	1.9
Dayton, OH	460,904	$45,894	8.5%	1.2
Fort Wayne, IN	257,382	$41,790	13.5%	2.0
Peoria, IL	223,241	$50,837	12.5%	1.8
Janesville-Beloit, WI	79,666	$43,526	11.7%	1.7

Relevant Recommendations by Cluster

IT Innovation

1. Support NIU EIGERlab Innovation Network to develop start-ups and early-stage companies, particularly those in information technology or product-based businesses.
2. Develop a linked network of makerspace facilities, including craft manufacturing, local food, and other projects.
3. Partner with the Illinois Manufacturing Excellence Center to help manufacturers reduce operational costs and improve performance.

Innovative Agriculture

1. Develop a linked network of makerspace facilities, including craft manufacturing, local food, and other projects.
2. Develop food hubs for aggregation of regionally grown produce for delivery to the Chicago region, Northern Illinois, and southern Wisconsin.
    a. The proposal from the McHenry County Local Food Assessment could be developed there and potentially expanded to the rest of the region.
3. Identify locations suitable for urban agriculture and assist companies and individuals with such projects.
4. Collaborate with the creators of the FARM Illinois plan and identify ways to enact its initiatives within the region.
5. Use growth boundary agreements to protect prime farmland, while maximizing business development along commercial nodes and near existing development.

Renewable Energy

1. Promote energy incentives by ComEd and Nicor Gas, such as their New Construction Service and ComEd's Smart Ideas Program, as part of other business outreach programming.
2. Assist with the recruitment of students for the new NIU/RVC engineering program, and identify employers within the region to provide internships, co-op placements, and other opportunities for students and graduates.
3. Recognize the link between smart growth practices and economic development by incorporating sustainability principles into relevant plans, policies, and codes at the municipal and county levels. Resources include the Rockford Region Plan for Sustainable Development and CMAP's Sustainability Planning White Paper.

Electric Vehicle

1. Make permit and review process for all projects as streamlined as possible, implementing a "culture of yes" that addresses public concerns/needs but clearly communicates options for private sector development.

Total Related Recommendations (summarize above)

4. Nurture entrepreneurial activity within the region
    a. Develop a manufacturing-based workforce training/business incubator on the west side of Rockford to increase employment in underrepresented populations.
    b. Support NIU EIGERlab Innovation Network to develop start-ups and early-stage companies, particularly those in information technology or product-based businesses.
    c. Develop a linked network of makerspace facilities, including craft manufacturing, local food, and other projects.
5. Develop food hubs for aggregation of regionally grown produce for delivery to the Chicago region, Northern Illinois, and southern Wisconsin.
    a. This proposal from the McHenry County Local Food Assessment could be developed there and potentially expanded to the rest of the region.
6. Identify locations suitable for urban agriculture and assist companies and individuals with such projects.
7. Collaborate with the creators of the FARM Illinois plan and identify ways to enact its initiatives within the region.
8. Develop the workforce pipeline by strengthening connections between employers and the region's P-20 educational systems, with emphasis on providing education and training to individuals of all ages and socioeconomic groups.
9. Create and implement a coordinated awareness program of regional career opportunities, particularly in manufacturing, healthcare, and other key industries.
    a. Encourage and assist with the implementation of the Illinois State Board of Education's Career Cluster Framework (which includes career clusters, career pathways, and programs of study) in the K12 school districts and the local workforce areas in the region.
    b. Assist with the recruitment of students for the new NIU/RVC engineering program, and identify employers within the region to provide internships, co-op placements, and other opportunities for students and graduates.
    c. Encourage the development of educational and technical training academies, such as the Career Academy program at Rockford Public Schools, Belvidere Public Schools' science-based Washington Academy, and Huntley School District Medical Academy.
    d. Develop an educational center and technical training facility in Belvidere in currently abandoned or underused commercial space.
    e. Create a centralized location for enhanced Career and Technical Education in Rockford for high school and college students to consolidate disparate facilities. This facility can also be used by private industry in partnership with public school districts to facilitate job training.
    f. Support the Rosalind Franklin University internship program at Centegra Health Systems' Huntley hospital to develop the future biomedical workforce.
10. Align workforce and economic development strategies and implementation plans by strengthening partnerships between industry associations, workforce boards, economic development agencies, educational partners, and employers.
    a. Develop regional workforce plans as part of the state-led process of meeting the requirements of the Workforce Innovation and Opportunity Act. While the Northern Illinois Region falls into two workforce regions, this CEDS can be used to help align workforce and economic development activities.

   b. Hold regular meetings between economic development and workforce development agencies to align and coordinate strategies and improve regional communication on current and future workforce needs. This includes adding workforce development entities to the team on business attraction and retention efforts as confidentiality allows.
   c. Share data and analysis among the partners to guide development of region-wide strategies to strengthen competitiveness among existing and emerging clusters identified in the CEDS process. Use data generated from regional Synchronist surveys and workforce agency business visits. Consult with Chicago-Cook Workforce Partnership on its workforce assessment tool in development.
   d. Proactively engage employers facing workforce shortages, either current or expected, in finding viable solutions to their needs through workforce development agency Business Services outreach
11. Increase efforts to retain workers in high-demand occupations who are commuting out of the region or moving to other regions, while attracting workers to move to the region.
   a. Increase the use of job fairs and online postings to attract individuals and promote careers available in key industries across the region.
   b. Develop a "live here/work here" campaign promoting job opportunities in the region and the benefits of reducing commutes outside of the region. This initiative is particularly important to McHenry County and would be started there to possibly expand to the rest of the region.
   c. Create a plan to attract and retain college graduates and young professionals for the key industries identified in the region.
   d. Work with businesses to offer internships, co-ops, apprenticeships job shadowing, and scholarships for local students, such as the Joint Institute for Engineering and Technology – Aerospace program.
12. Work with Chicago Rockford International Airport to continue to expand air cargo, passenger service, and airport-related development in the region.
   a. Promote business use of airport passenger service and of UPS next-day cargo capabilities, using a "Consider Rockford First" type model.
   b. Recruit students and workers for RVC aircraft maintenance school and Maintenance Repair and Overhaul companies at the airport.
   c. Support Rockford airport officials on cargo, MRO, and other development opportunities through economic development efforts, incentives, and infrastructure upgrades.
   d. Improve amenities and infrastructure at existing Rockford Global Trade Park and develop available parcels for industries that would benefit from proximity to Chicago Rockford International Airport.
13. Upgrade and extend freight rail service in key corridors to boost rail-reliant industrial development.
   a. Upgrade the Illinois Railway line from Davis Junction to Rockford and identify a possible link to Rochelle to connect to Union Pacific intermodal hub.
   b. Create large, rail-served industrial development at Rockford Global Trade Park – South.
   c. Upgrade of Union Pacific rail line through McHenry, Boone, and Winnebago counties.
14. Extend passenger rail service through the three-county region, linking the region to wider labor, employment, and recreational markets.
   a. Develop commuter rail service for Rockford, Belvidere, Marengo, and Huntley via Metra or new transit district.
   b. Advocate for the return of Amtrak from Chicago through Rockford to Iowa

15. Leverage the region's interstates as an economic catalyst, while improving overall highway access for businesses and residents.
    a. Upgrade and extend infrastructure needed to develop area around Irene Road interchange in Boone County for advanced manufacturing and logistics.
    b. Advocate and identify funds for I-90 interchange at Illinois 23 in McHenry County
    c. Continue supporting the completion of CMAP's major capital projects, including the Route 53/120 extension.
    d. Advocate and identify funds for I-90 interchange at Perry Creek Parkway in Rockford.
    e. Upgrade and extend infrastructure needed to develop US 20/IL 2 (South Main Street) Interchange Area to provide better access and services to Rockford Global Trade Park
16. Create a regional slate of infrastructure priorities based on the strategies outlined in this plan by coordinating across responsible entities that develop and maintain the capacity of the region's transportation system and seek the funding necessary to achieve those priorities.
    a. Complete the 5-year Transportation Improvement Programs for McHenry County Department of Transportation, Rockford Metropolitan Agency for Planning, and Stateline Area Transportation Study (SLATS); the Long-Range Transportation Plans for CMAP, RMAP and SLATS; and GO TO 2040.
    b. As the region advances identified priority infrastructure projects, consider the need for additional local revenues to support their completion. This should be considered within the broad goal of maintaining a good tax-value proposition for residents and businesses.
17. Build off each county's transit service strengths when seeking opportunities to expand service.
    a. Expand MCRide, McHenry County's consolidated dial-a-ride service, and work with Boone County to improve coordination and regional connectivity of its demand-response service.
    b. Work with businesses in McHenry County looking to establish new or access existing van pool services. MCEDC, Pace 2018 4.6C Expand Commuter Connection rideshare program in Rockford MSA and explore using RMTD's East-Side Transfer Center as staging point first for existing commuter and rideshare traffic, with the goal of developing demand for van service and later bus service to jobs elsewhere in region and in Chicago area.
18. Consolidate multiple infrastructure improvements, including utility, communications, and roadway improvements, into single projects.
    a. As a policy, the three counties will focus on consolidating multiple infrastructure improvements into single projects to increase efficiency and decrease costs to units of local government and other infrastructure funders.
19. Enhance high-speed fiber optic networks by further extending fiber backbones and adding "last mile" connections for businesses.
    a. Complete the expansion of fiber service in McHenry County via the improvements to US 14.
    b. Extend fiber to key job creation sites, such as Barber-Colman facility in downtown Rockford.
    c. Partner with TriRivers Health Partners and iFiber to connect companies and broadband service providers with available dark fiber.
20. Ensure that building and development codes, as well as plans within the region, promote and facilitate the redevelopment of existing structures and infill development, leveling the playing field with requirements for new greenfield construction.
    a. Increase collaboration and communication at the regional level regarding land use and transportation planning regarding economic development.

   b. Recognize the link between smart growth practices and economic development by incorporating sustainability principles into relevant plans, policies, and codes at the municipal and county levels. Resources include the Rockford Region Plan for Sustainable Development and CMAP's Sustainability Planning White Paper
   c. Develop programs and outreach efforts that create incentives, programs, and policies to encourage the use of LEED building and rehabilitation standards.
   d. Consistent with a policy of helping businesses grow in areas adjacent to or within areas that are already developed, McHenry County will continue to explore the reuse of existing facilities, including the Motorola site.
21. Streamline local permits and review processes for projects in suitable development areas to the extent possible, especially those that rebuild on cleared brownfield sites.
   a. Create a system for the region that ranks properties based on redevelopment potential using a place-based strategy incorporating transportation access, greenspace, walkability, and other characteristics.
   b. Integrate these tactics into a wider effort by local government to make permit and review process for all projects as streamlined as possible, implementing a "culture of yes" that addresses public concerns/needs but clearly communicates options for private sector development.
   c. Develop Rockford/Winnebago County's new BUSINESSFirst initiative and then deploy across the region with other local governments to make it easier for businesses to redevelop targeted brownfields and other properties.
   d. Engage the private sector to promote potential for redeveloping sites and other opportunities within region; whenever possible, identify and contact developers who specialize in, or have significant interest in, redevelopment.
   e. Take necessary steps to ensure ongoing improvement and/or maintenance of healthy air, soil, and water quality.
22. Continue to assess, remediate, and redevelop brownfield sites throughout the region, taking full advantage of federal and state funding opportunities, both for environmental purposes and for historic preservation of significant properties. Where redevelopment of existing structures on brownfield sites is not feasible, clear any unusable structures for either permanent open space or future development.
   a. Redevelop key sites such as the Barber-Colman campus in downtown Rockford and Leath building in downtown Belvidere.
   b. Develop a regional inventory of brownfield and infill sites with the potential to accommodate industrial and commercial growth.
   c. Aggressively pursue state and federal funding for key brownfield sites, using EPA Brownfield grants, New Market Tax Credits, Enterprise Zone/River Edge Redevelopment Zone, etc.
23. Protect prime farmland from encroachment of incompatible development and promote to maintain agriculture's key role as a part of the regional economy and promote ecological and agricultural tourism in rural areas of the region.
   a. Use growth boundary agreements to protect prime farmland, while maximizing business development along commercial nodes and near existing development.
   b. As McHenry County updates its 2030 Comprehensive Plan over the next few years, officials will continue to maintain a balance between development and preservation.

APPENDIX E: EDUCATIONAL ASSETS

Educational Programs Related to the Emerging Clusters in the Tri-County Region & the Broader Region[1]

Institution	Electric Vehicles	Renewable Energy	Innovative Agriculture	IT Innovation
McHenry County College McHenry County, IL	- Automotive Technology, Associate's - Automotive Technology - Management Option, Associate's - Advanced Automotive Technician, Certificate - Automotive Chassis, Certificate - Automotive Electrical, Certificate - Automotive Maintenance Technician, Certificate	- Engineering Science, Associate's - Geology, Associate's - Chemistry, Associate's - Geography, Associate's - Mathematics, Associate's - Physics, Associate's	- Horticulture, Associate's - Horticulture, Certificate - Horticulture - Garden - Management, Certificate - Entrepreneurial Agriculture, Associate's - Entrepreneurial Agriculture Production, Certificate - Entrepreneurial Agriculture Business & Marketing, Certificate - Supply Chain Management, Certificate - CDL-A Semi Tractor Trailer Driver Training, Certificate - Freight Broker/Agent Training, Certificate - Biology, Associate's	- Mobile Design & Development, Associate's - Web Design & Development, Associate's - Network, Associate's - Programming Fundamentals, Certificate - Networking Specialist, Certificate - Cyber Security, Certificate - Web Development, Certificate - PC Support Specialist, Certificate - &roid Development, Certificate - iOS Development, Certificate - Advanced Manufacturing Technician, Certificate - CNC Machining, Certificate - Manufacturing Management, Associate's - Manufacturing Processes, Certificate - Manufacturing, Certificate - Welding, Certificate - Industrial Maintenance, Certificate
Rock Valley College Winnebago County, IL	- Automotive Service Technician, Associate's - Automotive Management, Associate's - Automotive Technician, Certificate - Automotive Maintenance & Light Repair, Certificate	- Powerplant Technician, Certificate - Chemistry, Associate's - Electronic Engineering Technology, Associate's - Electronic Engineering Technology, Certificate - Engineering Science, Associate's - Geology, Associate's - Mathematics, Associate's - Physics, Associate's - Physical Geography, Associate's	- Biology, Associate's - Fundamentals of Supply Chain Management, Certificate - Truck Driver Training, Certificate	- Computers & Information Systems, Associate's - Personal Computer Technical Specialist, Certificate - C/C++ Programming, Certificate - Mobile Application Development, Certificate - Computer Numeric Control (CNC) Machining, Certificate - Cybersecurity Specialist, Associate's - Manufacturing Engineering Technology, - Engineering Tech-CAD, Certificate - Engineering Tech-CNC, Certificate - Engineering Tech-Basic Quality, Certificate

		- Mechatronics, Associate's - Mechatronics, Certificate		- Engineering Tech-Certified Manufacturing, Associate's - Industrial Welding, Certificate - Advanced Welding, Certificate
Rasmussen University Winnebago County, IL			- Supply Chain & Logistics Management, Bachelor's	- Computer Science, Bachelor's - Cyber Security, Bachelor's - Cyber Security, Certificate - Information Technology, Associate's - Information Technology Management, Bachelor's - Information Technology (IT) Project Management, Certificate - Information Technology (IT) Support, Certificate - Network Support, Certificate - Network Systems Administration, Associate's - Software Application Development, Associate's
Rockford Career College Winnebago County, IL	- Electrical Technician, Certificate	- Heating, Ventilation, Air Conditioning & Refrigeration, Certificate	- Medical Laboratory Technician, Associate's	- Welding, Certificate
Rockford University Winnebago County, IL	- Biology, Bachelor's - Supply Chain Management, Bachelor's	- Chemistry, Bachelor's - Biochemistry, Bachelor's - Mathematics, Bachelor's - Physics, Bachelor's		- Computer Science, Bachelor's
Northern Illinois University DeKalb County, IL	- Electrical Engineering, Bachelor's	- Engineering, Bachelor's - Chemistry, Bachelor's - Biochemistry, Bachelor's - Engineering Technology, Bachelor's - Environmental Studies, Bachelor's - Geography, Bachelor's - Geology & Environmental Geosciences, Bachelor's - Mechatronics Engineering, Bachelor's - Mathematics, Bachelor's	- Biology, Bachelor's - Biomedical Engineering, Bachelor's - Supply Chain Management, Certificate	- Computer Science, Bachelor's - Industrial & Systems Engineering, Bachelor's - Cybersecurity, Certificate - Software Engineering, Certificate

		- Mechanical Engineering, Bachelor's - Physics, Bachelor's		
Elgin Community College Kane County, IL	- Automotive Service Technician, Associate's - Automotive Electrical Specialist, Certificate - Brake & Suspension Specialist, Certificate - Engine Mechanical Repair Specialist, Certificate - Transmission & Drivetrain Specialist, Certificate	- Applied Physical Science, Associate's - Auto Heating & Air Conditioning, Certificate - Chemistry, Associate's - Energy Management, Associate's - Renewable Energy Option, Associate's - Renewable Energy, Certificate - Energy Management, Certificate - Engineering Science, Associate's - Geology, Associate's - Mathematics, Associate's - Physics, Associate's	- Biology, Associate's - Clinical lab technology, Associate's - Clinical Laboratory Assistant, Certificate - Truck Driving Owner/Operator, Certificate - Truck Driving, Certificate - Forklift Operator, Certificate	- Computer Aided Design, Associate's - Computer Aided Design, Certificate - AutoCAD, Certificate - CREO, Certificate - Solidworks, Certificate - Computer Integrated Manufacturing Option, Associate's - Industrial Manufacturing Technology, Associate's - Machine Tool Technology, Associate's - CNC Programmer, Certificate - Computer Integrated Manufacturing, Certificate - Machine Tool Operations, Certificate - Mold Making, Certificate - CNC Operator, Certificate - Computer Information Systems, Associate's - Computer Network Support Specialist, Certificate - Computer User Support Specialists, Certificate - Cybersecurity, Certificate - IST/Maintenance Technology, Associate's - Automated Electronic Systems, Certificate - Industrial Maintenance, Certificate - Welding Fabrication Technology, Associate's - Welding, Certificate - Welding - Basic Vocational Specialist, Certificate - Shielded Metal Arc Welding, Certificate - Gas Metal Arc Welding, Certificate
Judson University Kane County, IL		- Biochemistry, Bachelor's - Chemistry, Bachelor's - Mathematics, Bachelor's	- Biology, Bachelor's - Natural Science, Bachelor's	- Computer Science, Bachelor's
Aurora University		- Chemistry, Bachelor's	- Biology, Bachelor's	- Computer Science, Bachelor's

Kane County, IL		- Environmental Studies & Sustainability, Bachelor's - Mathematics, Bachelor's		- Cybersecurity, Bachelor's
Waubonsee Community College Kane/Kendall/DuPage Counties, IL	- Auto Body Repair, Associate's - Advanced Auto Body Repair, Certificate - Basic Auto Body Repair, Certificate	- CAD-Architecture, Certificate - Heating, Ventilation, Air Conditioning, Associate's - Heating, Ventilation, Air Conditioning, Certificate - Biochemistry, Associate's - Chemistry, Associate's - Electrical Engineering, Associate's - Industrial Engineering, Associate's - Mechanical Engineering, Associate's - Geography, Associate's - Geology, Associate's - Mathematics, Associate's - Physics, Associate's	- Clinical Laboratory Science, Associate's - Biology, Associate's	- Automation Technology, Associate's - Automation Technology, Certificate - Computer Aided Design & Drafting, Associate's - Computer Aided Design & Drafting, Certificate - Computer Science, Associate's - Computer Software Development, Associate's - Computer Software Development, Certificate - Computer Support, Associate's - Computer Support, Certificate - Cybersecurity, Associate's - Cybersecurity, Certificate - Advanced Manufacturing Technology, Associate's - CNC Operator, Certificate - CNC Programmer, Certificate - Welding Technology, Associate's - Advanced Welding, Certificate - Welding, Certificate
Highland Community College Stephenson County, IL	- Automotive Service Level I, Certificate - Automotive Service Level II, Certificate - Automotive Mechanics, Associate's	- Chemistry, Associate's - Engineering, Associate's - Geology, Associate's - Mathematics, Associate's - Physics, Associate's	- Agribusiness, Associate's - Animal Science, Associate's - Crop & Soil Science, Associate's - Food Science, Associate's - Horticulture, Associate's - Precision Agronomy, Associate's - Biology, Associate's - Truck Driver Training, Certificate	- Computer Science, Associate's - Industrial Training, Associate's - Industrial Manufacturing, Associate's - Industrial Manufacturing: CNC Machinist, Certificate - Industrial Manufacturing: Machine Processes, Certificate - Industrial Manufacturing: Computer-Aided Design/Mechanical, Certificate - Information Systems, Associate's - Computer Technician, Certificate - Welding, Certificate - Welding & Fabrication, Certificate
University of Wisconsin-	- Electrical Technician, Certificate	- Chemistry, Bachelor's - Biochemistry, Bachelor's	- Biology, Bachelor's - Environmental Science,	- Computer Science, Bachelor's - Cybersecurity, Bachelor's

Whitewater Rock County, WI	- Engineering Technician, Certificate - Residential Electrician, Certificate - Robotics Technician, Certificate	- Geography, Bachelor's - Geology, Bachelor's - Mathematics, Bachelor's - Physics, Bachelor's - Biofuel Production Operations, Certificate - Certified Manufacturing Associate, Certificate - Certified Manufacturing Engineer, Certificate - HVAC/R Certified Technician, Certificate - Leadership in Energy & Environmental Design (LEED), Certificate - Natural Gas Plant Operations, Certificate - Oil Refinery Operations, Certificate - Power Plant Operations, Certificate - Mechatronics, Certificate	Bachelor's - Occupational Safety - Environmental Management, Bachelor's - Supply Chain Management, Bachelor's - Online Freight Broker/Agent Training, - CDL-A Semi Tractor Trailer Driver Training, Certificate	- Information Technology, Bachelor's - COMPTIA™ TRAINING: A+, NETWORK+, SECURITY+, - Certificate - AutoCAD, Certificate - Oracle SQL & PL/SQL Developer with Crystal Reports, Certificate - C++ Programmer, Certificate - Full Stack Software Developer, Certificate - Certified Manufacturing Technologist, Certificate - CNC Machinist, Certificate - Maintenance Technician, Certificate - Manual Machinist, Certificate - Press Operator, Certificate - Press Operator: Hot Stamping, Certificate - Welder Technician, Certificate - Certified Network Defender (CND), Certificate **- Approximately 64 certificate programs related to IT Innovation**
Beloit College Rock County, WI		- Biochemistry, Bachelor's - Chemistry, Bachelor's - Engineering, Bachelor's[2] - Environmental Biology, Bachelor's - Environmental Chemistry, Bachelor's - Environmental Geology, Bachelor's - Geology, Bachelor's - Mathematics, Bachelor's - Physics, Bachelor's	- Biology, Bachelor's	- Computer Science, Bachelor's
Blackhawk Technical College Rock & Green Counties, WI	-Automotive Technician, Certificate -Diesel & Heavy Equipment Technician, Certificate -Journey worker, Associate's -Electric Power Distribution,	- Air Conditioning, Heating & Refrigeration Technology (HVAC/R), Certificate	- Agribusiness/Science & Technology, Associate's - Agribusiness Specialist, Certificate - Farm Business & Production Management, Certificate	- Automation Systems Technology, Associate's - Computer Numeric Control Technician, Certificate - Computer Service Technician, Certificate - Electro-Mechanical Technology,

	Certificate	- Laboratory Food Science Technician, Associate's - Supply Chain Management, Associate's	Associate's - Industrial Maintenance Mechanic, Certificate - IT-Network Specialist, Associate's - Manufacturing Engineering Technology, Associate's - Web Software Developer, Associate's - Welding, Certificate

[1] This matrix doesn't account for overlap between the educational programs and the emerging clusters. In other words, each program is only assigned to one cluster.
[2] Students get a degree from Beloit before moving to Rensselaer Polytechnic Institute or Washington University in St. Louis to finish their engineering degree.

APPENDIX F: GRANTS & FUNDING SOURCES

Funding by Innovative Cluster

	Electric Vehicles	Renewable Energy	Innovative Agriculture	IT Innovation	All
Name of Grant	Electric Vehicle Rebate Program	Illinois Clean Jobs Workforce Network Program (CEJA)	Illinois Meat & Poultry Supply Chain Capital Grant Program	Connect Illinois Broadband Grant Program	Innovation Vouchers Program
Awarding Agency	Illinois' Climate & Equitable Jobs Act	Illinois Department of Commerce & Economic Opportunity	Illinois Department of Commerce & Economic Opportunity	Illinois Department of Commerce & Economic Opportunity	Illinois Department of Commerce & Economic Opportunity
Link	https://pcb.illinois.gov/documents/dsweb/Get/Document-11964/	https://dceo.illinois.gov/aboutdceo/grantopportunities/3197-2586.html	https://dceo.illinois.gov/aboutdceo/grantopportunities/2862-2185.html	https://dceo.illinois.gov/connectillinois.html	https://dceo.illinois.gov/aboutdceo/grantopportunities/3126-2527.html
Name of Grant	Reimagining Energy and Vehicles (REV) Illinois Program	Illinois Energy Transition Navigators Program (CEJA)	National Multimodal Cooperative Freight Research Program		The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR)
Awarding Agency	Illinois Department of Commerce & Economic Opportunity	Illinois Department of Commerce & Economic Opportunity	U.S. Department of Transportation		Illinois Department of Commerce & Economic Opportunity
Link	https://dceo.illinois.gov/businesshelp/rev.html	https://dceo.illinois.gov/aboutdceo/grantopportunities/3174-2569.html	https://afdc.energy.gov/laws/search#/?show=result&id=12745		https://dceo.illinois.gov/aboutdceo/grantopportunities/2382-2419.html
Name of Grant	Commercial Electric Vehicle (EV) and Fuel Cell Electric Vehicle (FCEV) Tax Credit	Port Electrification Grants	Port Infrastructure Development Program		Federal Grant Support Program
Awarding Agency	U.S. Internal Revenue Service	U.S. Environmental Protection Agency	U.S. Department of Transportation		Illinois Department of Commerce & Economic Opportunity

Link	https://afdc.energy.gov/laws/search#/?show=result&id=13039	https://afdc.energy.gov/laws/search#/?show=result&id=13091	https://afdc.energy.gov/laws/search#/?show=result&id=12734	https://dceo.illinois.gov/aboutdceo/grantopportunities/3073-2554.html
Name of Grant	Electric Vehicle (EV) and Fuel Cell Electric Vehicle (FCEV) Manufacturing Tax Credit	Sustainable Aviation Fuel (SAF) Tax Credit	Specialty Crop Research Initiative (SCRI)	Illinois Angel Investment Tax Credit Program
Awarding Agency	U.S. Internal Revenue Service	U.S. Internal Revenue Service	National Institute of Food and Agriculture	Illinois Department of Commerce & Economic Opportunity
Link	https://afdc.energy.gov/laws/search#/?show=result&id=13087	https://afdc.energy.gov/laws/search#/?show=result&id=13160	https://www.nifa.usda.gov/grants/programs/specialty-crop-research-initiative-scri	https://dceo.illinois.gov/expandrelocate/incentives/taxassistance/angelinvestment.html
Name of Grant	Heavy-Duty Zero Emission Vehicle (ZEV) and Infrastructure Grants	Integrated Biorefineries Grant	Urban, Indoor, and Emerging Agriculture	
Awarding Agency	U.S. Environmental Protection Agency	U.S. Department of Energy	National Institute of Food and Agriculture	
Link	https://afdc.energy.gov/laws/search#/?show=result&id=13063	https://afdc.energy.gov/laws/search#/?show=result&id=12958	https://www.nifa.usda.gov/grants/programs/urban-indoor-emerging-agriculture	
Name of Grant	Pre-Owned Electric Vehicle (EV) and Fuel Cell Electric Vehicle (FCEV) Tax Credit	Carbon Reduction Program (CRP)	Agriculture and Food Research Initiative - Education and Workforce Development	
Awarding Agency	U.S. Internal Revenue Service	U.S. Department of Transportation	National Institute of Food and Agriculture	
Link	https://afdc.energy.gov/laws/search#/?show=result&id=13038	https://afdc.energy.gov/laws/search#/?show=result&id=12735	https://www.nifa.usda.gov/grants/funding-opportunities/agriculture-food-research-initiative-education-workforce-development	

Name of Grant	Charging and Fueling Infrastructure Grants	Public School Energy Program	Distance Education Grants for Institutions of Higher Education in Insular Areas
Awarding Agency	U.S. Department of Transportation	U.S. Department of Energy	National Institute of Food and Agriculture*
Link	https://afdc.energy.gov/laws/search#/?show=result&id=12732	https://afdc.energy.gov/laws/search#/?show=result&id=12742	https://www.grants.gov/web/grants/view-opportunity.html?oppId=346560
Name of Grant	Low or Zero Emission Ferry Program	Transportation Energy Efficiency Grants	Research Facilities Act Program*
Awarding Agency	U.S. Department of Transportation	U.S. Department of Energy	National Institute of Food and Agriculture
Link	https://afdc.energy.gov/laws/search#/?show=result&id=12743	https://afdc.energy.gov/laws/search#/?show=result&id=13183	https://www.nifa.usda.gov/grants/funding-opportunities/research-facilities-act-program
Name of Grant	National Electric Vehicle Infrastructure (NEVI) Formula Program		
Awarding Agency	U.S. Department of Transportation		
Link	https://afdc.energy.gov/laws/search#/?show=result&id=12744		
Name of Grant	Truck Emissions Reduction Study and Grant at Port Facilities		
Awarding Agency	U.S. Department of Transportation		

Link	https://afdc.energy.gov/laws/search#/?show=result&id=12733

APPENDIX G: LABOR UNIONS

Active Unions Related to the Emerging Clusters in the Tri-County Region

Zip Code	Reporting Year	Union Name	Total Assets	Total Liabilities	Total Receipts	Total Disbursements	Total Members
Boone County							
61008	2022	AUTO WORKERS AFL-CIO LOCAL UNION 1268	$4,342,304	$13,906	$2,005,370	$2,889,266	1531
61008	2001	MACHINISTS AFL-CIO LODGE 1290	$0	$0	$66,364	$81,324	0
61016	2022	AUTO WORKERS AFL-CIO LOCAL UNION 2056	$12,368	$2,070	$33,154	$31,690	36
Winnebago County							
61024	2022	AUTO WORKERS AFL-CIO LOCAL UNION 1023	$7,104	$1,761	$34,157	$32,315	54
61080	2005	MACHINISTS AFL-CIO LODGE 1197	$0	$0	$8,390	$29,472	410
61088	2022	AUTO WORKERS AFL-CIO LOCAL UNION 1178	$56,467	$6,534	$91,799	$93,023	93
61104	2022	AUTO WORKERS AFL-CIO LOCAL UNION 718	$85,662	$9,331	$164,225	$161,500	260
61104	2022	TRANSIT UNION AFL-CIO LOCAL DIVISION 1333	$5,328	$0	$66,530	$65,725	90
61108	2022	AUTO WORKERS AFL-CIO LOCAL UNION 592	$219,150	$2,593	$441,876	$452,030	360
61108	2022	ELECTRICAL WORKERS IBEW AFL-CIO LOCAL UNION 364	$9,757,921	$78,473	$5,971,119	$3,919,188	734
61109	2022	PLUMBERS AFL-CIO LOCAL UNION 23	$5,751,692	$43,045	$2,455,843	$2,333,957	776

61109	2022	AUTO WORKERS AFL-CIO CAP COUNCIL	$58,056	$0	$8,886	$14,128	563
61109	2022	BLDG AND CONSTRN TRADES DEPT AFL-CIO BLDG & CONSTRUCTION TRADES COUNCIL	$94,879	$6,146	$322,244	$375,122	36
61109	2022	SHEET METAL, AIR, RAIL AND TRANSPORTATION WORKERS LOCAL UNION 219	$3,154,512	$22,990	$2,792,270	$2,328,358	576
61109	2022	TEAMSTERS LOCAL UNION 325	$1,119,938	$26,386	$925,741	$922,866	827
61110	2021	MACHINISTS AFL-CIO LODGE 1553	$262,378	$0	$4,025	$8,993	61
61112	2022	LABORERS LOCAL UNION 32	$2,483,794	$70,107	$2,053,247	$1,632,458	795
61125	2022	AUTO WORKERS AFL-CIO LOCAL UNION 1761	$118,755	$3,193	$67,614	$90,044	52
McHenry County							
60014	2022	ELECTRICAL WORKERS IBEW AFL-CIO LOCAL UNION 117	$6,017,471	$2,477	$1,493,452	$1,563,295	367
60098	2023	PLASTERERS AND CEMENT MASONS AFL-CIO DISTRICT COUNCIL	$40,567	$0	$7,200	$5,207	3357
60098	2023	PLASTERERS AND CEMENT MASONS AFL-CIO LOCAL UNION 11	$3,642,988	$12,462	$2,573,860	$2,365,598	1029
60102	2022	MACHINISTS AFL-CIO LODGE 478	$225,223	$0	$96,393	$79,762	298
60050	2023	MAINTENANCE OF WAY EMPLS, IBT LODGE 2853	$20,334	$0	$4,348	$5,611	59
60051	2023	CARPENTERS IND LOCAL UNION 250	$1,025,006	$40,676	$664,710	$597,355	2023
60051	2022	MACHINISTS AFL-CIO LODGE 2125	$42,354	$0	$32,983	$34,589	353
60152	2022	LABORERS LOCAL UNION 1035	$5,866,918	$30,177	$1,156,017	$1,216,567	525

Source: US Department of Labor

APPENDIX H: RELEVANT POLICIES

Recent Legislation Related the Emerging Clusters in Tri-County Region

Name	Governing Body	Year	Is it designed to benefit the industry of interest?	Link
Electric Vehicles				
Electric Vehicle Charging Act	Illinois State Government	2023	Yes	https://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=103-0053
Lake Michigan Electric Vehicle Circuit Tour Memorandum of Understanding Between Illinois, Indiana, Michigan, and Wisconsin	Illinois State Government	2022	Yes	https://www.michigan.gov/leo/-/media/Project/Websites/leo/Lake_MI_Circuit_MOUdocx1.pdf
Regional Electric Vehicle Midwest Coalition Memorandum of Understanding Between Illinois, Indiana, Michigan, Minnesota, and Wisconsin	Illinois State Government	2021	Yes	https://www.michigan.gov/-/media/Project/Websites/leo/REV_Midwest_MOU_master.pdf?rev=6dd781b5a4eb4551b3b3a5b875d67fb9
Zero-Emission Vehicles (ZEV) Deployment Support	Illinois State Government	2021	Yes	https://www.illinois.gov/government/executive-orders/executive-order.executive-order-number-08.2021.html
Battery Electric Vehicle (BEV) Fee	Illinois State Government	2019	No	https://ilga.gov/legislation/ilcs/fulltext.asp?DocName=062500050K3-805#:~:text=(a)%20The%20owner%20of%20a,motor%20vehicles%20of%20the%20first
Utility Electric Vehicle (EV) Program Development Requirements	Illinois State Government	2022	Yes	https://www.icc.illinois.gov/informal-processes/beneficial-electrification-workshops-2021-2022
Electric Vehicle (EV) Permitting Support	Illinois State Government	2022	No	https://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=102-0996&GA=102

Transportation Decarbonization Support	U.S. Department of Energy	2022	Yes	https://afdc.energy.gov/laws/search#/?show=result&id=13140
Electric Vehicle (EV) Studies	U.S. Department of Energy	2021	No	https://afdc.energy.gov/laws/search#/?show=result&id=12741
Electric Vehicle Supply Equipment (EVSE) Standards	U.S. Department of Transportation	2021		https://afdc.energy.gov/laws/search#/?show=result&id=12731
Electric Vehicle Working Group (EVWG)	U.S. Department of Transportation	2021	Yes	https://afdc.energy.gov/laws/search#/?show=result&id=12741
Joint Office of Energy and Transportation	U.S. Department of Energy	2021	Yes	https://afdc.energy.gov/laws/search#/?show=result&id=12746
Truck Leasing Task Force	U.S. Department of Transportation	2021	Yes	https://afdc.energy.gov/laws/search#/?show=result&id=12738
Utility Electric Vehicle (EV) Promotion Measures	Federal Energy Regulatory Commission	2021	Yes	https://afdc.energy.gov/laws/search#/?show=result&id=12740
Strengthening American Leadership in Clean Cars and Trucks	Environmental Protection Agency, Department of Commerce, Department of Labor, Department of Energy	2021		https://www.federalregister.gov/documents/2021/08/10/2021-17121/strengthening-american-leadership-in-clean-cars-and-trucks
Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability	Environmental Protection Agency	2021	Yes	https://www.whitehouse.gov/briefing-room/presidential-actions/2021/12/08/executive-order-on-catalyzing-clean-energy-industries-and-jobs-through-federal-sustainability/
Innovative Agriculture				
Connected and Autonomous Vehicle (CAV) Initiative	Illinois State Government	2018	Yes	https://www.illinois.gov/government/executive-orders/executive-order.executive-order-number-13.2018.html
IT Innovation				

Manufacturing Illinois Chips for Real Opportunity Act (MICRO)	Illinois State Government	2022	Yes	https://dceo.illinois.gov/expandrelocate/incentives/micro.html
Renewable Energy				
Illinois Shines	Illinois State Government	2016	Yes	https://illinoisshines.com/about/
The "Siting Bill"	Illinois State Government	2023	Yes	https://www.polsinelli.com/publications/new-legislation-overhauls-state-and-local-regulations-for-commercial-wind-and-solar-farms
Improvements to Generator Interconnection Procedures and Agreements	Federal Energy Regulatory Commission	2022	Yes	https://www.ferc.gov/news-events/news/fact-sheet-improvements-generator-interconnection-procedures-and-agreements
Inflation Reduction Act	Multiple Federal Agencies	2022	Yes	https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/

APPENDIX I: FEDERAL AGRICULTURAL POLICIES

Federal Regulations and Policies Related to the Food & Agriculture Cluster

Program	Requirements of the Operation	Operation Type
Clean Water Act (CWA)/Safe Drinking Water Act (SDWA)		
National Pollutant Discharge Elimination System (NPDES)	Permit required or cease discharges.	Concentrated Animal Feeding Operations that discharge to a water of the U.S.
Concentrated Animal Feeding Operation (CAFO) Rule	Note: Animal feeding operations not required to obtain a NPDES permit may be regulated by state programs.	
National Pollutant Discharge Elimination System (NPDES)	Nutrient management planning	Large Concentrated Animal Feeding Operations that land apply their manure.
Concentrated Animal Feeding Operation (CAFO) Rule		
National Pollutant Discharge Elimination System (NPDES)	Permit Required	Applications of (1) biological pesticides and (2) chemical pesticides that leave a residue, in which applications are made directly to waters of the United States, or where a portion of the pesticide will unavoidably be deposited to waters of the United States irrigation ditches or other instances of pesticide application on, over, or near water bodies.
Water Related Pesticides Rule		
National Pollutant Discharge Elimination System (NPDES)	Obtain a permit or coverage under a general permit prior to discharging stormwater.	Stormwater discharges from construction activities (such as clearing, grading, excavating, and stockpiling) that disturb one or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under the National Pollutant Discharge Elimination System (NPDES) stormwater program.
Stormwater		
National Pollutant Discharge Elimination System (NPDES)	Permit required for specific forestry activities	Rock crushing, gravel washing, log sorting, and log storage facilities

Silviculture		
National Pollutant Discharge Elimination System (NPDES)	Permit required if meet specific conditions	Flow through, recirculating, and net pen systems that:
Concentrated Aquatic Animal Production (CAAP)		(1) produce more than 9,090 harvest weight kilograms (about 20,000 pounds of cold water fish (trout, salmon); or (2) produce more than 45,454 harvest weight kilograms (about 100,000 pounds) of warm water fish (e.g., catfish, sunfish, minnows) and that discharge either continuously or more than 30 days/year.
National Pollutant Discharge Elimination System (NPDES) - Biosolids	Federal permit generally not required, but farms must directly meet regulatory requirements for pollutant limits, management practices, operational standards, reporting and other requirements.	Farm that land applies biosolids or that owns land on which biosolids are land applied.
Clean Water Act Section 404 Clean Water Rule	Permit for non-exempt activities	
Underground Injection Control	Submit injection well inventory information; must not endanger underground sources of drinking water	Farms operating injection well(s)
Small Drinking Water Systems	Total coliform, nitrate testing most likely. Surface water source would invoke other non-drinking water regulations	Farms providing for human consumption (e.g., drinking, showering) from its own source to 25 people or through 15 service connections for more than 59 days/year
Oil Pollution Prevention	Report a discharge of oil that reach navigable waters or adjoining shorelines to the National Response Center	Any farm that has a discharge of oil that may reach navigable waters or adjoining shorelines
Spill Prevention Control and Countermeasures (SPCC)	Prepare and implement an SPCC Plan (see link for more information)	Farms that store, transfer, use, or consume oil or oil products depending on aboveground storage capacity and spill history. For more information on farm applicability, see: Farms Fact Sheet
Facility Response Plan (FRP)	Prepare an FRP and submit to EPA	Any farm/facility storing 1,000,000 gallons or more of oil and meets certain harm factors or storing 42,000 gallons or more and transfers oil to/from vessels.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)		
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) – Pesticide Label	Follow label instructions to apply pesticide legally.	Crop and livestock production practices that involve pest control.

Worker Protection Standard (WPS)	Label restrictions that typically require protective clothing and engineering controls (ex: tractors with enclosed cabs and air recirculation systems).	Farms that use farm labor to mix, load or apply pesticides and any other activity that involves exposure to pesticides.
Certification and training regulations	Required training for farmers and/or their pesticide applicators that use 'restricted use' pesticides.	Pest control with the use of 'restricted use' pesticides.
Pesticide Storage	Follow label instructions for storing and disposing of pesticides and containers.	Storage and disposal of pesticides and pesticide containers.
Pesticide Disposal		
EPA Office of Pesticide Programs Endangered Species Protection Program	Farmer must follow label requirements and county bulletin requirements.	Farms that require pest control on farmland that have endangered species habitat.
Bulletins Live		
Resource Conservation & Recovery Act (RCRA)		
Waste pesticides	Proper disposal of pesticide hazardous wastes	Farms that dispose of pesticide residues off-site
Underground storage tanks	Meet design and technical requirements; report to state; recordkeeping; financial responsibilities	Farms with underground storage tanks with a capacity of more than 1,100 gallons of motor fuel. Farm and residential USTs and their associated underground piping holding less than 1,100 gallons of motor fuel for non-commercial purposes, tanks holding less than 110 gallons, tanks holding heating oil used on the premises, septic tanks, and other listed tanks are excluded from regulations.
		Underground Storage Tanks that are not excluded must meet regulations related to design, construction, installation, notification, monitoring, operating, release detection, reporting to State or Federal regulatory agencies, owner record keeping, corrective action, closure and financial responsibility.
Used oil	Meet storage and transport technical requirements	Farms storing more than 25 gallons in underground or above-ground tanks Farmers who generate an average of 25 gallons or less per month of used oil from vehicles or machinery used on the farm in a calendar year are exempt from used oil regulations.

		Farmers exceeding 25 gallons are required to store the used oil in tanks meeting underground or above ground technical requirements and use transporters with EPA authorization numbers for removal from the farm.
Subtitle C hazardous waste	Proper handling of listed and characteristic hazardous	Farms that generate, transport, treat, store or dispose of hazardous waste
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA/Superfund)		
Release reporting-- Episodic or Continuous	Notify National Response Center of releases of any CERCLA hazardous substances that meets or exceeds its reportable quantity within 24 hours. CERCLA Hazardous Substances - 40 CFR part 302.4 (47 pp, 414 K, About PDF) CERCLA Release Reporting Requirements - 40 CFR part 302.6 (3 pp, 199 K, About PDF) NRC: 1-800-424-8802 or 202-267-2675. The following categories are exempt from release reporting: Normal application of fertilizers. Application, handling and storage of a registered pesticide by an agricultural producer. Natural gas, natural gas liquids, liquified natural gas, or synthetic gas usable for fuel. Petroleum products not specifically listed or designated as a hazardous substance. For example, gasoline or diesel fuel. Federally permitted releases. Air emissions from animal waste at farms. Note: EPA published a final rule on August 1, 2018, to amend the CERCLA release reporting regulations by adding the reporting exemption for air emissions from animal waste at farms.	Any farm
Emergency response	Allow access to federal responders; hire contractor(s) for response/cleanup actions	Any farm handling CERCLA hazardous substances that has had or currently has a threat of a release that is determined to be an imminent and substantial danger to public health or welfare.

Clean Air Act (CAA)		
Clean Air Act	Comply with your state's State Implementation Plan (SIP).	
Particulate Matter (PM) National Ambient Air Quality Standards (NAAQS)	Some agricultural sources in PM10 nonattainment areas are impacted by PM10 standards to satisfy reasonably available control measures and control technologies requirements. PM2.5 SIPs will be due no later than April 2008. In those SIPs, states will evaluate, on an area-by-area basis, whether there is a need to regulate PM 2.5 or PM 2.5 precursors from ag related sources.	Farms located in air "non-attainment" areas
Ozone NAAQS	Some agricultural areas are impacted by these standards which primarily deal with nitrogen oxides (NOX) and Volatile Organic Compound (VOC) emissions. These have the potential to impact some animal production practices and have potential to impact pesticide application practices. NOX emissions from stationary engines could be impacted by these standards and the corollary implementation rules.	
Air Program/Asbestos: The Asbestos National Emissions Standards for Hazardous Air Pollutants (NESHAP) is intended to minimize the release of asbestos fibers during activities involving the handling of asbestos. Accordingly, it specifies work practices to be followed during renovations of buildings.	Asbestos - Comply with requirements to minimize the release of asbestos fibers during activities involving the handling of asbestos. Comply with work practices to be followed during renovations of buildings.	Building renovation/demolition: Renovations of buildings which contain a certain threshold amount of friable asbestos, and during demolitions of all structures, installations, and facilities (except apartment buildings that have no more than four dwelling units).
Title V Permit	The source must apply for a permit if aggregate of non-fugitive emissions of any regulated pollutant exceeds 100 tpy. Also, generally, sources that are major under Section 112, Section 302, or Part D of title I are also considered major under title V and required to obtain a title V permit.	Any stationary source. In determining major source status, emissions from all operations at the farm must be considered, including stationary sources such as boilers and internal combustion engines but excluding mobile

		sources such as tractors. For farms, fugitive emissions are not included in determining whether a source is major. Fugitive emissions are those "...which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening."
New Source Review / Prevention of Significant Deterioration permit	The source must apply for a permit if the aggregate of non-fugitive emissions of any regulated pollutant exceeds a certain threshold amount depending on the attainment/non-attainment status of the area and on the pollutant. This requirement applies to new sources as well as to major modifications of sources.	Any stationary source. In determining major source status, emissions from all operations at the farm must be considered, including stationary sources such as boilers and internal combustion engines but excluding mobile sources such as tractors. For farms, fugitive emissions are not included in determining whether a source is major. Fugitive emissions are those "...which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening."
Controlling Air Pollution from Stationary Engines	The engine must comply with this regulation if it is located at a facility whose emissions are at least 10tpy of one HAP or 25tpy of total HAP and if the engine itself is at least 500 HP.	Stationary or reciprocating internal combustion engines (RICE).
Mobile Source Program	Producers are subject to various mobile source requirements, like other similar users/operators of highway and off-road vehicles, engines, equipment, and fuel.	On and Off-Road equipment Farm vehicles, engines, equipment, and fuels.
General duty for chemical accident prevention	Owners and operators of all facilities that use, handle, or store extremely hazardous substances in any quantity, including farms handling ammonia, have a general duty to identify hazards, design and maintain a safe facility taking steps to prevent releases, and minimize the consequences of accidental releases that do occur.	Any farm.
Risk Management Program and Plan (RMP)	Farms that handle more than a threshold quantity of certain toxic and/or flammable substances must implement a chemical accident program and prepare and submit a Risk Management Plan (RMP) to EPA.	Farms using ammonia on-site as an agricultural nutrient are excluded; Farms using listed flammables (e.g., propane) on site as a fuel are also exempt.

	Ammonia, used as an agricultural nutrient, when held by a farmer.	
	Listed flammable substances used on-site as a fuel.	
Farm Equipment Standards	Boilers - There are two types of air emission regulations for boilers.	Farms with boilers (steam generating units).
	Engines - Air quality requirements vary for stationary engines, depending on whether the engine is new or existing, where the engine is located, and what type of ignition system is used.	Farms with stationary internal combustion engines.
Emergency Planning & Community Right to Know Act (EPCRA)		
Hazardous Chemical Inventory Reporting (Tier I & Tier II)	Submit a hazardous chemical inventory form (also known as Tier II) to the State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC) and the local fire department, annually, by March 1.	Any farm handling more than a threshold quantity of OSHA hazardous chemicals, which includes EPCRA extremely hazardous substances (EHSs) and non-EHSs)
	Pursuant to EPCRA section 311(e)(5), substances used in routine agricultural operations are exempt from reporting.	
Emergency release reporting	Report releases of extremely hazardous substances or CERCLA hazardous substances to state and local emergency planning entities.	Any farm that releases more than a reportable quantity or more of an extremely hazardous substance or a CERCLA hazardous substance.
	EPA has interpreted EPCRA section 304 to not require reporting of air emissions from animal waste at farms.	

	On November 14, 2018, EPA published a proposed rule to amend EPCRA release notification regulations to add the reporting exemption for air releases from animal waste at farms provided in CERCLA section 103(e).	
	Additionally, EPA interprets EPCRA to exclude farms that only use substances in routine agricultural operations.	
	Other exemptions from release reporting:	
	Normal application of fertilizers.	
	Application, handling and storage of a registered pesticide by an agricultural producer.	
	Natural gas, natural gas liquids, liquified natural gas, or synthetic gas usable for fuel.	
	Petroleum products not specifically listed or designated as a hazardous substance. For example, gasoline or diesel fuel.	
	Federally permitted releases.	
	Natural releases from farming land disturbance activities	
Emergency Planning Notification	Notify State Emergency Response Commission (SERC) and Local Emergency Planning Committee (LEPC) if you have an EPCRA EHS at or above its threshold planning quantity (TPQ). Designate a facility emergency coordinator to participate in local emergency planning process and provide requested any information necessary for development of local emergency plan.	Any farm that has an EPCRA EHS present at or above its threshold planning quantity.
	The list of EHSs and their TPQs can be found at 40 CFR 355, Appendix A and B.	There are no exclusions or exemptions for farms for this requirement.
Toxic Substances Control Act (TSCA)		
Lead-Based Paint	EPA's Lead Renovation, Repair and Painting Rule (RRP Rule) requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in homes, child care facilities and pre-school built before 1978 have their firm	Home renovation, repairs, or painting that disturb lead-based paint.

certified by EPA (or an EPA authorized state), use certified renovators who are trained by EPA-approved training providers and follow lead-safe work practices.

APPENDIX J: BROAD SECTOR DEFINITIONS

Automotive	
NAICS Code	Description
335312	Motor and Generator Manufacturing
335910	Battery Manufacturing
336110	Automobile and Light Duty Motor Vehicle Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336390	Other Motor Vehicle Parts Manufacturing

Renewable Energy	
NAICS Code	Description
221111	Hydroelectric Power Generation
221113	Nuclear Electric Power Generation
221114	Solar Electric Power Generation
221115	Wind Electric Power Generation
221116	Geothermal Electric Power Generation
221117	Biomass Electric Power Generation
221118	Other Electric Power Generation
221121	Electric Bulk Power Transmission and Control
221122	Electric Power Distribution
237130	Power and Communication Line and Related Structures Construction
238210	Electrical Contractors and Other Wiring Installation Contractors
238220	Plumbing, Heating, and Air-Conditioning Contractors
332410	Power Boiler and Heat Exchanger Manufacturing
333242	Semiconductor Machinery Manufacturing
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334519	Other Measuring and Controlling Device Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335312	Motor and Generator Manufacturing
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
335910	Battery Manufacturing
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers
541330	Engineering Services
541360	Geophysical Surveying and Mapping Services
541620	Environmental Consulting Services
541690	Other Scientific and Technical Consulting Services
541713	Research and Development in Nanotechnology

Food & Agriculture	
NAICS Code	Description
111000	Crop Production
112000	Animal Production
115111	Cotton Ginning
115112	Soil Preparation, Planting, and Cultivating
115113	Crop Harvesting, Primarily by Machine
115114	Postharvest Crop Activities (except Cotton Ginning)
115115	Farm Labor Contractors and Crew Leaders
115116	Farm Management Services
115210	Support Activities for Animal Production
311111	Dog and Cat Food Manufacturing
311119	Other Animal Food Manufacturing
311211	Flour Milling
311212	Rice Milling
311213	Malt Manufacturing
311221	Wet Corn Milling
311224	Soybean and Other Oilseed Processing
311225	Fats and Oils Refining and Blending
311230	Breakfast Cereal Manufacturing
311313	Beet Sugar Manufacturing
311314	Cane Sugar Manufacturing
311340	Nonchocolate Confectionery Manufacturing
311351	Chocolate and Confectionery Manufacturing from Cacao Beans
311352	Confectionery Manufacturing from Purchased Chocolate
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311412	Frozen Specialty Food Manufacturing
311421	Fruit and Vegetable Canning
311422	Specialty Canning
311423	Dried and Dehydrated Food Manufacturing
311511	Fluid Milk Manufacturing
311512	Creamery Butter Manufacturing
311513	Cheese Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
311811	Retail Bakeries
311812	Commercial Bakeries
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
311821	Cookie and Cracker Manufacturing
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour
311830	Tortilla Manufacturing
311911	Roasted Nuts and Peanut Butter Manufacturing
311919	Other Snack Food Manufacturing

Food & Agriculture Continued	
NAICS Code	Description
311920	Coffee and Tea Manufacturing
311930	Flavoring Syrup and Concentrate Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing
311942	Spice and Extract Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing
312120	Breweries
312130	Wineries
312140	Distilleries
312230	Tobacco Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325315	Compost Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
333241	Food Product Machinery Manufacturing
423820	Farm and Garden Machinery and Equipment Merchant Wholesalers
424410	General Line Grocery Merchant Wholesalers
424420	Packaged Frozen Food Merchant Wholesalers
424430	Dairy Product (except Dried or Canned) Merchant Wholesalers
424440	Poultry and Poultry Product Merchant Wholesalers
424450	Confectionery Merchant Wholesalers
424470	Meat and Meat Product Merchant Wholesalers
424480	Fresh Fruit and Vegetable Merchant Wholesalers
424490	Other Grocery and Related Products Merchant Wholesalers
424510	Grain and Field Bean Merchant Wholesalers
424520	Livestock Merchant Wholesalers
424590	Other Farm Product Raw Material Merchant Wholesalers
424810	Beer and Ale Merchant Wholesalers
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers
424910	Farm Supplies Merchant Wholesalers
424930	Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers
424940	Tobacco and Tobacco Product Merchant Wholesalers
493110	General Warehousing and Storage
493120	Refrigerated Warehousing and Storage
493130	Farm Product Warehousing and Storage
493190	Other Warehousing and Storage
541380	Testing Laboratories
541614	Process, Physical Distribution, and Logistics Consulting Services
541620	Environmental Consulting Services
541690	Other Scientific and Technical Consulting Services
541714	Research and Development in Biotechnology (except Nanobiotechnology)
541715	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)

IT Innovation	
NAICS Code	Description
513210	Software Publishers
518210	Data Processing, Hosting, and Related Services
519290	Web Search Portals and All Other Information Services
541430	Graphic Design Services
541490	Other Specialized Design Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541513	Computer Facilities Management Services
541519	Other Computer Related Services
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
334519	Other Measuring and Controlling Device Manufacturing
334610	Manufacturing and Reproducing Magnetic and Optical Media

APPENDIX K: DATA SOURCES

Lightcast (formerly Emsi Burning Glass) is a global leader in labor market analytics, offering a data platform that gives a comprehensive, nuanced, and up-to-date picture of labor markets at all scales from national to local. Key components of the platform include traditional labor market information, job postings analytics, talent profile data, compensation data, and skills analytics. Lightcast integrates government data with information from online job postings, talent profiles, and resumes to produce timely intelligence on the state of the labor market. Job and compensation data is available by industry, occupation, educational program, and skill type. Click to learn more.

Esri ArcGIS Business Analyst combines proprietary statistical models covering demographic, business, and spending data with map-based analytics to offer insights on market opportunities for industries, businesses, and sites. Business Analyst integrates datasets covering a wide range of topics including demographics, consumer spending, market potential, customer segmentation, business locations, traffic counts, and crime indexes, which can be overlaid spatially to produce customizable maps and uncover market intelligence. Data can be pulled for standard and custom geographies, allowing for valuable comparison between places. Click to learn more.

IBISWorld is a leading provider of expert industry research and analysis for broad sectors and niche industries across the economy. Thoroughly researched industry reports from IBISWorld leverage economic, demographic, and market data into forward-looking insight, providing detailed data and narrative on current and historic trends, as well as future outlook and projections. Topics covered include products and services, major markets, upstream and downstream supply chain industries, performance drivers, factors for competitiveness, operating conditions, major players, and key statistics on industry performance. Reports are available by industry at the global, national, and state level. Click to learn more.

fDi Markets is the most comprehensive online database of cross-border greenfield investments available, covering all countries and sectors worldwide. The fDi Markets database tracks capital expenditures and jobs at the sector and project level for country-to-country foreign direct investment projects as well as domestic state-to-state investment projects. Click to learn more.

CoStar is a comprehensive source of commercial real estate intelligence, offering an inventory of over 6.4 million commercial properties spanning 135 billion square feet of space in 390 markets across the US. CoStar covers office, retail, industrial, hospitality, and multifamily markets. Property- and market-level data on absorption, occupancy, lease rates, tenants, listings, and transactions are researched and verified through calls to property managers, review of public records, visits to construction sites, and desktop research to uncover nearly real-time market changes. Click to learn more.

AUTM (formerly the Association for University Technology Managers) maintains the STATT database (Statistics Access for Technology Transfer), a tool that aggregates three decades of licensing data for US research institutions. Such data provides insights into the role that research institutions play in local and regional innovation ecosystems through technology transfer and the launch of startup companies.

The data covers variables such as research expenditures, activity and income, startups, funding, patent applications, disclosures, and royalties earned. Click to learn more.

Crunchbase offers a best-in-class live database on innovative companies across industries, powered by contributors, partners, and in-house data experts. With a focus on tech companies and startups, the platform aggregates information on investment and funding, founding members and leadership, mergers and acquisitions, news, and industry trends. Designed as both a market research and prospecting solution, Crunchbase offers the ability to narrow down companies matching criteria such as headquarter location, investment stage, or industry, while automatically offering recommendations based on these criteria. Click to learn more.

Demandbase is an account-based marketing, sales intelligence, and data platform used for identifying and gathering information on businesses, contacts, and prospects. Applications in the economic development space include developing databases of existing companies for business retention and expansion outreach, compiling marketing lists for business attraction prospecting, creating watchlists for following news on relevant companies and industries, identifying companies in specific sectors and regions, and accessing contact information for key decisionmakers across businesses. Click to learn more.

APPENDIX L: ABOUT CAMOIN ASSOCIATES

As the nation's only full-service economic development and lead generation consulting firm, Camoin Associates empowers communities through human connection backed by robust analytics.

Since 1999, Camoin Associates has helped local and state governments, economic development organizations, nonprofit organizations, and private businesses across the country generate economic results marked by resiliency and prosperity.

To learn more about our experience and projects in all of our service lines, please visit our website at www.camoinassociates.com. You can also find us on LinkedIn, Facebook, and YouTube.

The Project Team

Jim Damicis
Project Principal

Mara Klaunig
Strategic Advisor/Sr. Project Manager

Tom Dworetsky
Analytics Lead

Katherine Follansbee
Project Manager

Angela Hallowell
Analyst

Dawn Otterby
Analyst

Service Lines

Strategic and Organizational Planning

Lead Generation and Relationships

Entrepreneurship and Innovation

Impact Analysis

Real Estate Development Services

Business Attraction and Retention

Industry and Workforce Analytics

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