

A grayscale map of the Detroit-Windsor area, showing the Detroit River and surrounding urban grids. Two circular markers, one in Southeast Michigan and one in Southwest Ontario, are connected by a white line. The text 'SOUTHEAST MICHIGAN' is positioned above the marker in Michigan, and 'SOUTHWEST ONTARIO' is positioned above the marker in Ontario.

SOUTHEAST
MICHIGAN

SOUTHWEST
ONTARIO

Detroit-Windsor Medical Innovation and Healthcare Industry Cluster Assessment

11.20.17

PSC



**PUBLIC SECTOR
CONSULTANTS**

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EXECUTIVE SUMMARY

OVERVIEW

MedHealth is a collaborative, cross-border initiative that leverages the combined assets and opportunities of Southeast Michigan and Southwest Ontario to advance the region's status as a hub of innovation within the medical industry. Since October 2015, the members of the MedHealth steering committee, with the leadership of TechTown Detroit and the support of Public Sector Consultants (PSC), have successfully executed key activities to advance the region's medical device and digital health industry sectors. This technical assessment is one component of MedHealth's strategic initiatives and is intended to help inform the collaborative's decisions and provide baseline data to evaluate future progress. The "cluster" examined in this report is broadly defined as medical innovation and healthcare industries, of which MedHealth's more focused sectors of medical devices and digital health are a part.

Southeast Michigan and Southwest Ontario both have large and growing medical innovation and healthcare industries. Geographically, Windsor sits on the Canadian side of the Detroit River and, because of this, shares many economic development opportunities with Detroit despite the two cities being in separate countries. The analysis identifies industries that are currently important to the regional economy in terms of size or concentration, those that may be emerging as important, and those that may be on the decline in the region. The goal of this regional assessment is to determine the industry and occupation strengths that currently exist and provide comparisons between Detroit, Windsor, and similar regions in order to inform discussion of ways in which MedHealth can focus its activities.

This assessment focuses on the Detroit combined statistical area (CSA), often referred to just as Detroit, and the Windsor-Essex area, referred to as Windsor, which both contribute to the medical innovation and healthcare cluster economy. The cluster has been subdivided into seven industry groups for detailed analysis: Manufacturing; Medical Software; Research and Development; Service Provision—General; Service Provision—Centers, Facilities, and Hospitals; Service Provision—Offices; and Trade. Detroit and Windsor are analyzed jointly and separately in greater detail and against their respective comparison regions: Minneapolis, Houston, and Cleveland for Detroit; and London, Hamilton, and Surrey regions for Windsor.

KEY FINDINGS

For more than a century, Detroit has been known worldwide as the automotive town. As was seen in the last recession, dependency on a single industry—particularly one as dominant as auto—does not provide for the diversity a major economic region such as Detroit needs. Efforts at broadening the economic base to mitigate downturns in an industry or group of industries in the area are critical to a region's long-term sustainability.

Given these conditions, the medical innovation and healthcare sectors are credible opportunities for diversification. A cluster already exists in Detroit and Windsor and, while not universal, most of the industry groups included in this assessment are growing in at least one of the two cities. For the most part, the pay in these sectors is relatively high because many of the jobs are in high tech. Furthermore, it draws on the region's strengths, which are bolstered by other businesses in the medical innovation and

healthcare industries emerging due to research and development efforts, engineering innovations, and tech and tech transfer.

As previously noted, the Detroit and Windsor regions share many geographic and economic characteristics. Combined, they provide a solid foundation for the expansion of the cluster. Despite the difference in size of the two economies, both regions have a similar percentage of their economies devoted to cluster jobs. The cluster makes up 17 percent of Detroit's economy and 18 percent of Windsor's economy. Overall, cluster employment has been increasing, 10 percent for Detroit and 38 percent for Windsor from 2007 to 2016, for a total cluster employment in 2016 of 438,217 people.

Jobs in the cluster typically pay well. Two of the highest-paying industry groups in the U.S. and Canada are Medical Software (over \$90,000 and C\$51,000 respectively), and Research and Development (nearly \$90,000 and C\$52,000 respectively). The median annual earnings for the cluster-related occupations within the industries are also strong. In the Detroit CSA, earnings range from \$12.11 per hour to \$48.05 per hour annually, with an overall median salary of \$28.27 per hour. In the Windsor region, earnings range from C\$11.19 per hour to C\$52.50 per hour annually, with an overall median salary of C\$24.24 per hour.

The most striking difference between the two economies is their relative competitive advantages. The Detroit economy shows 30,000 fewer jobs in the cluster than would be expected when compared to the cluster's performance in the U.S. economy from 2007 to 2016. The main reason for slower growth is that the number of hospital jobs in Detroit hasn't kept up with U.S. trends. This, coupled with the recent economic downturn, contributed to a negative competitive effect. However, this can also be an opportunity for focused development efforts. During the same period, despite having closely related industries, the Windsor MedHealth market performed well in relation to the Canadian economy from 2007 to 2016.

Overall, the medical innovation and healthcare industry sectors have a foothold in both Detroit and Windsor, with the two regions complementing each other well. Medical innovation and healthcare industries of particular interest include:

- Research and Development (strong in Detroit and emerging in Windsor)
- Medical Software (strong in Detroit and emerging in Windsor)
 - Custom Computer Programming Services (emerging in Detroit)
- Service Provision—General (strong in Detroit and emerging in Windsor)
- Manufacturing (strong in Detroit and Windsor)
 - Other Measuring and Controlling Device Manufacturing (strong in Detroit)

Detroit and U.S. Comparison Regions Key Findings

The Detroit CSA was compared to the CSAs of Cleveland, Houston, and Minneapolis to gauge its relative standing, strengths, and weaknesses in cluster industries. This analysis was conducted at the six-digit North American Industry Classification System (NAICS) code level and four-digit Standard Occupational Classification (SOC) code level based on availability of data.

Among the four regions, Detroit had the greatest total employment in the cluster industries in 2016. However, over the last ten years, Detroit's cluster job growth (9.6 percent) was the lowest of the four

regions. If this trend continues, it could result in Detroit dropping from first to second, or even third, amongst the four CSAs in total employment.

The Minneapolis region has the highest percentage of its economy's gross regional product (GRP) related to cluster industries, followed by the Detroit CSA. With the Mayo Clinic locations around Minneapolis, they have distinct advantages over the other locations in several of the cluster industries. The cluster in the Detroit CSA most closely resembles that of Cleveland. Cleveland's strengths lie in the Research and Development group as a whole, particularly for Colleges, Universities, and Professional Schools, and though Detroit has not grown as much as other regions in the Research and Development group as a whole, it has remained strong in this group specifically in the Physical, Engineering, and Life Sciences industry. Finally, although Houston's cluster is not as large or as prevalent as the other comparable regions, it has shown considerable job growth in each subsector and has grown in nearly all seven subsectors relative to its size.

The Detroit CSA has many manufacturing industries that could greatly benefit from additional focus due to their high growth potential and ability to compete at a higher level than they do in other regions. The cluster around Detroit has shown growth in Medical Manufacturing, including Measuring and Controlling Devices, Medicinal and Botanical Manufacturing, and Surgical and Medical Instruments. The Medical Software industry has seen significant growth, as have insurance companies, hospitals, and home healthcare systems.

Windsor and Canadian Comparison Regions Key Findings

The Windsor region was compared to London, Hamilton, and Surrey to gauge its relative standing, strengths, and weaknesses in cluster industries. Based on the availability of data, this analysis was conducted at the four-digit NAICS code level and the four-digit National Occupation Classification (NOC) code level.

In 2016, Hamilton (with nearly three times the population of each of the other three regions) had more total jobs in MedHealth cluster industries than Windsor, Surrey, and London. However, Windsor had a slightly higher share of its total regional jobs in MedHealth (nearly 18 percent) than Hamilton's regional jobs (17 percent). All regions had strong growth in medical innovation and healthcare industry jobs over the past ten years, with Windsor experiencing an increase of 38 percent. Like Houston, Surrey, although small, has shown significant strides as well.

With the exception of a slight decline in research and development, all industries within the cluster around Windsor have performed well over the past ten years. With Windsor's strong manufacturing presence and availability of skilled labor, Windsor has a competitive advantage in the Manufacturing group of industries within the cluster. There are several emerging industries in Medical Software and Research and Development industry groups, and the Service Provision industry groups have also added strength to Windsor's economy.

NEXT STEPS

This technical assessment serves as a starting point for discussion about the status and future of the region's medical innovation and healthcare cluster industries. It will set the stage for MedHealth stakeholders to market the area as a medical device and digital health hub, thereby accelerating business and talent attraction and retention and contributing to economic growth. The assessment also provides a

baseline analysis from which future industry and job growth, in part, can be measured. The next phase of activities will include:

- Conducting interviews with business leaders to identify emerging trends, the scope of businesses involved in the MedHealth cluster, current and needed infrastructure for expanding the cluster in the region, and business needs and desires in expansion and location decisions
- Documenting current commercialization/entrepreneurial activities associated with the MedHealth cluster
- Working with other cluster organizations across industries and geographies to share best practices and identify opportunities to spur economic growth

There are countless opportunities for binational collaboration amongst small and large medical technology companies, major health systems and other health providers, universities, economic developers, entrepreneurial service providers, government agencies, and innovators to grow the cluster.

REPORT LAYOUT

This report is divided into three separate sections. The first chapter focuses on the Detroit-Windsor combined region (using the Detroit CSA and the Windsor-Essex region of Canada). Due to the differences in available data between the U.S. and Canada, not all estimates are directly comparable. However, employment, growth and share of their respective economies can be examined and comparisons between the two economies are made whenever possible. For more information on the level of detail available for each region, please see Appendices II and VI for a list of industries included in each analysis.

The second chapter of this report investigates Detroit and three comparison regions in the United States. The CSAs of Cleveland, Houston, and Minneapolis were selected due to their size, presence of medical innovation and healthcare industries, and other similarities to Detroit (see Appendix I for a list of counties included in the analysis). This chapter provides detail on the industry sectors in which the Detroit CSA may or may not have a strategic advantage and how its growth compares to other similar regions. Appendix II provides further detail on the geographic areas included in the analysis.

The third chapter examines Windsor and three comparison regions in Canada. The regions of London, Hamilton, and Surrey were selected based on their size, presence of medical innovation and healthcare industries, and other similarities to Windsor (see Appendix V for a list of counties included in the analysis). As with chapter two, this chapter provides detail on the industry sectors in which Windsor may or may not have a strategic advantage and how its growth compares to that of similar regions. Appendix VI provides detail on the geographic areas included in the analysis.

METHODOLOGY

To define the medical innovation and healthcare cluster, PSC gathered known industry titles and NAICS codes from the medical and health fields, building off research conducted at Purdue University¹ and

¹ Center for Regional Development, Purdue University (PCRD), and Indiana Business Research Center, Kelley School of Business, Indiana University (IBRC). January 2007. *Unlocking Rural Communities: The Role of Regional Clusters*. Accessed October 26, 2017. <https://pcrd.purdue.edu/files/media/Unlocking-Rural-Competitiveness-The-Role-of-Regional-Clusters.pdf>

Harvard Business School,² and presented the results of that work to the MedHealth steering committee for feedback. The initial cluster was expanded to include additional industries related to MedHealth based on local knowledge and involvement. This process resulted in 61 NAICS codes, which were divided into seven industry groups: Manufacturing; Medical Software; Research and Development; Service Provision—General; Service Provision—Centers, Facilities, and Hospitals; Service Provision—Offices; and Trade. Southwest Ontario, an integral part of the Detroit-Windsor medical innovation and healthcare cluster, is analyzed separately from the Detroit CSA because the data was not compatible for combination with Detroit or comparison with other U.S. regions. While employment numbers could be compared, location quotient and shift share analyses are based, in part, on the national economy and are not directly comparable between countries. For the Canadian analysis, six-digit NAICS code data is not available. As a result, the Windsor and comparison region analysis was conducted at a higher level, using four-digit NAICS codes (see Appendices III and VII for the complete list of codes and industry groups for the U.S. and Canada, respectively).

Past, present, and projected cluster data from 2007 to 2026 was obtained from Economic Modeling Specialists International. (Emsi). For each NAICS code and each region, the data included jobs; median wages; location quotient (LQ); shift share; and other variables to determine strength and growth potential of the Detroit and Windsor cluster industries. This report discussed the competitive advantage (the job change associated with unique regional characteristics and not tied to the broader economy or industry) and LQ analysis. While the focus of this report is to examine current conditions, 2026 data for the U.S. and 2024 data for Canada is included in the appendices.

- **Shift share analysis**—Examines the current level of employment in an industry and estimates how much of the industry’s predicted growth or decline can be attributed to changes in the nation’s overall economy (national growth effect), how much can be attributed to predicted changes in the target industry at the national level (industry mix effect), and how much of the predicted employment change can be attributed to unique regional characteristics (regional competitiveness effect—which, in this report, is referred to as competitive advantage or disadvantage).
- **Location quotient analysis**—Identifies how a region’s share of total employment in an industry or industry cluster compares with the nation’s share of employment within that industry. A location quotient of one indicates that the regional employment percentage is the same as the national employment percentage, or that the industry’s share of regional employment is “average.” A location quotient greater than one indicates a share of employment devoted to a certain industry that is larger than the national average.

The following is a rule of thumb when analyzing the LQ and employment bubble charts presented throughout the report. Industries fall into four areas on the charts:

- Upper right quadrant—important growth industries
- Lower right quadrant—emerging industries
- Lower left quadrant—industries showing little promise to the local economy

² Mercedes Delgado, Michael E. Porter, and Scott Stern. August 2014. *Defining Clusters of Related Industries*. Accessed October 27, 2017. <http://clustermapping.us/sites/default/files/files/resource/Defining%20Clusters%20of%20Related%20Industries%20-%20NUMBER%20Working%20Paper%2020375.pdf>

- Upper left quadrant—industries that may require attention

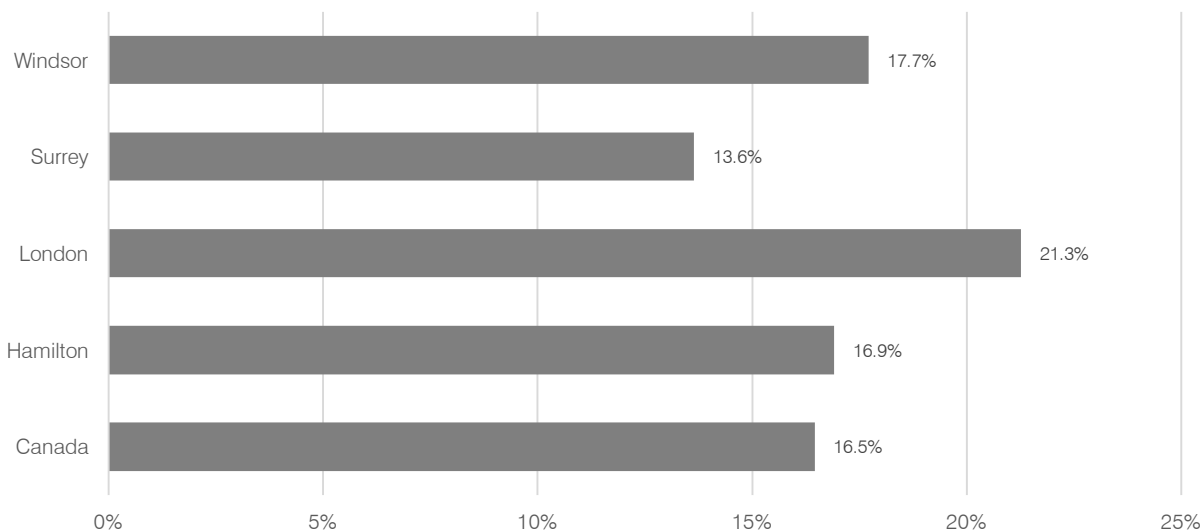
PSC also used the identified NAICS codes to determine SOC codes and NOC codes belonging to occupations related to the economic activities of the cluster. The team selected occupations directly and uniquely relevant to MedHealth and removed or consolidated more general occupations, such as administration or retail sales. Higher-level (three-digit) SOC codes were used whenever possible, whereas five-digit SOC codes were used when a specific occupation fit but other similarly categorized occupations did not. For example, biomedical engineers (SOC 17-2030) fit within the cluster, but counting all engineers (three-digit SOC 17-2) would be an overrepresentation because doing so would encompass every engineer occupation, including industrial engineers, environmental engineers, and aerospace engineers. The occupations were combined into 24 occupation categories, ranging from three- to five-digit SOC code levels and four-digit NOC codes. PSC also used the identified NAICS codes to determine 24 four-digit NOC codes belonging to occupations related to the economic activities of the cluster in Canada. The occupations were combined into 15 occupation categories, which were matched as closely as possible to the SOC codes used in the Detroit analysis. Past, present and projected cluster occupation data from 2007 to 2026 was obtained from Emsi. For each SOC and NOC code, data pulled included occupational growth, LQ, median hourly earnings, shift share, and other variables.

CHAPTER 1: THE DETROIT-WINDSOR CLUSTER

The combined medical innovation and healthcare cluster in Detroit, Michigan and Windsor, Ontario is first examined to provide an overall profile for the Detroit-Windsor region. These binational regions are working together to create a vibrant cluster and their differing strengths and weaknesses offer the opportunity for strategic industry and job growth. The Detroit, Michigan CSA in the United States was selected as the unit of analysis and for Windsor, Essex County, Ontario, Canada was used. This combination is consistent throughout this report and they are often referred to simply as Detroit and Windsor.

The economies of Detroit and Windsor operate on vastly different scales; however, the importance of the cluster is similar in both economies.³ The Detroit economy has a total of 409,748 cluster jobs, while the Windsor economy has only 28,469 cluster jobs, for a combined total of 438,217 jobs.⁴ While Windsor has only 7 percent of total jobs in the joint cluster, the medical innovation and healthcare cluster jobs make up a similar share of Detroit and Windsor's total employment (17 percent and 18 percent, respectively), indicating that the cluster is equally important in both economies.

EXHIBIT 1. Cluster Jobs as a Percentage of all Jobs in a Region, 2016—Canada

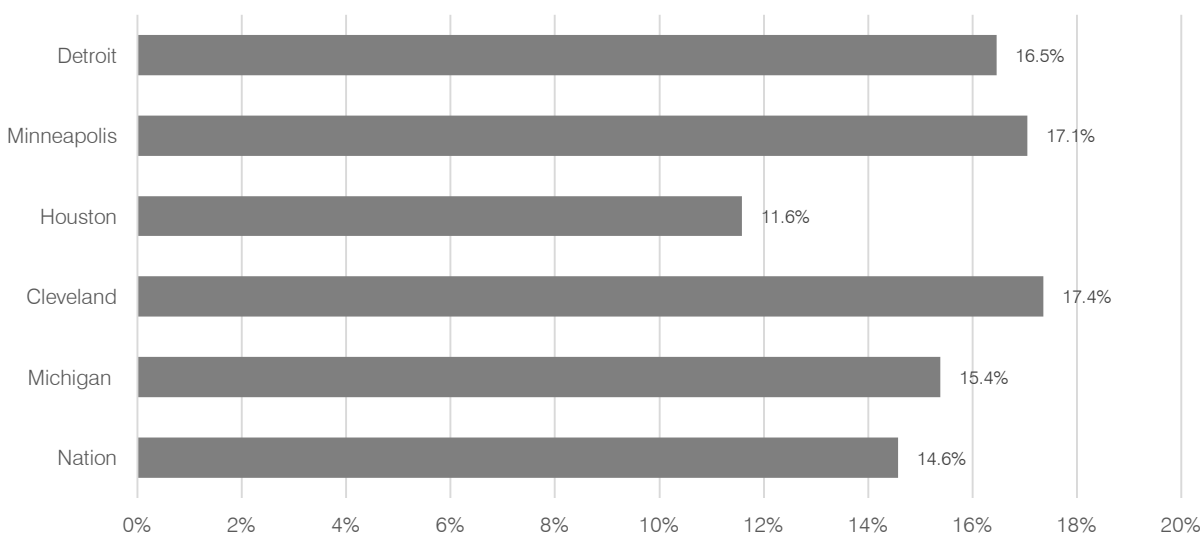


SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

³For the U.S. analysis, a six-digit NAICS code was used in order to obtain the most granular data possible. Six-digit level NAICS code data is not available for Canadian data; therefore, for the most comparable Canadian analysis, a four-digit NAICS code was used..

⁴Aggregate data for Canada does not include the self-employed.

EXHIBIT 2. Cluster Jobs as a Percentage of all Jobs in a Region, 2016—United States



SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

Identifying the job trends in both regions relative to this cluster provides additional insight. The cluster industries in both the Detroit CSA and the Windsor region have seen overall job growth over the last ten years. However, the Windsor medical innovation and healthcare economy has grown 38 percent (an annual rate of 3.8 percent over the last ten years), and the Detroit CSA medical innovation and healthcare economy has grown only 10 percent (1 percent annually) during the same period. Despite slow job growth, the Detroit CSA cluster is considerably larger.

The regional competitive effect (or advantage) explains how much of the change in each industry is due to some unique competitive advantage that the region possesses. This effect is calculated by taking the total regional growth and subtracting the national growth (overall economic changes) and industry growth (employment change specific to that industry at a national level). As this finds the difference, there is a possibility of a negative competitive effect, as we see with Detroit in Exhibit 3. This means that the Detroit CSA fell short of their expected change from 2007–2016 by 31,132 jobs. Hospitals were the largest contributor to the negative competitive advantage. Although there was some job growth in this industry, it was expected to grow more to keep up with area demand and national growth trends. However, an industry not keeping pace with expected growth over the last ten years could be seen as having considerable potential for future growth. Other industries that contributed to the negative competitive advantage include the Computer Systems Design Services sector, which was hit strongly during the recession; the Colleges, Universities, and Professional Schools sector; and Offices of Physicians and Dentists. Again, a negative competitive advantage does not mean that these industries did not grow, only that they did not grow as much as would be expected given the industry conditions and national growth effects.

In Windsor, the opposite can be observed. Windsor's competitive advantage was 3,434 jobs, meaning that Windsor added 3,434 more jobs than expected between 2007–2016 due to positive regional conditions. Although there was a combination of industries that contributed to the unexpected influences in the

Windsor cluster market, much of it can be attributed to an unexpected rise in Health and Personal Care Stores and Nursing Care Facilities.

EXHIBIT 3. Cluster Industries by Region, 2007–2016

Region	2007 Jobs	2016 Jobs	2007–2016 Percent Change	2016 LQ	LQ Change (2007–2016)		2007–2016 Competitive Advantage (Effect)
					Numeric Change	Percent Change	
Detroit	373,905	409,748	10%	1.3	0.00	0.3%	(31,132)
Windsor	20,577	28,469	38%	1.4	0.03	32.6%	3,434

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*; EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

The cluster has been subdivided into seven industry groups to provide a more detailed picture of the cluster and where its strengths and weaknesses may lie (see Exhibit 4). The NAICS codes were grouped into Manufacturing; Medical Software; Research and Development; Service Provision—General; Service Provision—Centers, Facilities, and Hospitals; Service Provision—Offices; and Trade. See Appendix II and Appendix VI for a further breakdown of the cluster industries.

EXHIBIT 4. Cluster Industries by Region by Industry Group, 2007–2016

Region	2007 Jobs	2016 Jobs	2016 Wages, Salaries, and Proprietor Earnings	2007–2016 Percent Change in Jobs	2016 LQ	2007–2016 LQ Percent Change	2007–2016 Competitive Advantage (Effect)
Manufacturing							
Detroit	6,463	6,909	\$72,709	7%	1.24	30%	176
Windsor	1,133	1,642	C\$56,026	45%	4.43	123%	565
Medical Software							
Detroit	33,651	37,479	\$89,121	11%	1.13	(15%)	(9,534)
Windsor	805	1,038	C\$51,319	29%	0.47	(6%)	33
Research and Development							
Detroit	32,224	33,474	\$89,739	4%	1.99	14%	275
Windsor	3,425	3,388	C\$51,672	(1 %)	1.06	(15%)	(698)
Service Provision—General							
Detroit	38,106	47,700	\$46,941	25%	1.20	1%	(2,986)
Windsor	1,989	2,913	C\$46,954	46%	1.19	23%	372
Service Provision—Centers, Facilities, and Hospitals							
Detroit	168,130	183,009	\$50,196	9%	1.35	(0.2%)	(9,937)
Windsor	8,718	12,698	C\$44,870	46%	1.32	39%	2,108
Service Provision—Offices							
Detroit	74,861	80,037	\$67,627	7%	1.17	(4%)	(3,924)
Windsor	2,249	3,562	C\$38,748	58%	1.30	24%	594
Trade							
Detroit	20,471	21,139	\$47,491	3%	1.29	10%	(381)

Region	2007 Jobs	2016 Jobs	2016 Wages, Salaries, and Proprietor Earnings	2007–2016 Percent Change in Jobs	2016 LQ	2007–2016 LQ Percent Change	2007–2016 Competitive Advantage (Effect)
Windsor	2,258	3,228	C\$29,671	43%	1.49	27%	459

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*; EMSI Intl. 2017. "2017.1 Canadian Dataset" *EMSI Developer*.

Each of the industry groups in the Detroit cluster is substantially larger than their counterparts in Windsor. However, for each region, the same industry group holds relative importance to the overall cluster. Despite Detroit's reputation in manufacturing, the medical innovation and healthcare Manufacturing group is the smallest of all Detroit clusters and has only grown by 7 percent, a 0.7 percent annual growth rate over the last ten years (this is due in part to the type of manufacturing included in the cluster's manufacturing group). However, the average wage is the third highest of all the Detroit cluster industry groups at \$72,709.

Like its Detroit counterpart, the Windsor cluster's Manufacturing group is one of the smallest industry groups in its respective region (second to last); however, it expanded 4.5 percent each year from 2007–2016 (45 percent over ten years).

The two highest-paying industry groups in the Detroit region are the Medical Software Engineering group and the Research and Development group—paying an average annual wage of \$89,121 and \$89,739 respectively. Similarly, these clusters are the second and third highest-paying industry groups in the Windsor geography, paying an average annual wage of C\$51,319 and C\$51,672 respectively. However, both geographies have relatively low employment in these clusters when compared to the employment in the other cluster industry groups.

There are three different service groups within each of the geographies. The Service Provision—General group experienced the greatest amount of growth (due to the Home Healthcare Services industry) of any industry groups in Detroit, growing by 25 percent (or at a 2.5 percent annual growth rate) from 2007 to 2016. The Service Provision—Centers, Facilities, and Hospitals category is the largest industry group in both the Detroit CSA, with 183,009 jobs in 2016, and in Windsor, with 12,698 jobs in 2016 (see Exhibit 4). Finally, the Service Provision—Offices group was the fastest growing of all the Windsor industry groups, growing by 58 percent, or at an annual rate of 5.8 percent, from 2007 to 2016. While Detroit's growth rate was only 7 percent from 2007 to 2016, the total increase in jobs surpasses the total number of Service Provision—Office jobs in Windsor.

The last industry group is the Trade group. In both geographies, this industry pays the lowest of all the industry groups, paying an average wage of \$47,491 in the Detroit CSA and C\$29,671 in the Windsor geography.

While not universal, most of the seven industry groups are growing in at least one of the two regions. The industry groups tend to have relatively high-paying jobs because many of them are in high-tech fields. Additionally, the cluster draws on the region's strengths. The region's automotive base has supported research and development, engineering innovations, training, tech and tech transfer that can be used in medical innovation and healthcare cluster industries.

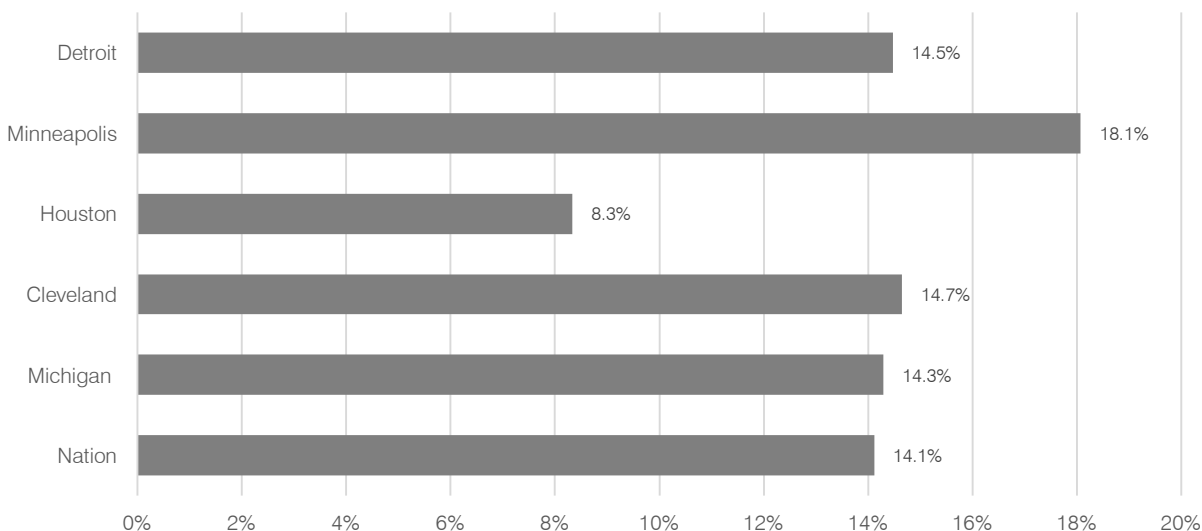
CHAPTER 2: REGIONAL COMPARISON—DETROIT

In order to encompass key players in the Southeast Michigan region, the CSA for Detroit was selected as the region for analysis. This also provides an easy delineation for comparisons with other regions around the country. This report examines the Detroit CSA and the three comparison regions of Cleveland, Houston, and Minneapolis, providing highlights of strengths and relative standing of Detroit's medical innovation and healthcare cluster industries (see Appendix I for a list of counties included in the analysis). The cluster in the U.S. is made up of 61 industry codes (NAICS) and 24 occupation codes (SOC) that contribute to the cluster. Exhibits 5 through 7 provide aggregate information on the cluster industries and occupations at the regional level. The remainder of this section focuses on the Detroit cluster industries and occupations in more detail and makes comparisons to other regions where appropriate. Industry-level data for the comparison regions and more detail on the Detroit CSA are presented in Appendix II of this report.

GROSS REGIONAL PRODUCT

The cluster makes up 14.5 percent of Detroit's gross regional product, and its contribution to the state's GRP is similar at 14.3 percent. In comparison, the MedHealth cluster in Minneapolis contributes 18.1 percent to the region's total GRP, while the Cleveland's GRP is similar to Detroit's (14.7 percent). Houston's cluster contributes the lowest share to its overall GRP for the region, at 8.3 percent.

EXHIBIT 5. Cluster Industries as a Percentage of Gross Regional Product, 2016

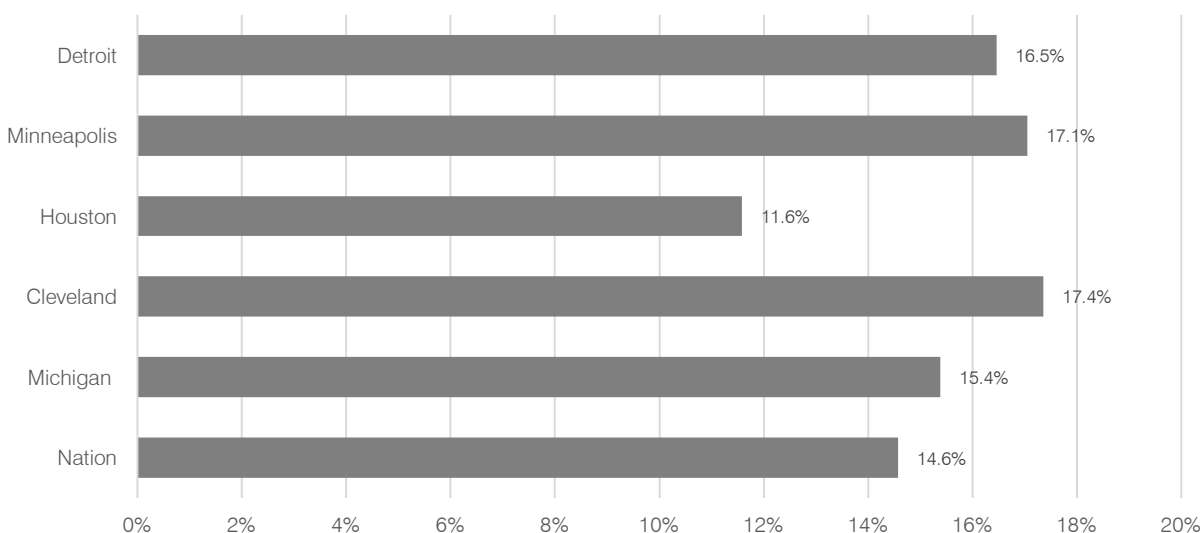


SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

JOBS

Cluster jobs make up 16.5 percent of Detroit's employment. Cleveland and Minneapolis have the largest number of cluster jobs as a share of total employment—17.4 and 17.1 percent, respectively). Houston is at the bottom with cluster jobs comprising 11.6 percent of total regional jobs.

EXHIBIT 6. Cluster Jobs as a Percentage of all Jobs in a Region, 2016



SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." EMSI Developer.

In 2016, the Detroit CSA had more total jobs in cluster industries than did the comparison regions of Cleveland, Houston, and Minneapolis, as seen in Exhibit 7. This is an increase of 9.6 percent over the last decade—the lowest change in job growth of all four CSAs and very small growth in concentration, or LQ. With the exception of Houston, medical innovation and healthcare industries have a healthy concentration of jobs (strong LQ, all greater than 1.25).

EXHIBIT 7. Cluster Industries by Region, 2007–2016

Region	Jobs			LQ			Change in Competitive Advantage (Effect)	
	2007	2016	2007–2016 Percent Change	2016 LQ	2007–2016 Numeric Change	2007–2016 Percent Change	2007–2016	2016–2026
Detroit	373,905	409,748	9.6%	1.3	0.00	0.3%	-31,132	-28,101
Cleveland	275,710	308,237	11.8%	1.4	0.09	6.5%	-13,795	-16,576
Houston	295,401	380,684	28.9%	1.0	-0.02	-2.0%	24,700	24,611
Minneapolis	317,139	372,911	17.6%	2.0	0.05	2.3%	-1,697	-17,589
Total*	1,262,155	1,471,580	16.6%	1.4	0.02	1.5%	-21,924	-37,655

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." EMSI Developer.

*Total may not equal the sum of the regions due to rounding.

The seven industry groups are comprised of multiple individual industries which were examined collectively and individually.

Within the cluster, the Research and Development in Biotechnology industry (NAICS 541711) shrank dramatically, losing 23.8 and 72.3 percent of jobs, respectively, between 2007 and 2016 across the four regions. Other industries, however, are growing quickly, such as Kidney Dialysis Centers (NAICS 621492),

All Other Information Services (NAICS 519190), and Surgical and Medical Instrument Manufacturing (NAICS 339112). In the Detroit CSA, these industries experienced job growth of 382.1 percent, 742.1 percent, and 51.4 percent respectively (see Appendix II).

The increase in jobs from 2007 to 2016 in Detroit can be attributed mainly to the Service Provision—General group, which grew at 25.2 percent over the last ten years. This cluster experienced the fastest growth in Detroit; however, the importance of the Medical Software group, which experienced 11.4 percent growth in an industry with an average wage of \$89,121, should also be considered. The percentage change in the Medical Software group is smaller than the Service Provision—General group, but the average annual wage is almost double in the Medical Software group, leading to greater economic impact per job, which increases the value of this cluster as a whole.

EXHIBIT 8. Cluster Industries by Region by Industry Group, 2007–2016, United States

Region	2007 Jobs	2016 Jobs	2016 Wages, Salaries, and Proprietor Earnings	2007–2016 Percent Change in Jobs	2016 LQ	2007–2016 LQ Numeric Change	2007–2016 LQ Percent Change	2007–2016 Competitive Advantage (Effect)
Manufacturing								
Detroit	6,463	6,909	\$72,709	6.9%	1.2	0.37	29.8%	574
Cleveland	8,554	7,854	\$60,583	-8.2%	1.8	0.27	15.7%	-784
Houston	6,263	7,236	\$89,670	15.5%	0.6	-0.02	-2.7%	961
Minneapolis	33,134	34,420	\$97,132	3.9%	9.1	0.51	5.6%	-88
Medical Software								
Detroit	33,651	37,479	\$89,121	11.4%	1.1	-0.16	-14.6%	-11,524
Cleveland	12,219	17,034	\$76,969	39.4%	0.7	0.02	2.1%	-566
Houston	26,892	33,061	\$102,352	22.9%	0.7	-0.17	-22.4%	-5,916
Minneapolis	26,218	34,443	\$100,293	31.4%	1.1	-0.09	-8.6%	-3,412
Research and Development								
Detroit	32,224	33,474	\$89,739	3.9%	2.0	0.27	13.6%	-4,217
Cleveland	24,263	30,535	\$34,599	25.9%	1.2	0.19	15.7%	1,442
Houston	25,678	28,551	\$82,839	11.2%	0.5	-0.08	-15.2%	-1,934
Minneapolis	30,863	37,568	\$47,736	21.7%	1.1	0.03	2.7%	679
Service Provision—General								
Detroit	38,106	47,700	\$46,941	25.2%	1.2	0.02	1.3%	-1,225
Cleveland	27,474	33,048	\$37,123	20.3%	1.2	-0.03	-2.3%	-2,802
Houston	48,436	67,351	\$28,154	39.1%	1.6	-0.08	-5.3%	1,537
Minneapolis	38,166	46,072	\$69,353	20.7%	1.6	-0.06	-3.8%	1,101
Service Provision—Centers, Facilities, and Hospitals								
Detroit	168,130	183,009	\$50,196	8.8%	1.3	0.00	-0.2%	-8,277
Cleveland	144,689	160,168	\$48,382	10.7%	1.7	0.15	8.8%	-4,177
Houston	106,268	139,687	\$56,779	31.4%	0.8	0.04	5.2%	17,670
Minneapolis	123,288	142,865	\$49,807	15.9%	1.3	0.00	0.1%	-3,866
Service Provision—Offices								
Detroit	74,861	80,037	\$67,627	6.9%	1.2	-0.05	-3.9%	-6,832
Cleveland	43,115	45,071	\$70,751	4.5%	0.9	-0.04	-4.6%	-5,749

Region	2007 Jobs	2016 Jobs	2016 Wages, Salaries, and Proprietor Earnings	2007–2016 Percent Change in Jobs	2016 LQ	2007–2016 LQ Numeric Change	2007–2016 LQ Percent Change	2007–2016 Competitive Advantage (Effect)
Houston	64,592	83,876	\$72,633	29.9%	0.9	0.02	1.8%	9,008
Minneapolis	50,445	61,618	\$77,668	22.1%	1.1	0.08	7.8%	3,346
Trade								
Detroit	20,471	21,139	\$47,491	3.3%	1.3	0.13	9.8%	369
Cleveland	15,395	14,527	\$41,474	-5.6%	1.2	0.00	-0.1%	-1,158
Houston	17,272	20,920	\$50,483	21.1%	0.9	0.08	9.3%	3,374
Minneapolis	15,025	15,926	\$57,520	6.0%	1.1	0.03	2.7%	544

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

Medical Software and Research and Development are two of the cluster industries that pay the most, ranging from \$34,599 to \$102,352 in average annual wages and salaries. In general, the average wages and salaries paid in the Detroit area for cluster industry jobs is first among the comparison regions for Research and Development (\$89,739) and third for Medical Software (\$89,121), not adjusting for cost-of-living differences. In the Manufacturing and Trade industry groups, Detroit pays the third-highest average wages and salaries—\$72,709 for Manufacturing and \$47,491 for Trade—behind both Minneapolis (\$97,132 Manufacturing, \$57,520 Trade) and Houston (\$89,670 Manufacturing, \$50,483 Trade).

OCCUPATIONS

While the NAICS examines industry behavior over time, the Standard Occupational Classification codes analyze aspects of specific industry jobs, including median hourly wage (Exhibit 9). These occupations cut across industries and provide an overview of the skills base needed and available in a region. A total of 640 occupations relate to the cluster industries, with 24 overall categories relating more closely, including Biomedical Engineers (17-2030); Health Diagnosing and Treating Practitioners (29-1000); and Electrical, Electronics, and Electromechanical Assemblers (51-2020). Cluster occupations pay higher than average earnings at \$58,802 annually (\$28.27/hour). Median annual earnings in the Detroit CSA range from \$24,819 (\$12.11/hour) to \$99,944 annually (\$48.05/hour) (see Exhibit 9).

EXHIBIT 9. Cluster Industry Occupations, 2007–2026, Detroit

SOC Code	Description	2007 Jobs	2016 Jobs	2026 Jobs	2007–2016 Percent Change	Median Hourly Wage	Median Annual Salary	2016 LQ	Numeric Change LQ (2007– 2016)	Percent Change LQ 2007– 2006
15-1100	Computer Occupations	65,812	72,412	80,362	10.0%	\$36.24	\$75,379	1.1	0.00	-0.2%
15-2030	Operations Research Analysts	1,128	1,292	1,665	14.6%	\$41.64	\$86,611	0.7	-0.03	-3.8%
15-2090	Miscellaneous Mathematical Science Occupations	33	43	49	32.2%	\$26.98	\$56,118	1.0	0.17	17.2%
17-2030	Biomedical Engineers	125	128	179	1.8%	\$37.30	\$77,584	0.4	-0.04	-10.1%
17-2040	Chemical Engineers	330	369	487	11.7%	\$48.05	\$99,944	0.7	0.11	15.9%
17-2060	Computer Hardware Engineers	1,131	1,113	1,271	-1.7%	\$38.68	\$80,454	1.0	0.00	0.1%
17-2070	Electrical and Electronics Engineers	7,646	9,188	10,272	20.2%	\$42.40	\$88,192	1.8	0.51	28.2%
17-2130	Materials Engineers	693	805	897	16.2%	\$37.35	\$77,688	1.9	0.44	23.8%
19-1020	Biological Scientists	813	763	993	-6.1%	\$35.63	\$74,110	0.5	-0.05	-10.2%
19-1040	Medical Scientists	2,123	2,082	2,353	-2.0%	\$26.63	\$55,390	1.1	-0.10	-9.1%
19-2030	Chemists and Materials Scientists	1,766	2,170	2,679	22.9%	\$38.48	\$80,038	1.4	0.36	24.8%
19-4020	Biological Technicians	516	460	670	-10.9%	\$17.41	\$36,213	0.4	-0.07	-17.2%
19-4030	Chemical Technicians	1,326	1,512	1,976	14.0%	\$23.01	\$47,861	1.5	0.26	17.7%
29-1000	Health Diagnosing and Treating Practitioners	96,339	102,610	111,852	6.5%	\$37.21	\$77,397	1.2	-0.03	-2.2%
29-2000	Health Technologists and Technicians	49,332	53,196	58,744	7.8%	\$21.19	\$44,075	1.1	-0.02	-1.6%
29-9000	Other Healthcare Practitioners and Technical Occupations	1,939	2,089	2,277	7.7%	\$28.56	\$59,405	0.8	0.00	-0.1%
31-1000	Nursing, Psychiatric, and Home Health Aides	41,935	50,203	58,849	19.7%	\$12.11	\$25,189	1.3	0.03	2.4%
31-2000	Occupational Therapy and Physical Therapist Assistants and Aides	2,795	3,697	4,796	32.3%	\$21.41	\$44,533	1.3	0.04	3.4%
31-9000	Other Healthcare Support Occupations	26,026	27,859	31,201	7.0%	\$14.75	\$30,680	1.1	-0.05	-4.3%
51-2010	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	177	214	231	21.0%	\$26.77	\$55,682	0.3	0.08	24.3%

SOC Code	Description	2007 Jobs	2016 Jobs	2026 Jobs	2007–2016 Percent Change	Median Hourly Wage	Median Annual Salary	2016 LQ	Numeric Change LQ (2007– 2016)	Percent Change LQ 2007– 2006
51-2020	Electrical, Electronics, and Electromechanical Assemblers	4,197	4,126	4,201	-1.7%	\$12.49	\$25,979	0.9	0.14	14.8%
51-2030	Engine and Other Machine Assemblers	2,918	2,928	2,819	0.4%	\$23.71	\$49,317	4.9	0.40	8.1%
51-4060	Model Makers and Patternmakers, Metal and Plastic	973	1,019	919	4.7%	\$28.74	\$59,779	6.5	1.53	23.4%
51-9040	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	852	790	806	-7.3%	\$13.11	\$27,269	0.7	0.08	11.9%
Total		310,926	341,068	380,550	9.7%	\$28.27	\$58,802	1.2	0.01	0.9%

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

*Total may not equal the sum of the occupations due to rounding.

LOCATION QUOTIENT AND SHIFT SHARE ANALYSES

In addition to the total number of jobs, an industry's location quotient and shift share are important indicators to consider in the analysis of the cluster and its economic competitiveness within specific regions. Growth potential analysis is based on the number of jobs, projected job growth, LQ (relative share of employment), expected change in LQ, national growth effect, industry growth effect, and competitive advantage from 2007 to 2016 for identified cluster industries. Key findings are presented below for each industry group, focusing on the Detroit CSA with comparisons to other regions where appropriate.

Exhibits 10 through 15 show the current LQ for each specific industry within an industry group against the change in employment from 2007 to 2016. An LQ of one indicates that the share of employment in the given industry matches the nationwide share of employment in that industry. An LQ above one means that employment in the industry is more concentrated than the national average, and an LQ of 1.25 or greater is an indication of an exporting industry. Each circle represents the relative size of the industry in terms of total jobs, to show the relative importance of a specific industry.

The following is a rule of thumb when analyzing each bubble chart.

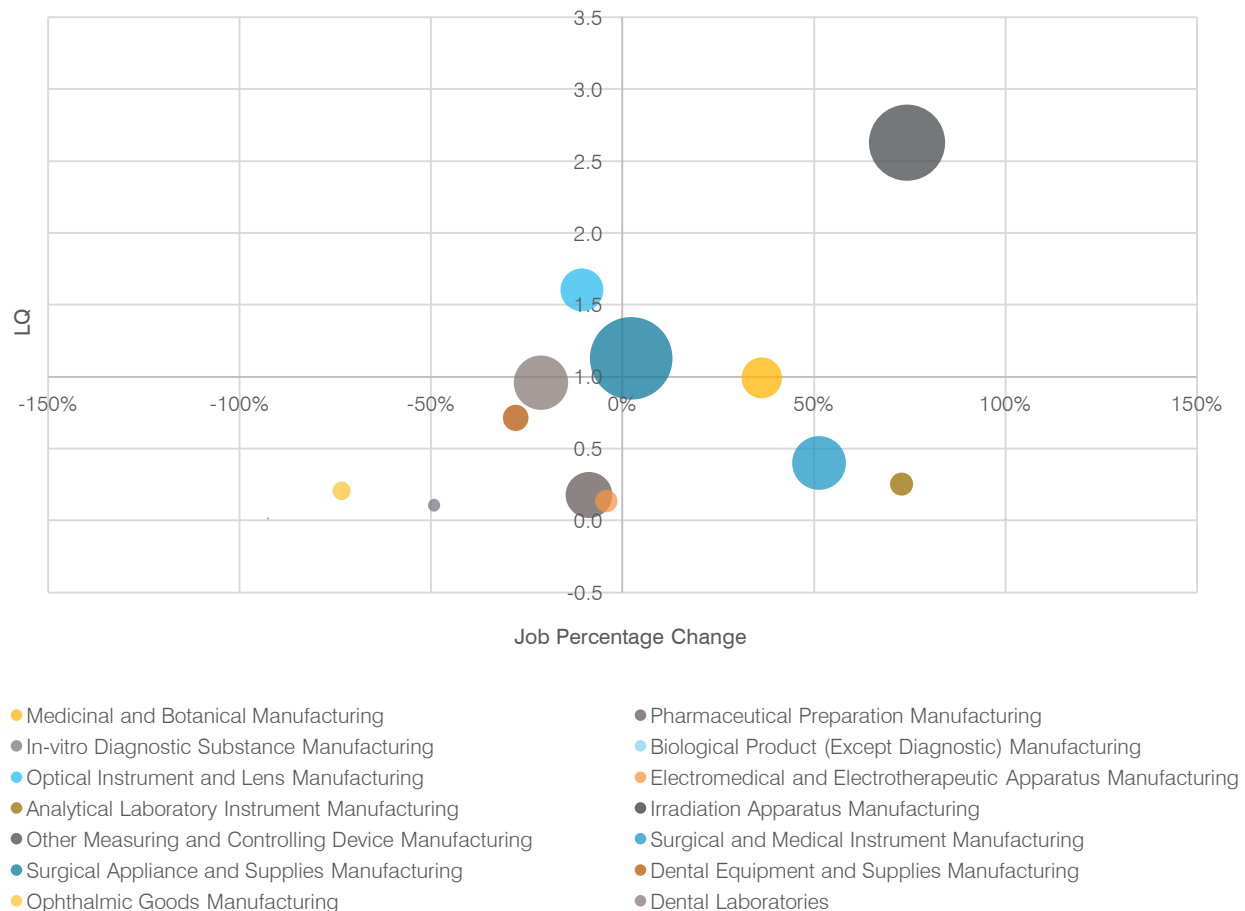
- Upper right quadrant—important growth industries
- Lower right quadrant—emerging industries
- Lower left quadrant—industries showing little promise to the local economy
- Upper left quadrant—industries that may require attention

MANUFACTURING INDUSTRIES

With Michigan's large manufacturing presence and availability of skilled labor (due in part to the decline in manufacturing jobs over the last decade), there is a large opportunity for strategic growth that capitalizes on this available workforce. Detroit has many manufacturing industries that could greatly benefit from additional focus due to their high growth potential and ability to compete at a higher level than they do in other regions nationally. Other Measuring and Controlling Device Manufacturing (NAICS 334519) has a strong and increasing share of employment in the metro Detroit area with a 2.63 LQ, well above an average relative share of employment. The industry experienced an increase in both total employment (from 873 to 1,522, or 74.3 percent) and its share of employment (LQ increase of 76.6 percent, from 1.49 to 2.63) from 2007 to 2016 (see Appendix II for details). Based on the shift share analysis, Detroit has a competitive advantage in this industry over two of the three comparison regions, the Houston being the only comparison region to have a higher competitive advantage in this manufacturing industry group. Coupled with the high and increasing LQ, this is an industry that currently is and could increasingly be an important sector to the regional economy. Medicinal and Botanical Manufacturing (NAICS 325411) is a high-growth, high-potential industry, and experienced 36 percent job growth (increasing from 317 to 433 jobs) between 2007 and 2016 as well as an increase in LQ of 24.7 percent, outpacing the other three regions. This could be the result of the growing medical marijuana market in Michigan. Surgical and Medical Instrument Manufacturing (NAICS 339112) is a small employment base; however, over the last ten years, it experienced a significant increase in the number of jobs (51 percent, increasing from 504 to 763 jobs) and in LQ (45.4 percent). This industry also represents

the strongest potential job and LQ growth of like regions, making it another prime industry with good potential.

EXHIBIT 10. Manufacturing Sector Location Quotient Analysis 2007–2016



SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

MEDICAL SOFTWARE AND RESEARCH AND DEVELOPMENT INDUSTRIES

Medical Software

Medical Software industries in metro Detroit are experiencing substantial growth overall, with increasing job numbers and LQ. In the metro Detroit region, the All Other Information Services (NAICS 519190) industry has a very strong and growing LQ (4.27) but the lowest competitive effect of all the industries despite adding 1,054 jobs between 2007 and 2016 and outperforming the other comparable regions on job growth and LQ growth (see Appendix II for more details). These factors indicate a very strong and increasingly important industry for the regional economy. Custom Computer Programming Services (NAICS 541511) has an LQ slightly lower than average at 0.96; however, it has grown 13.9 percent in LQ over the last ten years, and the industry's jobs increased by 54 percent from 2007 to 2016 (from 9,042 to 13,928)—making this an emerging industry in this region (see Appendix II). The job growth and LQ

factors point to an important industry in which Detroit has potential for growth; however, the shift share analysis indicates that the region must expand further before it can gain competitive advantage.

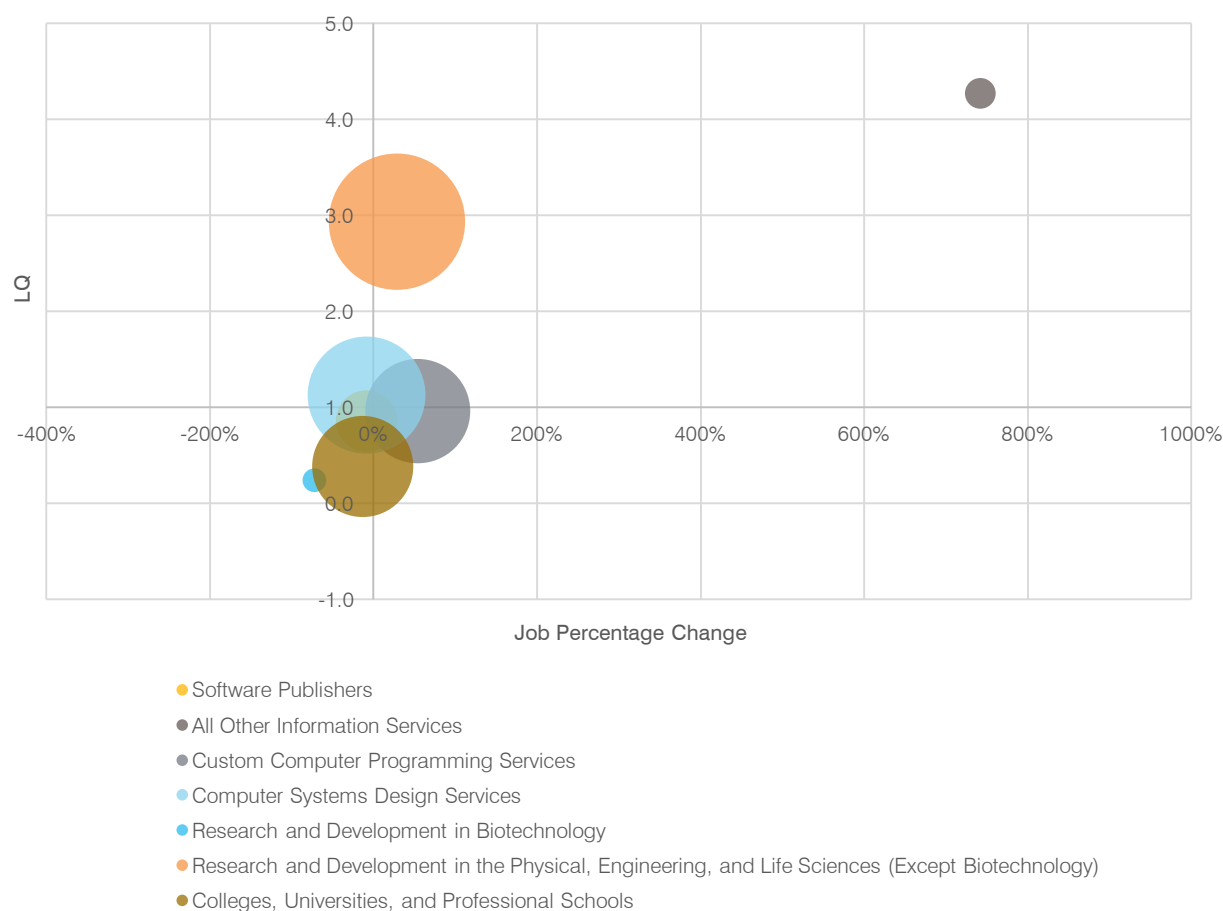
Computer Systems Design Services (NAICS 541512) is the only Medical Software group within the Detroit CSA to experience any decline, losing 8.6 percent of its jobs from 2007 to 2016, going from 19,234 down to 17,579. These can be attributed to the significant loss in automotive jobs through the recession, during which Michigan was hit particularly hard. This is inconsistent with the growth the comparison regions of Cleveland (55.5 percent), Minneapolis (37.1 percent), and Houston (24 percent) have experienced over the same period and represents an opportunity for greater focus on the existing talent.

Research and Development

Research and Development industries have fluctuated between 2007 and 2016 in both the number of jobs and LQ. Detroit has held an advantage in Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology) (NAICS 541712). Metro Detroit experienced an increase (28.9 percent) in its 16,419 industry jobs in 2007 to 21,159 in 2017 and an increase of 19.2 percent in a relative share of employment (currently 2.93 LQ) that is expected to remain above average (see Appendix II). The Detroit CSA has a competitive advantage in the industry over the other regions, possessing a competitive effect of 2,651 jobs from 2007 to 2017. These factors indicate that this sector is important to the economy and has great potential for continued development.

Research and development in biotechnology (NAICS 541711) has experienced a 72.3 percent decrease in jobs and a 76.9 percent decrease in LQ between 2007 and 2016 (see Appendix II for more details). If this job trend continues at its current pace, it could very well wipe out the industry. This is the highest projected decrease amongst the comparison regions. Minneapolis, Houston, and Cleveland also experienced a decline in these industry jobs during the same period.

EXHIBIT 11. Medical Software and Research and Development Sectors Location Quotient Analysis, 2007–2016



SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

SERVICE PROVISION INDUSTRIES

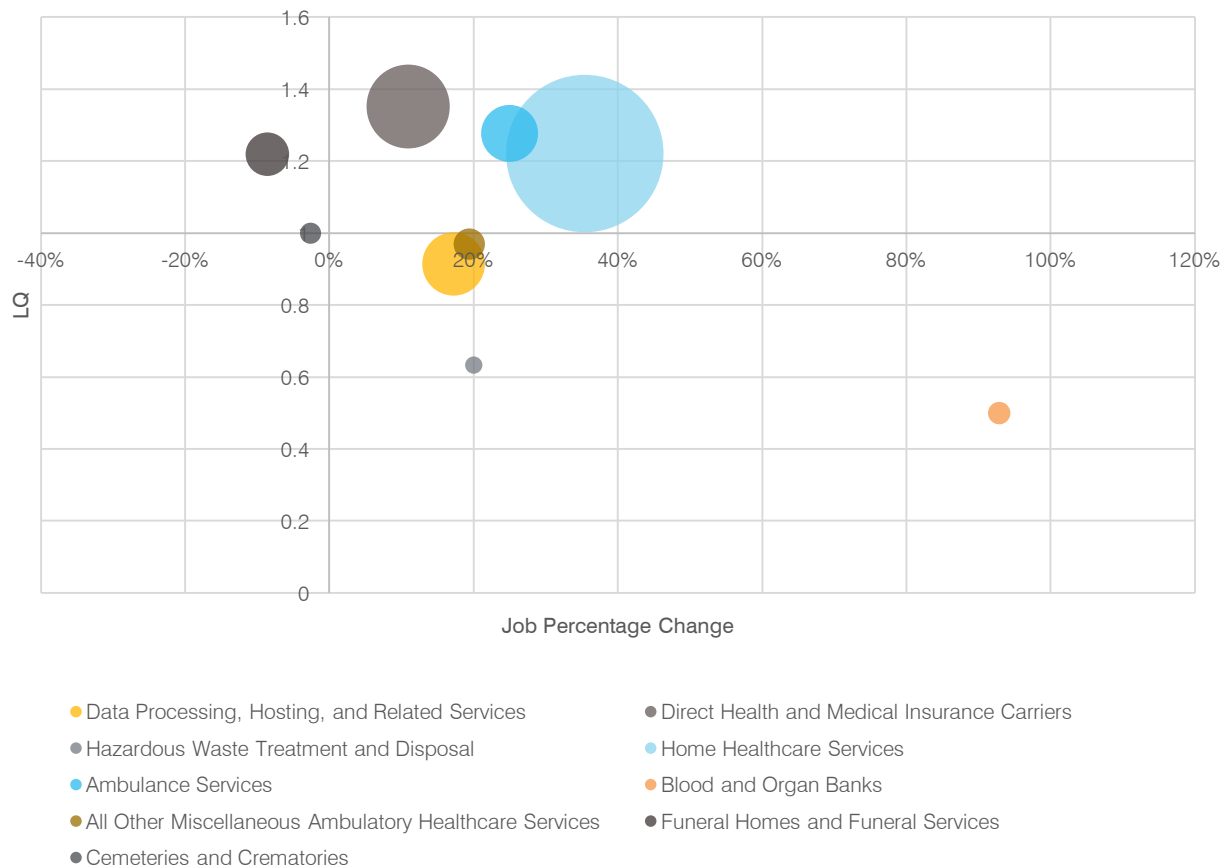
The metro Detroit area has experienced high rates of growth and has been highly competitive in many service-providing industries for the last ten years. The Home Healthcare Services (NAICS 621610) industry represents some of the strongest industry growth in the Detroit region, with the number of employees—currently nearly 28,000—having increased by 35.4 percent from 2007's figures. The LQ is higher than average at 1.22, although the industry's relative share of employment has decreased by 3.2 percent over the last ten years.

The job growth indicates that this is an important industry, but the recent decrease of relative share of employment suggests the need for continued focus and nurturing within the region. In this industry, all other comparison regions are performing as well as the Detroit CSA.

In the Direct Health and Medical Insurance Carriers (NAICS 524114) industry, Detroit CSA's strong job growth (10.9 percent, from 6,921 in 2007 to 7,677 in 2016) and LQ growth (14.2 percent, ending at 1.35 LQ in 2017) has been outpaced only by the lower employment base of the Cleveland CSA, which has seen

job growth of 40.6 percent and LQ growth of 49.2 percent (see Appendix II for details). Data Processing, Hosting, and Related Services (NAICS 518210) represents a burgeoning industry in metro Detroit with its current LQ of 0.91 (an increase of 10.1 percent) and with a current employment of 4,390 (a 17.2 percent increase since 2007). Both industries have great potential for continued importance in the Detroit regional economy.

EXHIBIT 12. Service Provision Sector Location Quotient Analysis, 2007–2016



SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

SERVICE PROVISION—CENTERS, FACILITIES, AND HOSPITALS

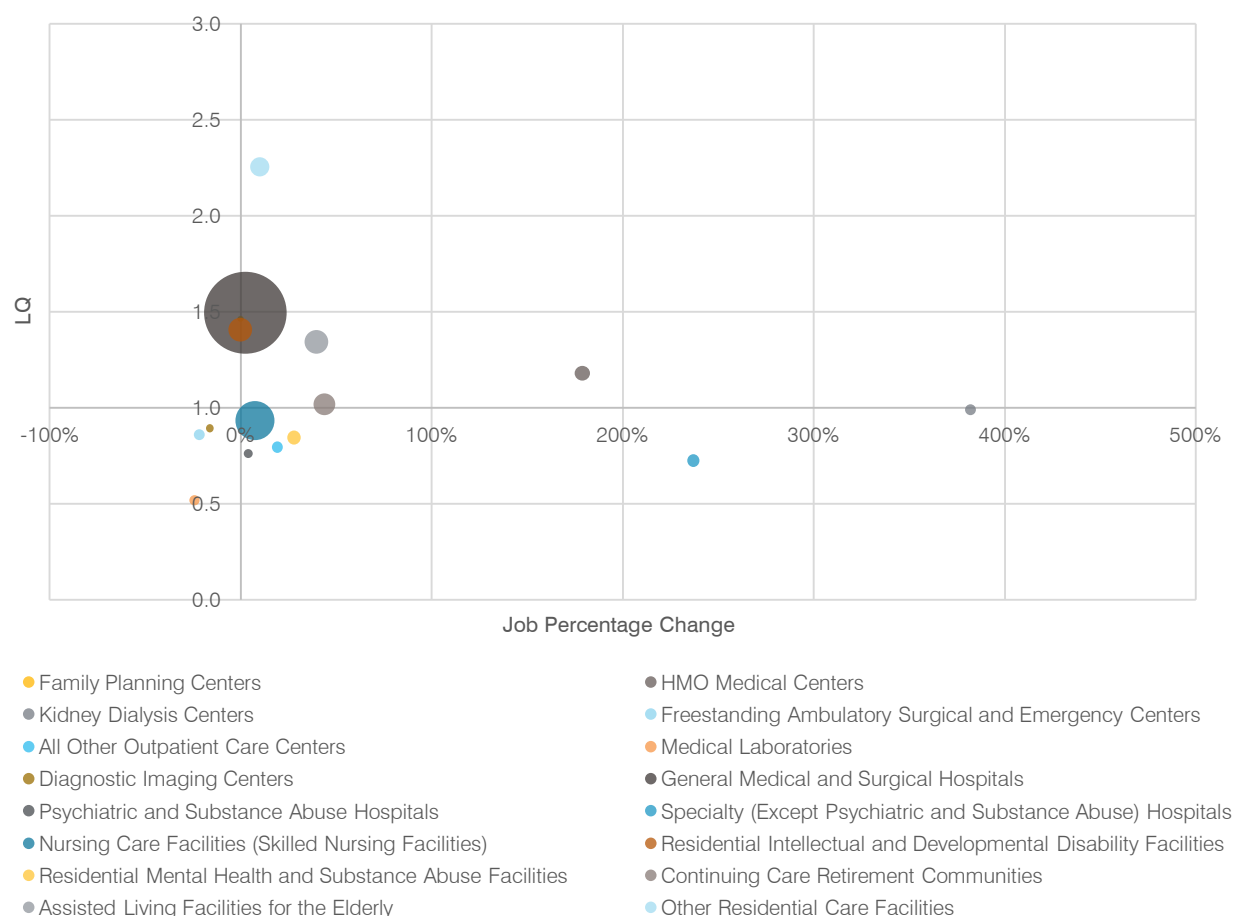
Overall, service provision industries that involve centers, facilities, and hospitals have grown during the last ten years. The metro Detroit region's largest industry, General Medical and Surgical Hospitals (NAICS 622110), employs 107,938 people and has grown 2.3 percent since 2007 with a higher-than-average LQ of 1.49 (which has been on a slight decline, dropping 2.8 percent since 2007's LQ of 1.54). The comparison regions, while lower in total employment, have grown faster than the Detroit CSA due to their local competitive advantages. The second-largest industry, Nursing Care Facilities (Skilled Nursing Facilities) (NAICS 623110), employs 24,073 people in the Detroit CSA region and has increased the number of jobs by 7.4 percent (from 22,423) and the LQ by 9.1 percent (to 0.93 in 2017) in the last ten years (see

Appendix II). The job growth indicates an emerging industry that can, with additional help and resources, grow to become a more important facet of the economy.

Kidney Dialysis Centers (NAICS 621492) and Health Maintenance Organization (HMO) Medical Centers (NAICS 621491) have both increased in number of jobs—growing by 382.1 percent and 178.8 percent respectively—and increased LQ by 223.4 percent and 14.6 percent, making both high-growth, highly competitive industries compared to other regions (see Appendix II). While currently small (in terms of employment), there may be potential for a growing presence in these industries. Continuing Care Retirement Communities (NAICS 623311) and Assisted Living Facilities for the Elderly (NAICS 623312) employ 7,609 and 8,923, respectively, and have experienced job growth of 43.8 percent and 39.6 percent respectively over the last ten years. Additionally, both industries have above-average LQs, which grew by 5.5 percent (LQ 1.02 in 2017) and 12.4 percent (LQ 1.34 in 2017) respectively during the same period. Both industries merit ongoing focus within the region as their above-average employment concentration has grown quickly.

The Detroit region has seen a decline in Medical Laboratories (NAICS 621511), with a loss of 24.1 percent of industry jobs (from 2,179 to 1,653) and a 41.1 percent loss in LQ from 2006 to 2017 (down to 0.52 in 2017), while two of the comparison regions have experienced job growth of 77.2 percent (Houston) and 126.2 percent (Minneapolis). The change in the Medical Laboratories industry indicates the need for diversification or business attraction within the region if this industry is important to the cluster's future growth.

EXHIBIT 13. Service Provision—Centers, Facilities, and Hospitals Sector Location Quotient Analysis, 2007–2016

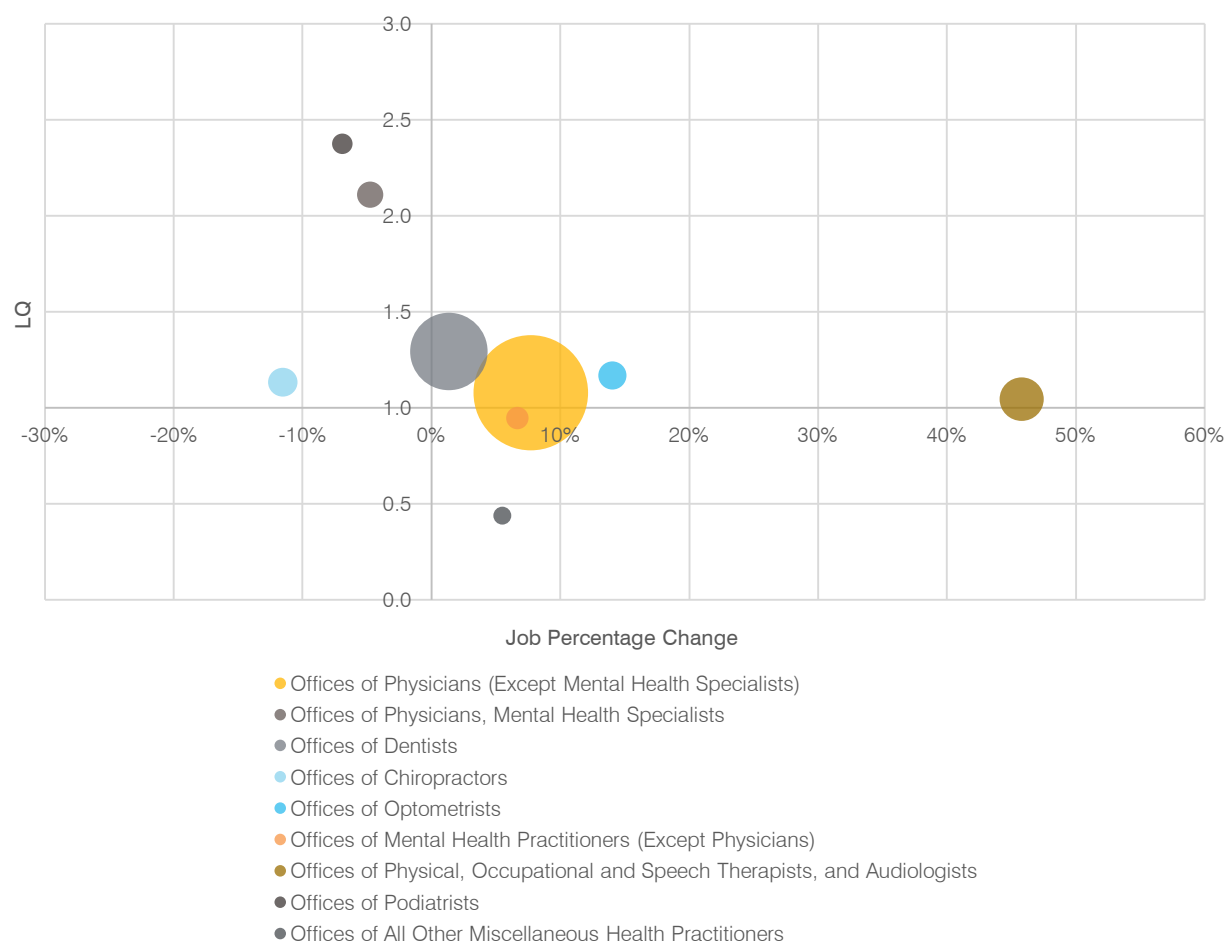


SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." EMSI Developer.

SERVICE PROVISION—OFFICES

Service Provision industries pertaining to the professional offices of physicians, dentists, optometrists, and others have been, overall, growing within the metro Detroit region. The Detroit CSA has an above-average share of employment in many of these industries. The largest industry, Offices of Physicians (except Mental Health Specialists) (NAICS 621111), employs 42,602 people in the region and has grown at a 7.7 percent rate over the last ten years; however, the industry's LQ has decreased somewhat (-0.8 percent). Despite the slight declining LQ, this is an important industry to the region's economy and has potential for growth. The second-largest industry (based on total employment), Offices of Dentists (NAICS 621210), employs 19,588 people in the Detroit CSA region and has grown by 1.3 percent, although the 1.29 LQ (which indicates above-average employment concentration) has decreased by 5.9 percent within the last ten years. These factors point to the need for greater attention and investment to ensure that the industry does not continue to decline. The Offices of Physical, Occupational, and Speech Therapists, and Audiologists (NAICS 621340) industry has also grown at a faster pace than the comparable regions, growing jobs at 45.8 percent and increasing the above-average LQ by 0.3 percent, indicating a strong industry and the potential for an increased role in the economy.

EXHIBIT 14. Service Provision—Offices Sector Location Quotient Analysis, 2007–2016

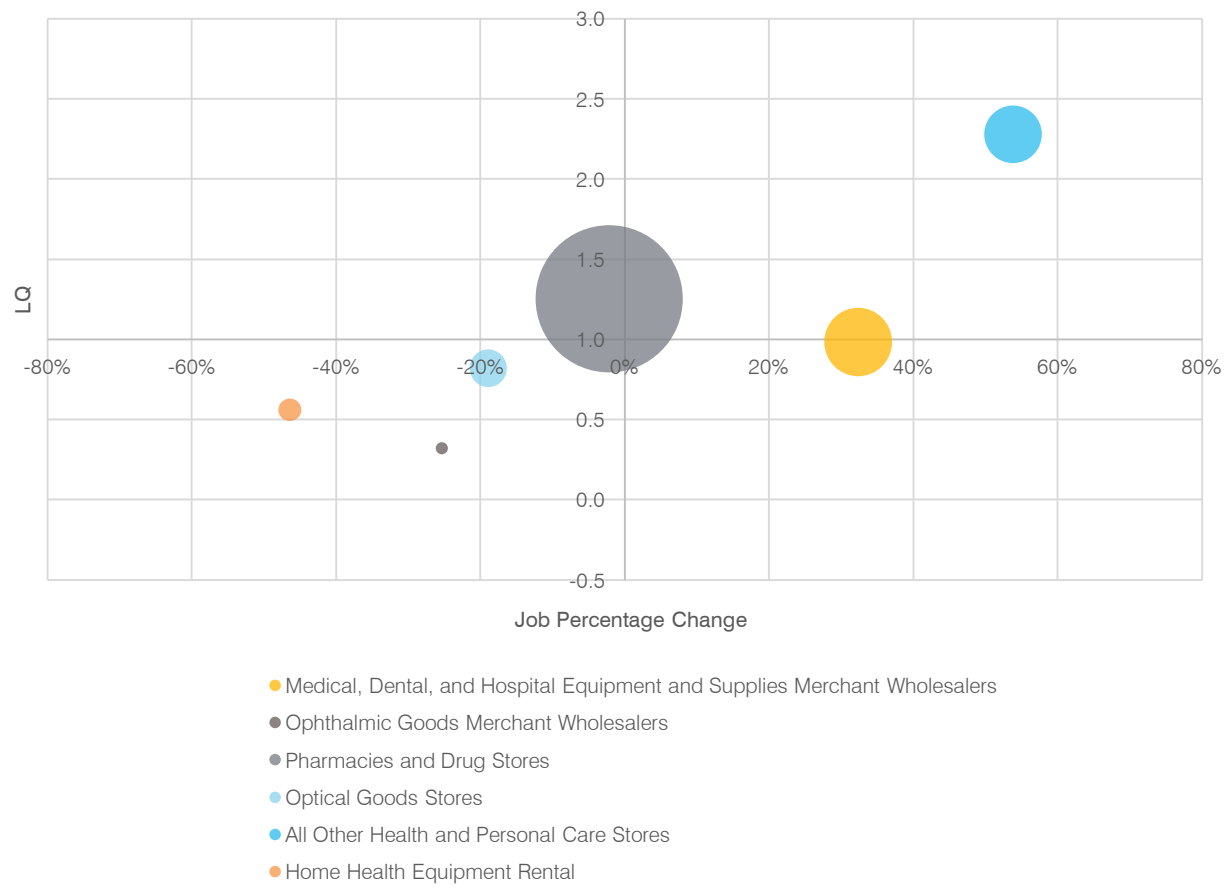


SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

TRADE INDUSTRIES

Pharmacies and Drug Stores (NAICS 446110) make up the largest industry, by total employment, in the Trade group. In the Detroit CSA, the industry employs more than 14,000 people, but has seen a decline in employment (2.1 percent) due to both an industry decline and a competitive disadvantage, while the strong LQ has increased by 2.7 percent since 2007. This indicates that while the region has declined slightly, the percentage employed in this sector remains above average and the share of employment has increased relative to other industries. Between 2007 and 2016, Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers (NAICS 423450) increased industry jobs in the Detroit CSA by 32.3 percent, with LQ growing by 29.9 percent during the same period, outperforming all comparison CSAs other than Houston. That industry's higher positive competitive advantage and LQ growth, as compared to the other regions, point to a small industry sector with a strong opportunity for growth.

EXHIBIT 15. Trade Sector Location Quotient Analysis, 2007–2016



SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

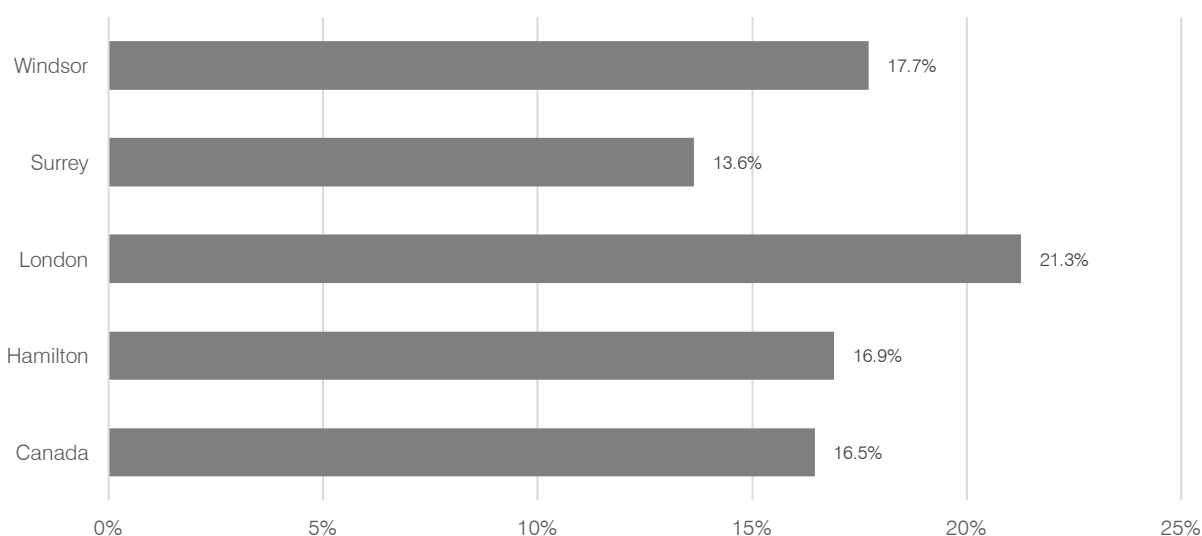
CHAPTER 3: REGIONAL COMPARISON—WINDSOR

Windsor, Ontario, a key partner in the regional MedHealth initiative, includes the area of Windsor and Essex County, which this report refers to simply as Windsor. The comparison regions chosen, based on their size and the strong presence of medical innovation and healthcare industries, were London, Ontario (Middlesex and Elgin Counties); Hamilton, Ontario (Hamilton, Halton, and Niagara Counties); Surrey, British Columbia (Surrey County); and Essex County for Windsor, Ontario. Appendix V provides more detail on the jurisdictions included with each analysis. We examined Windsor and the three comparison regions, providing highlights of strengths and relative standing of Windsor's medical innovation and healthcare cluster industries. The Canadian cluster is made up of 30 industry codes (NAICS) and 25 occupation codes (NOC) that contribute to the cluster. Exhibits 16 through 18 provide aggregate information on the cluster industries and occupations at the regional level. The remainder of this section focuses on the Windsor cluster industries and occupations in more detail and makes comparisons to other regions where appropriate. Industry-level data for the comparison regions and more detail on Windsor are presented in Appendix V.

JOBS

Medical innovation and healthcare cluster jobs make up nearly 18 percent of Windsor's employment. This is slightly below the cluster's share of employment in London (21.3 percent) and Hamilton (16.9 percent), but above Surrey's 13.6 percent. All four regions combined have nearly 214,000 jobs in the cluster.

EXHIBIT 16. Cluster Jobs as a Percentage of all Jobs in a Region, 2016



SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

In 2016, Hamilton, a larger region, had more total jobs in cluster industries than Windsor, Surrey, and London, as seen in Exhibit 17. All regions had strong growth in jobs over the past ten years, with Windsor experiencing an increase of 38 percent.

EXHIBIT 17. Cluster Industries by Region, 2007–2016

Region	2007 Jobs	2016 Jobs	2007–2016 Percent Change	2016 LQ	2007–2016 LQ Percent Change	2007–2016 Competitive Advantage (Effect)
Windsor	20,577	28,469	38%	1.44	32.5%	3,434
Hamilton	86,192	107,740	25%	1.14	3.3%	2,374
London	47,250	54,718	16%	1.50	-2.5%	-1,992
Surrey	15,189	22,885	51%	1.02	12.1%	4,262
Total	169,208	213,812	26%	1.26	6.6%	8,078

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." EMSI Developer.

*Total may not equal the sum of the regions due to rounding.

The seven industry groups are comprised of multiple individual four-digit NAICS code industries which were examined collectively and individually. See Appendix VI for a further breakdown of the cluster industries. Within the cluster, the Service Provision groups grew the most in Windsor, with an increase in jobs of 46 to 58 percent, depending on the industry group, between 2007 and 2016 across the four regions (see Exhibit 18). In particular, Service Provision—Centers, Facilities, and Hospitals grew by 46 percent in Windsor over the ten-year period (2007–2016). Other cluster industries growing quickly include the Manufacturing and Trade groups.

With its proximity to Detroit, Windsor has a strong manufacturing base in general. Within the medical innovation and healthcare cluster, the Manufacturing group declined in three regions since 2007, but grew by 45 percent in Windsor. The highly paid industry groups of Medical Software and Research and Development doubled in size (measured by number of jobs) in Surrey.

Medical Software pays the most, ranging from C\$51,319 to C\$80,814, with average annual salaries just over C\$73,000. Manufacturing, while largely in decline, is next with average annual salaries across the four regions of C\$65,294. Third, Research and Development pays nearly C\$55,000 in average annual wages and salaries. The average wages and salaries paid in the Windsor area for industry jobs trail the other three comparison regions in all seven industry groups, not adjusting for cost-of-living differences.

EXHIBIT 18. Cluster Industries by Region by Industry Group, 2007–2026, Canada

Region	2007 Jobs	2016 Jobs	2016 Wages, Salaries, and Proprietor Earnings	2007–2016 Percent Change in Jobs	2016 LQ	2007–2016 LQ Percent Change	2007–2016 Competitive Advantage (Effect)
Manufacturing							
Windsor	1,133	1,642	C\$56,026	45%	4.43	123%	565
Hamilton	3,667	3,421	C\$67,609	-7%	1.42	-7%	-262
London	1,630	1,504	C\$70,101	-8%	1.71	-1%	-12
Surrey	498	451	C\$65,445	-9%	0.76	-13%	-6
Medical Software							
Windsor	805	1,038	C\$51,319	29%	0.47	-6%	33
Hamilton	5,678	8,706	C\$77,972	53%	0.41	9%	1,479
London	2,783	3,331	C\$63,319	20%	0.41	-2%	-250
Surrey	708	1,528	C\$80,814	116%	0.6	56%	624
Research and Development							
Windsor	3,425	3,388	C\$51,672	-1%	1.06	-15%	-698
Hamilton	11,065	14,052	C\$55,343	27%	1.06	2%	920
London	9,245	10,536	C\$55,153	14%	1.95	-4%	-383
Surrey	501	1,195	C\$56,173	139%	0.34	68%	629
Service Provision—General							
Windsor	1,989	2,913	C\$46,954	46%	1.19	23%	372
Hamilton	7,604	9,881	C\$49,227	30%	1.04	4%	149
London	5,057	5,504	C\$55,711	9%	1.3	-14%	-861
Surrey	1,741	2,089	C\$54,584	20%	0.74	-24%	-47
Service Provision—Centers, Facilities, and Hospitals							
Windsor	8,718	12,698	C\$44,870	46%	1.32	39%	2,108
Hamilton	38,285	43,305	C\$47,608	13%	1	-12%	-3,139
London	21,275	25,822	C\$50,679	21%	1.57	-6%	646
Surrey	7,641	11,864	C\$50,865	55%	1.13	6%	2,392
Service Provision—Offices							
Windsor	2,249	3,562	C\$38,748	58%	1.3	24%	594
Hamilton	10,932	17,123	C\$49,525	57%	1.65	25%	2,779
London	4,391	4,812	C\$46,309	10%	1.14	-16%	-994
Surrey	2,311	3,300	C\$46,916	43%	1.2	1%	275
Trade							
Windsor	2,258	3,228	C\$29,671	43%	1.49	27%	459
Hamilton	8,961	11,251	C\$39,406	26%	1.2	5%	448
London	2,871	3,209	C\$35,967	12%	0.43	-3%	-140
Surrey	1,789	2,458	C\$31,776	37%	1.1	5%	396

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

OCCUPATIONS

While the NAICS examines industry behavior over time, the National Occupation Classification codes analyze aspects of specific industry jobs, including median salary (Exhibit 19). A total of 15 occupations

relate to the cluster industries in Canada. Median annual earnings in Windsor medical innovation and healthcare occupations range from C\$23,276 to C\$109,202 annually (see Appendix VI).

EXHIBIT 19. Cluster Industry Occupations, 2007–2016, Windsor, Essex County, Ontario

NOC Code	Description	2007 Jobs	2016 Jobs	2007–2016 Percent Change	Median Salary C\$/Hour	Median Salary C\$ Annual
3012	Registered Nurses and Registered Psychiatric Nurses	3,003	3,575	19%	C\$34.29	C\$71,330
3413	Nurse Aides, Orderlies, and Patient Service Associates	2,250	3,018	34%	C\$19.23	C\$39,996
3219	Other Medical Technologists and Technicians (Except Dental Health)	583	947	62%	C\$16.50	C\$34,317
3233	Licensed Practical Nurses	737	870	18%	C\$25.08	C\$52,176
4012	Post-secondary Teaching and Research Assistants	586	820	40%	C\$21.99	C\$45,741
4011	University Professors and Lecturers	606	644	6%	C\$41.51	C\$86,340
3414	Other Assisting Occupations in Support of Health Services	190	600	216%	C\$17.70	C\$36,812
3411	Dental Assistants	289	538	86%	C\$19.33	C\$40,202
3011	Nursing Coordinators and Supervisors	124	490	295%	C\$37.71	C\$78,435
9421	Chemical Plant Machine Operators	101	387	283%	C\$22.53	C\$46,866
1243	Medical Administrative Assistants	275	315	15%	C\$22.04	C\$45,840
3131	Pharmacists	299	306	2%	C\$52.50	C\$109,202
3222	Dental Hygienists and Dental Therapists	334	289	-13%	C\$32.18	C\$66,926
2171	Information Systems Analysts and Consultants	140	282	101%	C\$33.29	C\$69,240
Combination	Support Occupations	3,064	4,844	58%	C\$16.34	C\$33,987
Total		12,584	17,925	42%	C\$24.24	C\$50,427

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

*Total may not equal the sum of the occupations due to rounding.

LOCATION QUOTIENT AND SHIFT SHARE ANALYSES BY INDUSTRY GROUP

In addition to the total number of jobs, an industry's location quotient and shift share are important indicators to consider in the analysis of the cluster and its economic competitiveness within specific regions. Due to data limitations, the aggregate analysis presented for Windsor and the comparison regions did not include self-employed workers. However, we are able to include them in the LQ and jobs analyses by individual industry for Windsor. As such, the total employment for the industry groups may be slightly higher in some cases than previously reported. Including these workers in the detailed LQ and shift share analyses allows a more robust view of the changes that have occurred in Windsor.

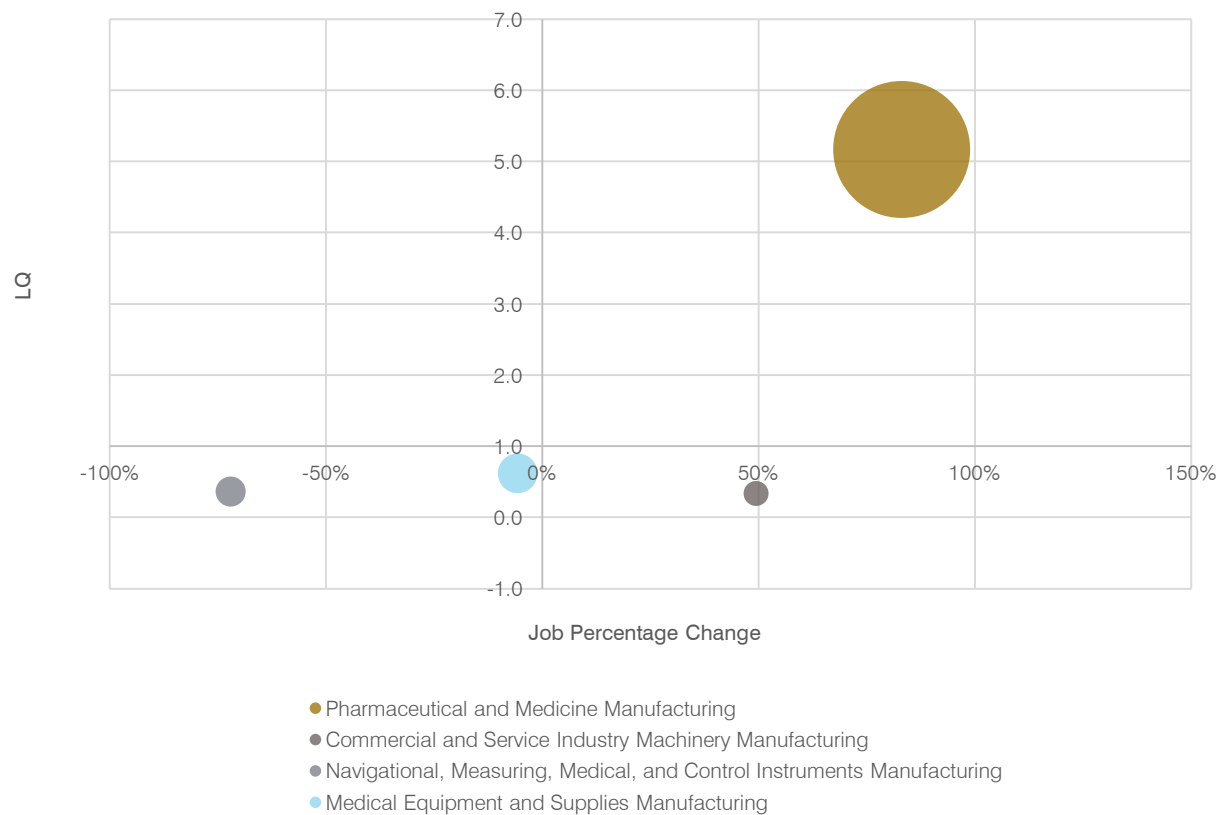
Growth potential analysis is based on the number of jobs, projected job growth, LQ (relative share of employment), expected change in LQ, national growth effect, industry growth effect, and competitive advantage from 2007 to 2016 for identified cluster industries. Key findings are presented below for each industry group, focusing on Windsor with comparisons to other CSAs where appropriate.

Exhibits 20 through 25 show the current LQ for each specific industry within an industry group against the expected change in LQ from 2007 to 2016. An LQ of one indicates that the share of employment in the given industry matches the nationwide share of employment in that industry. An LQ above one means that employment in the industry is more concentrated than the national average, and an LQ of 1.25 or greater is an indication of an exporting industry. Each circle represents the relative size of the industry in terms of total jobs to allow for a view of the relative importance of a specific industry.

MANUFACTURING INDUSTRIES

With Windsor's strong manufacturing presence and availability of skilled labor, medical innovation and healthcare cluster manufacturing industries have performed well in the area over the past ten years, growing the number of jobs by 45 percent overall. With an LQ of 4.43, Windsor has a strong competitive advantage in the Manufacturing group of industries within the cluster. Not only did the Manufacturing group increase total employment in Windsor, it increased its share of total regional employment (LQ increase of 123 percent) in the last ten years (2007–2016). Based on the shift share analysis, Windsor has a competitive advantage in this industry over the three comparison regions. Coupled with the high and increasing LQ, this is a group that currently is and could increasingly be an important sector to the regional economy. Pharmaceutical and Medicine Manufacturing (NAICS 3254) is a high-growth, high-potential industry with employment increasing 83 percent (ending at 1,418 jobs) and LQ increasing 99 percent (ending at 5.17) from 2007–2016. Medical Equipment and Supplies Manufacturing (NAICS 3391), though smaller in total employment (at 120 jobs in 2016), also shows potential (see Appendix VI).

EXHIBIT 20. Manufacturing Sector Location Quotient Analysis: LQ Versus LQ Percent Change 2007–2016



SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

MEDICAL SOFTWARE AND RESEARCH AND DEVELOPMENT INDUSTRIES

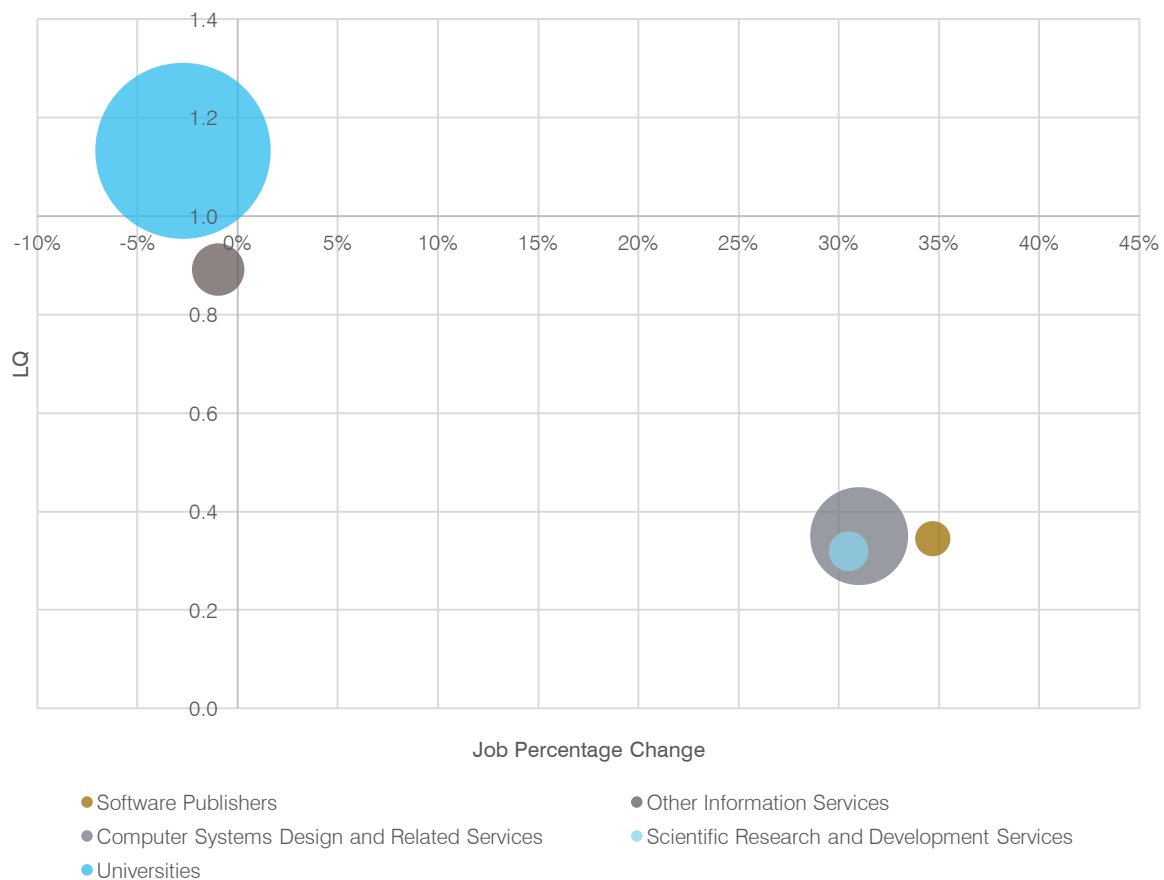
Medical Software

Medical Software industries in Windsor are experiencing growth, increasing the number of jobs but declining in LQ. This is possibly because the group is growing at a much faster pace in both Surrey and Hamilton. Both areas increased in their competitiveness, while London and Windsor experienced competitive declines despite good job growth.

Research and Development

Research and development industries have fluctuated between 2007 and 2016 in both the number of jobs and LQ. Windsor trails the other three areas in job growth and LQ change over the past ten years. Windsor has the second-highest LQ of the comparison regions at 1.13 in 2016, but it currently has a negative competitive effect and a declining LQ. Hamilton has the largest number of jobs of all the regions, and despite increasing job growth saw little change in competitiveness (LQ growth of 2 percent over ten years). While Surrey is the smallest and least competitive region (LQ of only 0.34), it saw the greatest growth both in percent of job growth and percent of LQ change.

EXHIBIT 21. Medical Software and Research and Development Sectors Location Quotient Analysis: LQ Versus LQ Percent Change 2007–2016

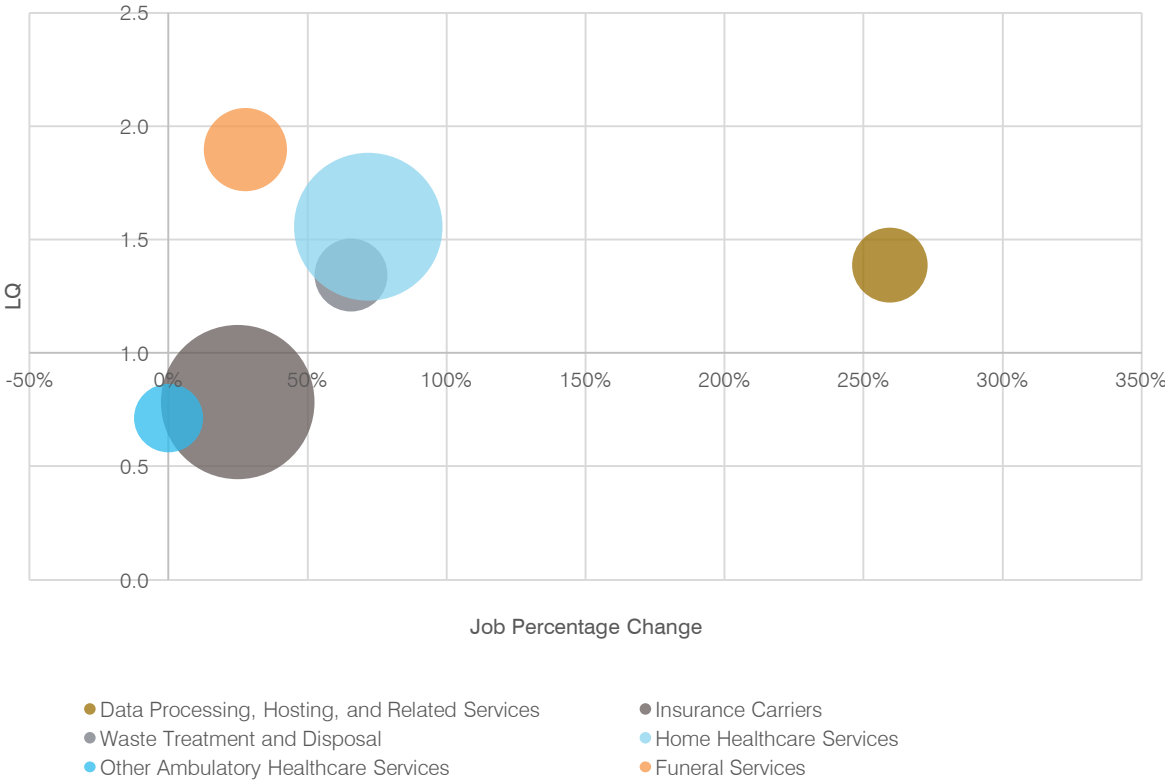


SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

SERVICE PROVISION INDUSTRIES

All the Service Provision industries have experienced high rates of growth in all four regions. Windsor has seen good growth in the number of jobs in these industries overall and has improved its competitiveness (LQ). For Service Provision—General, Windsor has a strong Data Processing, Hosting, and Related Services industry (NAICS 5182), with an average number of jobs (LQ of 1.39 and 248 jobs in 2016), but growth in competitiveness (12.4 percent change from 2007–2016). Home Healthcare Services (NAICS 6216) has a strong concentration of jobs (LQ of 1.56 in 2016) and has increased the number of jobs and LQ between 2007 and 2016 by 71.8 percent and 28.6 percent, respectively. This is an important industry to the Service Provision—General group. Insurance Carriers (NAICS 5241) is an emerging industry in Windsor with the highest total employment and a positively trending LQ.

EXHIBIT 22. Service Provision Sector Location Quotient Analysis: LQ Versus LQ Percent Change 2007–2016



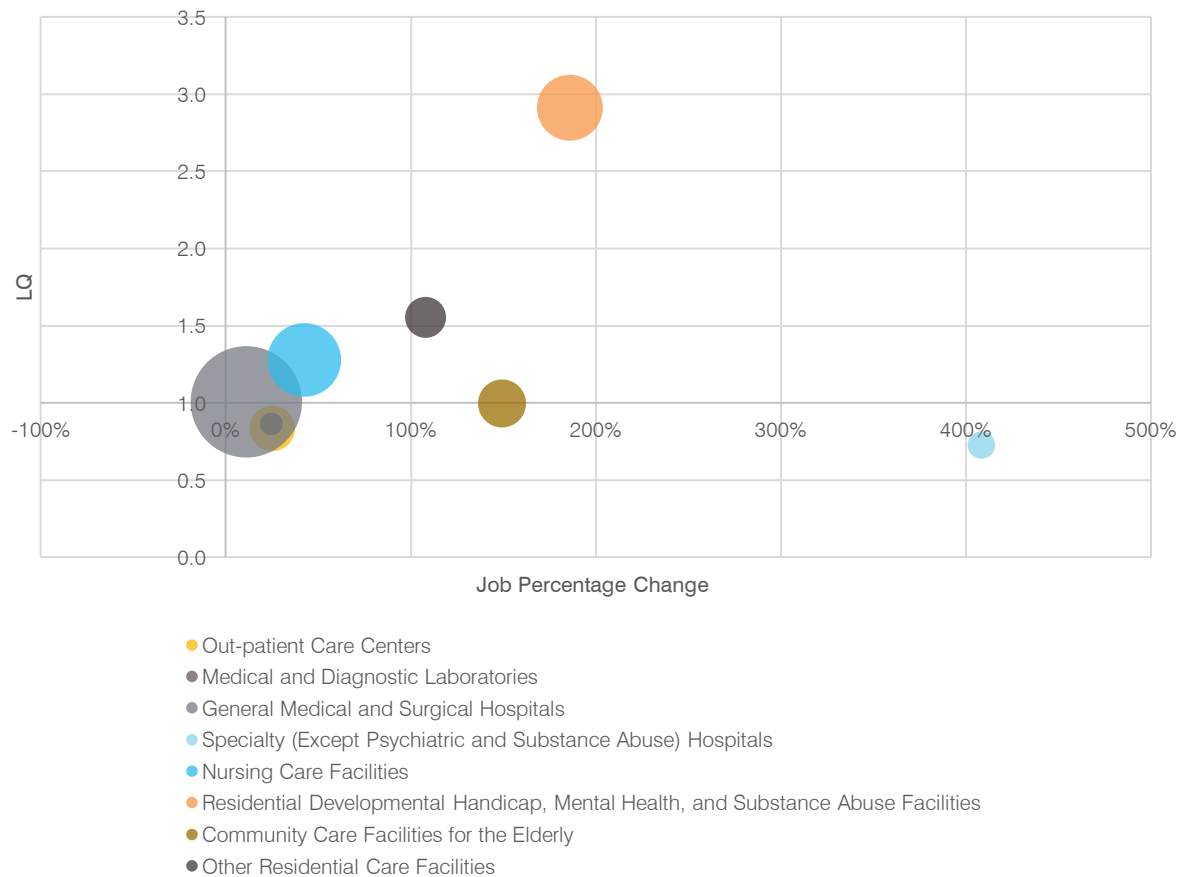
SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

SERVICE PROVISION—CENTERS, FACILITIES, AND HOSPITALS

Overall, service provision industries that involve centers, facilities, and hospitals have grown over the last ten years across all the regions. Windsor’s job growth in this group surpassed the other regions, with an increase both in the number of jobs and in competitiveness (LQ increased by 39 percent). At nearly C\$50,000 in average salaries, the job growth and competitiveness indicate an emerging group that can, with additional help and resources, grow to become a more important facet of the economy.

General Medical and Surgical Hospitals (NAICS 6221) has the highest employment in this group (5,440) and an average concentration (LQ of 1.01), but a negative competitive effect (see Appendix VI). Community Care Facilities for the Elderly (NAICS 6233) experienced over 149.4 percent increase, going from only 404 jobs in 2007 to 1,008 in 2016, taking it to an average concentration of jobs (1.0 LQ), which is up from a below-average LQ in 2006. This indicates an emerging industry in the region.

EXHIBIT 23. Service Provision—Centers, Facilities, and Hospitals Sector Location Quotient Analysis: LQ Versus LQ Percent Change 2007–2016

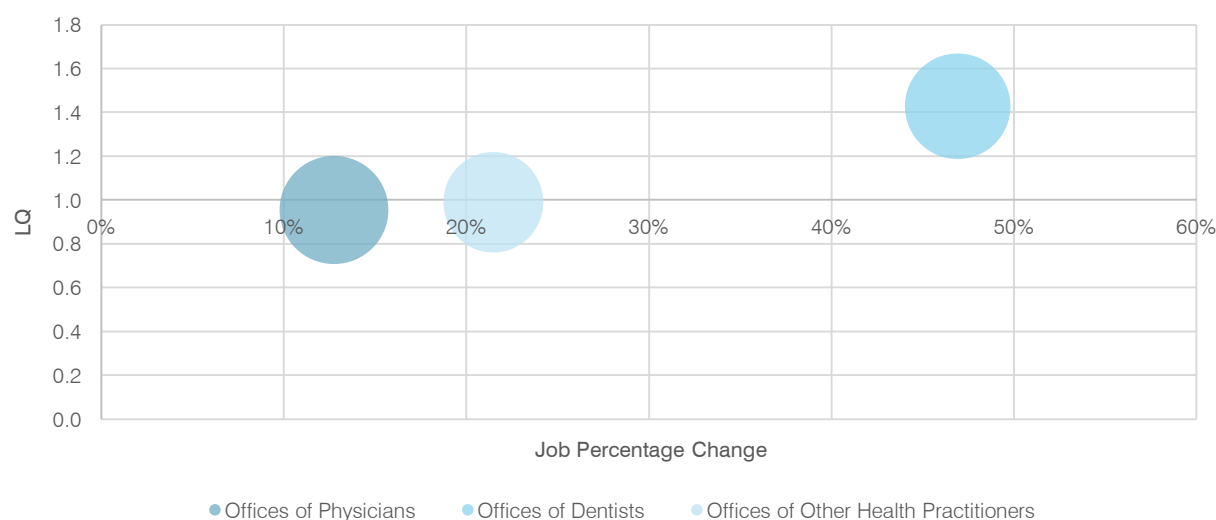


SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

SERVICE PROVISION—OFFICES

Service Provision industries pertaining to the Professional Offices of Physicians, Dentists, and Other Healthcare Providers have been, overall, growing within Windsor and all the regions. Windsor has an average to above-average share of employment and competitiveness in many of the industries for this group. Offices of Dentists (NAICS 6212) grew by 46.9 percent, increasing from 1,085 to 1,594 jobs from 2007 to 2016, and has a high concentration of jobs at 1.43 LQ in 2016, indicating that this is an important industry to the group (see Appendix VI for more details).

EXHIBIT 24. Service Provision—Offices Sector Location Quotient Analysis: LQ Versus LQ Percent Change

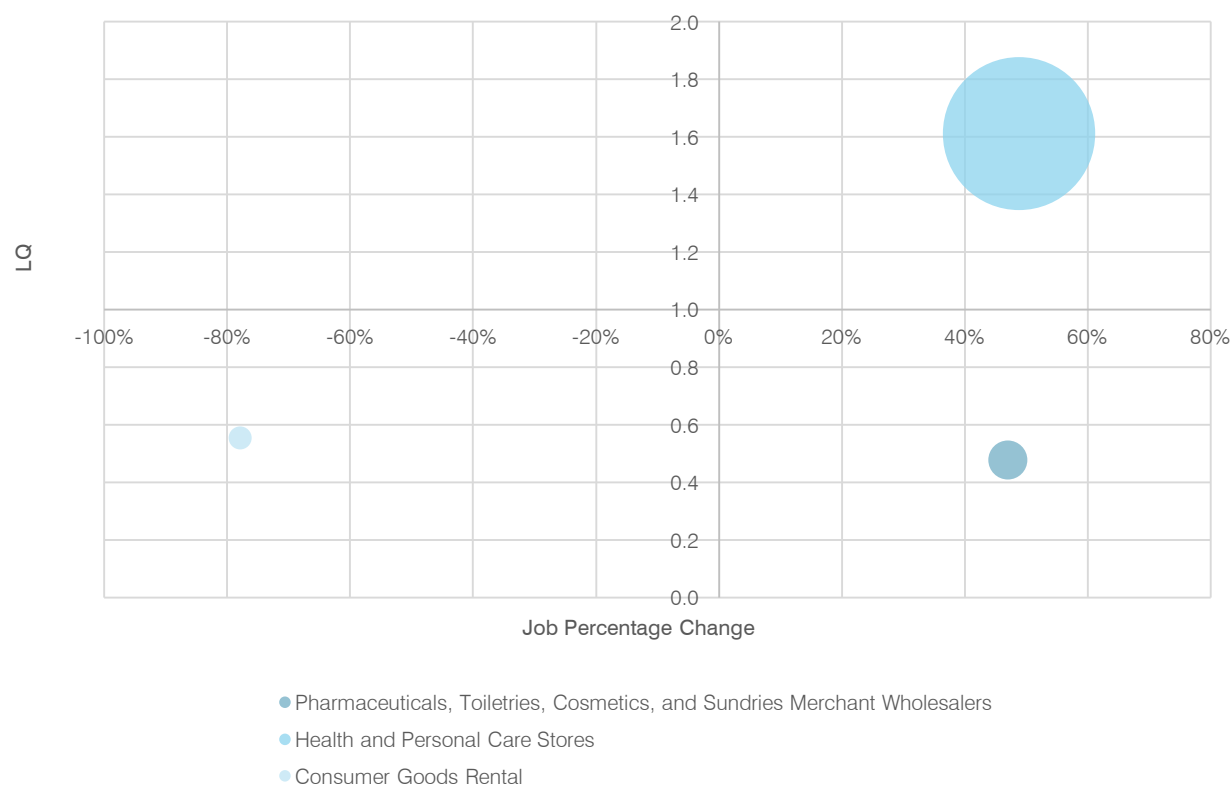


SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

TRADE INDUSTRIES

Health and Personal Care Stores is the largest industry, by total employment, in the Trade group. In Windsor, the industry employs slightly more than 3,100 people, and has seen increases in both employment and competitive advantage. All the regions have seen similar growth in both employment and LQ over the past ten years. Across all regions, this group pays the lowest, and has a smaller number of jobs than some of the larger and more rapidly growing industries. Nonetheless, the occupations that are most prevalent in this group offer entry-level opportunities for those in the labor force with less education than is required by other cluster industry groups. The Health and Personal Care Stores industry (NAICS 4461) had 3,177 employees in 2016. This is an increase of 48.8 percent in jobs from 2007. The concentration of jobs experienced an increase of 21.1 percent, going from 1.33 in 2007 to 1.61 in 2017 (see Appendix VI). Combined with a positive competitive advantage (375 jobs from 2007 to 2016), this is a growing industry (see Appendix VI).

EXHIBIT 25. Trade Sector Location Quotient Analysis: LQ Versus LQ Percent Change



SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

CONCLUSION

Detroit and Windsor are strong and vibrant communities that need diverse economies to support long-term stability and growth. The automotive history of the region has provided a strong research, engineering, technology, and training base for industries that can capitalize on the available skills and resources in the region. The medical innovation and healthcare cluster is one sector uniquely positioned to take advantage of these facts. The cluster already has a strong or emerging presence in both Detroit and Windsor. The region offers many opportunities for growth and strategic investment to help the cluster develop and thrive. Industries of particular interest in either Detroit, Windsor, or both include:

- Research and Development (strong in Detroit and emerging in Windsor)
 - Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology) (strong in Detroit with great potential for growth)
- Medical Software (strong in Detroit and emerging in Windsor)
 - Custom Computer Programming Services (emerging in the Detroit)
- Service Provision—General (strong in Detroit and emerging in Windsor)
- Manufacturing (strong in Detroit and Windsor)

- Other Measuring and Controlling Device Manufacturing (strong in Detroit)
- Surgical and Medical Instrument Manufacturing (growth potential in Detroit)

The combined regions complement each other well, with most of the seven groups growing well in at least one of the two regions. Additionally, many of the jobs associated with the medical innovation and healthcare cluster tend to be in high-tech fields and pay relatively well in both Windsor and Detroit, making these desirable occupations to attract and retain talent in the region.

APPENDIX I: CLUSTER COMPARISON REGIONS—DETROIT

Region	2016 Population
Detroit-Warren-Ann Arbor CSA (MI)	5,318,710
Wayne County	1,749,365
Oakland County	1,244,038
Macomb County	867,768
Genesee County	408,620
Washtenaw County	364,632
Livingston County	188,634
St. Clair County	159,594
Monroe County	149,213
Lenawee County	98,504
Lapeer County	88,342
Cleveland-Akron-Canton CSA (OH)	3,483,331
Cuyahoga County	1,249,376
Summit County	540,309
Stark County	373,615
Lorain County	306,364
Lake County	228,614
Medina County	177,219
Portage County	161,912
Ashtabula County	98,230
Geauga County	94,058
Tuscarawas County	92,420
Erie County	75,106
Huron County	58,439
Carroll County	27,669
Minneapolis-St. Paul-St. Cloud CSA (MN)⁵	3,765,590
Hennepin County	1,232,521
Ramsey County	540,658
Dakota County	417,492
Anoka County	345,962
Washington County	253,118
Stearns County	155,641
Scott County	143,681
Wright County	132,549
Carver County	100,260
Sherburne County	93,528
Rice County	65,617
Chisago County	54,748

Goodhue County	46,676
Benton County	39,990
Isanti County	39,025
McLeod County	35,842
Le Sueur County	27,590
Mille Lacs County	25,866
Sibley County	14,827
Houston-Baytown-Huntsville CSA (TX)	6,972,357
Harris County	4,589,922
Fort Bend County	741,218
Montgomery County	556,213
Brazoria County	354,195
Galveston County	329,434
Liberty County	81,705
Walker County	71,475
Waller County	50,118
Wharton County	41,734
Chambers County	39,900
Matagorda County	37,187
Washington County	35,055
Austin County	29,758
Trinity County	14,442

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

⁵ The Minneapolis-St. Paul-St. Cloud CSA includes only the 19 counties in Minnesota. The population of the Wisconsin counties not included makes up approximately three percent of the overall CSA population.

APPENDIX II: REGIONAL COMPARISON OF CLUSTER INDUSTRIES—DETROIT

JOBS

		Jobs						
NAICS	Description	Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
Manufacturing								
325411	Medicinal and Botanical Manufacturing	Detroit	317	433	570	36.4%	31.8%	\$93,658
		Cleveland	44	7	N/A	-84.0%	N/A	N/A
		Houston	149	232	360	55.4%	55.0%	\$112,037
		Minneapolis	31	59	86	93.7%	44.4%	\$105,112
325412	Pharmaceutical Preparation Manufacturing	Detroit	617	563	491	-8.7%	-12.8%	\$103,593
		Cleveland	1,158	166	32	-85.7%	-80.7%	\$89,229
		Houston	1,251	2,167	2,800	73.2%	29.2%	\$182,434
		Minneapolis	1,486	965	686	-35.1%	-28.9%	\$103,748
325413	In-vitro Diagnostic Substance Manufacturing	Detroit	83	42	43	-49.2%	1.7%	\$135,296
		Cleveland	268	83	16	-69.2%	-80.0%	\$111,683
		Houston	97	45	78	-53.3%	72.8%	\$117,302
		Minneapolis	1,056	2,056	2,296	94.6%	11.7%	\$108,875
325414	Biological Product (Except Diagnostic) Manufacturing	Detroit	0	8	N/A	N/A	N/A	N/A
		Cleveland	68	5	N/A	-92.6%	N/A	N/A
		Houston	206	162	124	-21.4%	-23.6%	\$98,170
		Minneapolis	43	26	36	-39.8%	39.2%	\$228,023
333314	Optical Instrument and Lens Manufacturing	Detroit	540	483	461	-10.6%	-4.5%	\$92,924
		Cleveland	124	330	561	166.1%	69.6%	\$60,321
		Houston	< 10	21	14	N/A	-34.6%	\$42,325
		Minneapolis	426	104	42	-75.5%	-59.4%	\$82,536
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	Detroit	140	134	174	-4.2%	29.9%	\$119,896
		Cleveland	658	1,528	2,203	132.1%	44.2%	\$113,782
		Houston	551	806	923	46.3%	14.5%	\$104,681
		Minneapolis	12,584	13,837	13,689	10.0%	-1.1%	\$146,975

NAICS	Description	Jobs						
		Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
334516	Analytical Laboratory Instrument Manufacturing	Detroit	81	140	173	72.9%	23.7%	\$112,708
		Cleveland	19	68	119	259.3%	75.9%	\$23,918
		Houston	635	732	784	15.3%	7.1%	\$77,297
		Minneapolis	241	334	393	39.0%	17.4%	\$117,195
334517	Irradiation Apparatus Manufacturing	Detroit	13	10	N/A	-25.8%	N/A	Insf. Data
		Cleveland	278	316	454	13.6%	43.6%	\$107,000
		Houston	22	84	138	291.1%	63.6%	\$77,208
		Minneapolis	38	55	78	44.3%	41.4%	\$74,895
334519	Other Measuring and Controlling Device Manufacturing	Detroit	873	1,522	1,949	74.3%	28.0%	\$92,477
		Cleveland	631	617	620	-2.1%	0.4%	\$83,467
		Houston	1,345	769	568	-42.8%	-26.1%	\$80,027
		Minneapolis	1,560	1,605	1,577	2.9%	-1.7%	\$116,028
339112	Surgical and Medical Instrument Manufacturing	Detroit	504	763	814	51.4%	6.7%	\$135,258
		Cleveland	1,150	1,065	1,066	-7.4%	0.1%	\$82,005
		Houston	523	676	797	29.3%	17.9%	\$78,286
		Minneapolis	8,785	10,336	11,187	17.6%	8.2%	\$114,508
339113	Surgical Appliance and Supplies Manufacturing	Detroit	1,750	1,791	1,736	2.3%	-3.0%	\$94,707
		Cleveland	2,984	2,725	2,331	-8.7%	-14.5%	\$69,179
		Houston	507	403	289	-20.5%	-28.2%	\$95,325
		Minneapolis	3,848	2,130	1,025	-44.6%	-51.9%	\$105,796
339114	Dental Equipment and Supplies Manufacturing	Detroit	247	178	102	-27.9%	-42.9%	\$84,655
		Cleveland	252	241	220	-4.6%	-8.7%	\$69,961
		Houston	48	100	121	107.5%	21.4%	\$107,938
		Minneapolis	281	289	313	2.7%	8.2%	\$92,503
339115	Ophthalmic Goods Manufacturing	Detroit	323	86	65	-73.4%	-24.0%	\$58,359
		Cleveland	128	167	176	31.2%	5.1%	\$58,163
		Houston	154	263	389	70.6%	47.8%	\$53,696
		Minneapolis	1,630	1,704	1,958	4.5%	14.9%	\$64,596
339116	Dental Laboratories	Detroit	974	767	641	-21.3%	-16.4%	\$55,723

		Jobs						
NAICS	Description	Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
		Cleveland	792	536	446	-32.3%	-16.9%	\$54,491
		Houston	766	777	795	1.4%	2.4%	\$54,536
		Minneapolis	1,124	920	880	-18.2%	-4.3%	\$58,416
Medical Software								
511210	Software Publishers	Detroit	5,233	4,775	5,221	-8.7%	9.3%	\$123,009
		Cleveland	706	1,257	1,743	78.0%	38.7%	\$105,420
		Houston	2,537	2,302	2,193	-9.3%	-4.7%	\$153,676
		Minneapolis	5,213	5,400	5,496	3.6%	1.8%	\$123,575
519190	All Other Information Services	Detroit	142	1,196	1,807	742.1%	51.1%	\$65,246
		Cleveland	135	240	288	77.8%	19.9%	\$89,731
		Houston	32	67	72	106.1%	7.4%	\$133,128
		Minneapolis	269	538	666	100.1%	23.8%	\$79,005
541511	Custom Computer Programming Services	Detroit	9,042	13,928	17,703	54.0%	27.1%	\$101,425
		Cleveland	6,850	8,494	9,591	24.0%	12.9%	\$87,633
		Houston	11,293	14,538	16,956	28.7%	16.6%	\$118,004
		Minneapolis	9,616	13,259	15,453	37.9%	16.5%	\$110,434
541512	Computer Systems Design Services	Detroit	19,234	17,579	15,391	-8.6%	-12.5%	\$103,847
		Cleveland	4,528	7,043	9,635	55.5%	36.8%	\$91,520
		Houston	13,030	16,155	19,265	24.0%	19.3%	\$111,714
		Minneapolis	11,121	15,247	18,739	37.1%	22.9%	\$121,267
Research and Development								
541711	Research and Development in Biotechnology	Detroit	2,334	646	180	-72.3%	-72.1%	\$96,574
		Cleveland	618	433	376	-30.0%	-13.1%	\$106,619
		Houston	1,410	1,074	1,011	-23.8%	-5.8%	\$129,849
		Minneapolis	658	454	362	-31.1%	-20.2%	\$119,672
541712	Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology)	Detroit	16,419	21,159	25,531	28.9%	20.7%	\$140,180
		Cleveland	2,856	2,680	2,718	-6.2%	1.4%	\$109,160
		Houston	7,231	5,728	5,333	-20.8%	-6.9%	\$144,327
		Minneapolis	5,048	5,894	6,696	16.8%	13.6%	\$149,325

		Jobs						
NAICS	Description	Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
611310	Colleges, Universities, and Professional Schools	Detroit	13,471	11,669	10,384	-13.4%	-11.0%	\$42,446
		Cleveland	20,788	27,422	31,602	31.9%	15.2%	\$35,010
		Houston	17,037	21,750	26,826	27.7%	23.3%	\$86,317
		Minneapolis	25,156	31,220	34,415	24.1%	10.2%	\$38,398
Service Provision								
518210	Data Processing, Hosting, and Related Services	Detroit	3,745	4,390	5,275	17.2%	20.2%	\$94,329
		Cleveland	1,497	2,170	2,553	45.0%	17.6%	\$88,176
		Houston	4,040	3,651	3,554	-9.6%	-2.7%	\$98,090
		Minneapolis	6,295	6,135	5,077	-2.5%	-17.3%	\$111,054
524114	Direct Health and Medical Insurance Carriers	Detroit	6,921	7,677	9,593	10.9%	25.0%	\$101,305
		Cleveland	2,926	4,113	5,602	40.6%	36.2%	\$85,049
		Houston	1,128	831	475	-26.3%	-42.8%	\$98,687
		Minneapolis	15,599	13,119	11,849	-15.9%	-9.7%	\$143,429
562211	Hazardous Waste Treatment and Disposal	Detroit	286	343	291	20.0%	-15.0%	\$71,821
		Cleveland	449	341	294	-24.2%	-13.5%	\$72,444
		Houston	1,000	1,532	1,569	53.2%	2.4%	\$79,928
		Minneapolis	115	191	186	66.1%	-2.5%	\$80,363
621610	Home healthcare Services	Detroit	20,265	27,445	38,562	35.4%	40.5%	\$40,500
		Cleveland	15,581	20,070	26,671	28.8%	32.9%	\$32,779
		Houston	34,616	52,798	79,720	52.5%	51.0%	\$23,068
		Minneapolis	10,562	19,324	30,655	83.0%	58.6%	\$35,041
621910	Ambulance Services	Detroit	2,862	3,578	4,832	25.0%	35.0%	\$40,234
		Cleveland	2,859	2,580	2,933	-9.8%	13.7%	\$39,826
		Houston	3,025	3,297	4,140	9.0%	25.6%	\$44,579
		Minneapolis	1,093	1,465	1,882	34.1%	28.5%	\$71,066
621991	Blood and Organ Banks	Detroit	291	561	816	92.9%	45.5%	\$88,508
		Cleveland	923	673	420	-27.0%	-37.7%	\$47,233
		Houston	1,023	1,250	1,578	22.2%	26.2%	\$66,254
		Minneapolis	1,695	2,444	3,142	44.2%	28.5%	\$67,989

		Jobs						
NAICS	Description	Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
621999	All Other Miscellaneous Ambulatory healthcare Services	Detroit	937	1,119	1,405	19.4%	25.6%	\$52,229
		Cleveland	894	835	971	-6.6%	16.2%	\$46,047
		Houston	925	983	1,263	6.2%	28.4%	\$63,915
		Minneapolis	1,743	2,343	2,722	34.4%	16.2%	\$75,914
812210	Funeral Homes and Funeral Services	Detroit	2,310	2,111	2,065	-8.6%	-2.2%	\$40,930
		Cleveland	1,856	1,846	1,839	-0.5%	-0.4%	\$37,167
		Houston	2,137	2,399	2,658	12.3%	10.8%	\$65,164
		Minneapolis	846	876	893	3.5%	2.0%	\$44,258
812220	Cemeteries and Crematories	Detroit	489	477	456	-2.6%	-4.4%	\$59,213
		Cleveland	489	420	406	-14.1%	-3.4%	\$44,454
		Houston	541	608	686	12.4%	12.8%	\$46,435
		Minneapolis	218	174	133	-20.0%	-23.8%	\$46,193
Service Provision—Centers, Facilities, and Hospitals								
621410	Family Planning Centers	Detroit	572	572	574	-0.1%	0.3%	\$54,363
		Cleveland	166	185	126	11.8%	-32.3%	\$36,655
		Houston	454	395	283	-12.8%	-28.5%	\$66,733
		Minneapolis	145	254	357	75.8%	40.3%	\$45,124
621491	HMO Medical Centers	Detroit	1,282	3,573	5,755	178.8%	61.0%	\$80,128
		Cleveland	1,542	547	155	-64.5%	-71.7%	\$65,313
		Houston	598	1,248	1,925	108.8%	54.3%	\$181,646
		Minneapolis	6,098	3,481	3,149	-42.9%	-9.5%	\$130,706
621492	Kidney Dialysis Centers	Detroit	414	1,998	3,434	382.1%	71.9%	\$60,003
		Cleveland	1,413	1,658	1,924	17.3%	16.1%	\$54,856
		Houston	2,010	3,301	4,898	64.2%	48.4%	\$70,340
		Minneapolis	629	1,002	1,287	59.3%	28.4%	\$63,237
621493	Freestanding Ambulatory Surgical and Emergency Centers	Detroit	2,529	1,979	1,592	-21.8%	-19.5%	\$60,003
		Cleveland	1,104	1,561	1,894	41.4%	21.3%	\$69,514
		Houston	1,447	5,216	9,278	260.5%	77.9%	\$70,821
		Minneapolis	506	1,359	2,072	168.6%	52.5%	\$78,570

NAICS	Description	Jobs						
		Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
621498	All Other Outpatient Care Centers	Detroit	1,702	2,027	2,183	19.1%	7.7%	\$64,288
		Cleveland	1,400	974	889	-30.4%	-8.7%	\$42,422
		Houston	1,396	3,190	5,247	128.5%	64.5%	\$74,314
		Minneapolis	813	413	158	-49.2%	-61.8%	\$69,497
621511	Medical Laboratories	Detroit	2,179	1,653	1,606	-24.1%	-2.8%	\$55,443
		Cleveland	770	715	733	-7.1%	2.5%	\$57,972
		Houston	1,993	3,531	5,156	77.2%	46.0%	\$70,390
		Minneapolis	1,011	2,286	3,392	126.2%	48.4%	\$74,784
621512	Diagnostic Imaging Centers	Detroit	1,268	1,062	706	-16.2%	-33.6%	\$56,644
		Cleveland	851	663	776	-22.2%	17.1%	\$63,005
		Houston	2,553	2,753	3,455	7.8%	25.5%	\$55,487
		Minneapolis	320	272	246	-14.9%	-9.7%	\$75,397
622110	General Medical and Surgical Hospitals	Detroit	105,480	107,938	108,731	2.3%	0.7%	\$74,934
		Cleveland	83,292	95,992	105,175	15.2%	9.6%	\$74,811
		Houston	62,866	77,534	94,212	23.3%	21.5%	\$80,200
		Minneapolis	60,871	67,008	72,461	10.1%	8.1%	\$78,339
622210	Psychiatric and Substance Abuse Hospitals	Detroit	1,314	1,364	2,028	3.9%	48.6%	\$44,941
		Cleveland	601	900	1,461	49.6%	62.4%	\$41,461
		Houston	3,069	3,404	4,740	10.9%	39.3%	\$59,261
		Minneapolis	174	568	1,026	225.8%	80.7%	\$52,659
622310	Specialty (Except Psychiatric and Substance Abuse) Hospitals	Detroit	759	2,557	4,191	236.9%	63.9%	\$56,633
		Cleveland	1,178	1,928	2,809	63.6%	45.7%	\$54,256
		Houston	3,290	4,998	6,363	51.9%	27.3%	\$70,434
		Minneapolis	1,198	1,955	2,479	63.2%	26.8%	\$81,033
623110	Nursing Care Facilities (Skilled Nursing Facilities)	Detroit	22,423	24,073	27,302	7.4%	13.4%	\$40,369
		Cleveland	33,392	32,164	32,899	-3.7%	2.3%	\$35,050
		Houston	15,265	16,900	20,510	10.7%	21.4%	\$40,974
		Minneapolis	25,635	25,004	24,758	-2.5%	-1.0%	\$39,431
623210		Detroit	8,877	8,857	10,183	-0.2%	15.0%	\$26,721

		Jobs						
NAICS	Description	Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
	Residential Intellectual and Developmental Disability Facilities	Cleveland	6,019	8,527	11,063	41.7%	29.7%	\$27,874
		Houston	2,705	3,484	4,603	28.8%	32.1%	\$27,490
		Minneapolis	12,985	13,126	13,363	1.1%	1.8%	\$30,357
623220	Residential Mental Health and Substance Abuse Facilities	Detroit	2,315	2,961	3,584	27.9%	21.0%	\$33,547
		Cleveland	1,469	1,095	982	-25.4%	-10.3%	\$36,033
		Houston	1,248	1,671	2,248	33.9%	34.5%	\$37,095
		Minneapolis	3,743	5,936	8,108	58.6%	36.6%	\$44,592
623311	Continuing Care Retirement Communities	Detroit	5,292	7,609	9,875	43.8%	29.8%	\$38,596
		Cleveland	6,713	8,726	12,140	30.0%	39.1%	\$30,430
		Houston	2,731	5,426	8,591	98.7%	58.3%	\$33,699
		Minneapolis	4,880	8,189	11,950	67.8%	45.9%	\$32,374
623312	Assisted Living Facilities for the Elderly	Detroit	6,393	8,923	12,546	39.6%	40.6%	\$28,505
		Cleveland	3,550	3,298	3,870	-7.1%	17.3%	\$26,014
		Houston	3,385	5,553	8,354	64.0%	50.4%	\$33,132
		Minneapolis	2,596	5,609	8,569	116.1%	52.8%	\$30,820
623990	Other Residential Care Facilities	Detroit	5,331	5,862	6,100	10.0%	4.1%	\$30,245
		Cleveland	1,228	1,236	1,212	0.7%	-2.0%	\$32,349
		Houston	1,259	1,083	931	-13.9%	-14.1%	\$34,248
		Minneapolis	1,685	6,402	9,795	279.9%	53.0%	\$29,616
Service Provision—Offices								
621111	Offices of Physicians (Except Mental Health Specialists)	Detroit	39,557	42,602	48,498	7.7%	13.8%	\$101,572
		Cleveland	22,490	23,536	25,430	4.7%	8.0%	\$113,872
		Houston	40,054	50,185	64,740	25.3%	29.0%	\$104,555
		Minneapolis	30,156	35,592	42,080	18.0%	18.2%	\$113,738
621112	Offices of Physicians, Mental Health Specialists	Detroit	2,309	2,199	2,382	-4.8%	8.3%	\$70,638
		Cleveland	610	625	756	2.3%	21.0%	\$70,728
		Houston	922	955	1,108	3.6%	15.9%	\$96,035
		Minneapolis	450	1,142	1,866	153.7%	63.5%	\$76,076
621210	Offices of Dentists	Detroit	19,328	19,588	21,240	1.3%	8.4%	\$61,549

		Jobs						
NAICS	Description	Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
621310	Offices of Chiropractors	Cleveland	10,793	10,571	11,125	-2.1%	5.2%	\$60,613
		Houston	13,580	18,325	23,805	34.9%	29.9%	\$63,980
		Minneapolis	11,506	11,860	12,617	3.1%	6.4%	\$69,905
		Detroit	3,092	2,736	2,838	-11.5%	3.7%	\$39,164
		Cleveland	1,556	1,746	2,004	12.2%	14.8%	\$42,184
		Houston	1,858	2,288	2,886	23.1%	26.1%	\$42,146
		Minneapolis	3,031	3,359	3,725	10.8%	10.9%	\$35,868
621320	Offices of Optometrists	Detroit	2,244	2,560	3,091	14.0%	20.7%	\$61,534
		Cleveland	1,454	1,682	2,001	15.7%	19.0%	\$53,186
		Houston	2,637	3,885	5,306	47.3%	36.6%	\$50,989
		Minneapolis	1,351	1,743	2,261	29.0%	29.7%	\$65,831
621330	Offices of Mental Health Practitioners (Except Physicians)	Detroit	1,600	1,707	1,789	6.7%	4.8%	\$51,771
		Cleveland	1,009	978	1,003	-3.0%	2.5%	\$44,169
		Houston	1,360	1,705	2,310	25.4%	35.5%	\$66,288
		Minneapolis	1,489	3,277	4,658	120.1%	42.1%	\$51,785
621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists	Detroit	4,284	6,247	9,254	45.8%	48.1%	\$51,472
		Cleveland	3,212	3,740	4,890	16.4%	30.7%	\$46,420
		Houston	2,548	3,756	5,379	47.4%	43.2%	\$54,854
		Minneapolis	1,329	2,673	3,887	101.1%	45.4%	\$55,640
621391	Offices of Podiatrists	Detroit	1,456	1,355	1,495	-6.9%	10.3%	\$52,067
		Cleveland	560	580	627	3.4%	8.1%	\$45,538
		Houston	561	602	745	7.3%	23.8%	\$60,755
		Minneapolis	142	90	61	-36.8%	-32.0%	\$62,791
621399	Offices of All Other Miscellaneous Health Practitioners	Detroit	988	1,043	1,247	5.5%	19.6%	\$46,893
		Cleveland	1,430	1,613	2,267	12.8%	40.5%	\$36,721
		Houston	1,072	2,176	3,162	102.9%	45.3%	\$51,650
		Minneapolis	992	1,882	2,579	89.8%	37.0%	\$52,142
Trade								
423450		Detroit	2,355	3,117	3,757	32.3%	20.5%	\$95,078

NAICS	Description	Jobs						
		Region	2007	2016	2026	2007-2016 Percent Change	2016-2026 Percent Change	2016 Average Earnings
	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers	Cleveland	2,990	2,594	2,524	-13.3%	-2.7%	\$85,609
		Houston	2,809	4,127	5,294	46.9%	28.3%	\$95,905
		Minneapolis	4,026	4,104	4,587	1.9%	11.8%	\$113,677
423460	Ophthalmic Goods Merchant Wholesalers	Detroit	132	99	91	-25.4%	-7.9%	\$88,185
		Cleveland	92	61	71	-33.5%	16.9%	\$55,248
		Houston	90	43	37	-51.9%	-13.7%	\$40,874
		Minneapolis	129	213	270	65.5%	26.8%	\$65,017
446110	Pharmacies and Drug Stores	Detroit	14,740	14,424	13,751	-2.1%	-4.7%	\$49,562
		Cleveland	9,890	9,805	8,619	-0.9%	-12.1%	\$40,043
		Houston	11,749	13,942	15,903	18.7%	14.1%	\$49,142
		Minneapolis	8,582	9,018	9,388	5.1%	4.1%	\$50,777
446130	Optical Goods Stores	Detroit	1,151	934	873	-18.9%	-6.5%	\$44,474
		Cleveland	735	676	574	-8.0%	-15.1%	\$35,633
		Houston	954	1,365	1,841	43.2%	34.9%	\$37,865
		Minneapolis	896	952	934	6.3%	-1.9%	\$39,415
446199	All Other Health and Personal Care Stores	Detroit	1,441	2,217	2,889	53.8%	30.3%	\$39,103
		Cleveland	1,105	922	950	-16.5%	3.0%	\$49,490
		Houston	894	952	1,088	6.5%	14.2%	\$59,659
		Minneapolis	778	1,056	1,245	35.6%	17.9%	\$49,793
532291	Home Health Equipment Rental	Detroit	650	348	226	-46.4%	-35.1%	\$59,136
		Cleveland	583	470	363	-19.5%	-22.7%	\$53,846
		Houston	777	491	327	-36.9%	-33.3%	\$58,216
		Minneapolis	614	583	601	-5.2%	3.1%	\$64,754

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

SHIFT SHARE AND LOCATION QUOTIENT

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage (Effect)	2016–2026 Competitive Advantage (Effect)	2016–2026 Competitive Advantage Percent	2007	2016	2026	2007–2016 Percent Change	2016–2026 Percent Change
Manufacturing										
325411	Medicinal and Botanical Manufacturing	Detroit	71	47	10.9%	0.79	0.99	1.14	24.7%	15.1%
		Cleveland	-45	-2	-23.2%	0.15	0.02	0.01	-88.9%	-19.8%
		Houston	62	79	34.0%	0.33	0.40	0.49	23.3%	20.6%
		Minneapolis	24	14	23.5%	0.09	0.16	0.20	70.0%	26.2%
325412	Pharmaceutical Preparation Manufacturing	Detroit	17	-63	-11.2%	0.16	0.18	0.17	7.4%	-6.4%
		Cleveland	-859	-131	-79.1%	0.42	0.07	0.02	-82.6%	-78.7%
		Houston	1,059	668	30.8%	0.29	0.52	0.64	76.9%	23.7%
		Minneapolis	-351	-264	-27.3%	0.47	0.34	0.26	-26.6%	-23.7%
325413	In-vitro Diagnostic Substance Manufacturing	Detroit	-75	-10	-23.4%	0.28	0.11	0.09	-62.5%	-14.2%
		Cleveland	-296	-87	-105.2%	1.24	0.29	0.05	-76.6%	-82.7%
		Houston	-92	22	47.7%	0.29	0.09	0.11	-70.1%	30.0%
		Minneapolis	564	-277	-13.5%	4.26	5.87	5.54	37.9%	-5.7%
325414	Biological Product (Except Diagnostic) Manufacturing	Detroit	4	2	29.1%	0.00	0.01	0.01	N/A	49.4%
		Cleveland	-78	-2	-31.2%	0.22	0.02	0.02	-91.9%	-14.0%
		Houston	-96	-69	-42.8%	0.43	0.25	0.15	-43.1%	-39.7%
		Minneapolis	-28	5	20.0%	0.12	0.06	0.07	-51.8%	23.4%
333314	Optical Instrument and Lens Manufacturing	Detroit	29	7	1.5%	1.45	1.60	1.72	10.8%	7.2%
		Cleveland	226	250	75.6%	0.45	1.54	3.01	240.0%	95.5%
		Houston	13	-6	-28.7%	0.02	0.05	0.03	134.4%	-34.6%
		Minneapolis	-254	-56	-53.4%	1.35	0.39	0.18	-70.9%	-54.3%
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	Detroit	-13	33	24.4%	0.14	0.13	0.17	-5.0%	30.0%
		Cleveland	836	590	38.6%	0.90	2.14	3.17	137.4%	48.0%
		Houston	227	72	9.0%	0.48	0.61	0.62	25.9%	2.2%
		Minneapolis	614	-914	-6.6%	15.05	15.75	15.60	4.7%	-0.9%
334516		Detroit	55	28	19.7%	0.15	0.25	0.32	71.2%	25.6%

NAICS	Description	Region	Shift Share			Location Quotient				
			2007–2016 Competitive Advantage (Effect)	2016–2026 Competitive Advantage (Effect)	2016–2026 Competitive Advantage Percent	2007	2016	2026	2007–2016 Percent Change	2016–2026 Percent Change
	Analytical Laboratory Instrument Manufacturing	Cleveland	48	49	71.9%	0.05	0.17	0.32	266.8%	83.4%
		Houston	64	22	3.1%	1.01	1.00	0.97	-0.9%	-3.1%
		Minneapolis	81	45	13.4%	0.52	0.69	0.82	32.1%	19.3%
334517	Irradiation Apparatus Manufacturing	Detroit	-11	0	-2.3%	0.07	0.01	0.01	-79.0%	-2.1%
		Cleveland	25	105	33.3%	1.83	2.14	3.01	16.6%	41.1%
		Houston	62	45	53.3%	0.09	0.31	0.43	237.7%	39.6%
		Minneapolis	15	17	31.0%	0.22	0.30	0.41	37.8%	35.4%
334519	Other Measuring and Controlling Device Manufacturing	Detroit	623	289	19.0%	1.49	2.63	3.26	76.6%	24.0%
		Cleveland	-32	-53	-8.6%	1.46	1.49	1.49	2.2%	-0.1%
		Houston	-615	-270	-35.1%	2.00	1.00	0.64	-49.8%	-36.2%
		Minneapolis	-1	-172	-10.7%	3.15	3.15	3.00	0.0%	-4.7%
339112	Surgical and Medical Instrument Manufacturing	Detroit	216	-8	-1.0%	0.28	0.40	0.42	45.4%	4.6%
		Cleveland	-184	-81	-7.6%	0.86	0.79	0.79	-8.4%	0.8%
		Houston	109	69	10.1%	0.25	0.27	0.28	7.8%	3.0%
		Minneapolis	801	53	0.5%	5.71	6.19	6.58	8.4%	6.2%
339113	Surgical Appliance and Supplies Manufacturing	Detroit	11	-163	-9.1%	1.08	1.13	1.09	4.9%	-3.5%
		Cleveland	-310	-559	-20.5%	2.49	2.41	2.10	-3.5%	-12.6%
		Houston	-113	-138	-34.3%	0.27	0.19	0.12	-29.3%	-36.3%
		Minneapolis	-1,784	-1,234	-57.9%	2.81	1.53	0.73	-45.5%	-52.0%
339114	Dental Equipment and Supplies Manufacturing	Detroit	-66	-91	-51.2%	0.94	0.71	0.40	-23.8%	-44.3%
		Cleveland	-8	-41	-16.9%	1.30	1.35	1.24	3.9%	-8.5%
		Houston	52	13	13.2%	0.16	0.30	0.32	90.1%	5.6%
		Minneapolis	11	0	0.0%	1.26	1.32	1.39	4.1%	5.7%
339115	Ophthalmic Goods Manufacturing	Detroit	-193	-26	-30.7%	0.64	0.21	0.16	-67.9%	-24.8%
		Cleveland	57	-3	-1.6%	0.35	0.56	0.60	63.0%	6.7%
		Houston	129	108	41.1%	0.27	0.48	0.62	78.2%	30.4%
		Minneapolis	293	139	8.2%	3.85	4.65	5.29	20.8%	13.8%
339116	Dental Laboratories	Detroit	-94	-128	-16.7%	1.03	0.96	0.84	-7.2%	-12.0%

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage (Effect)	2016–2026 Competitive Advantage (Effect)	2016–2026 Competitive Advantage Percent	2007	2016	2026	2007–2016 Percent Change	2016–2026 Percent Change
		Cleveland	-164	-92	-17.2%	1.14	0.94	0.84	-17.7%	-10.2%
		Houston	100	16	2.1%	0.71	0.74	0.71	3.7%	-3.9%
		Minneapolis	-74	-43	-4.6%	1.41	1.31	1.32	-7.4%	0.8%
Medical Software										
511210	Software Publishers	Detroit	-2,570	-803	-16.8%	1.26	0.86	0.78	-32.2%	-8.5%
		Cleveland	266	158	12.6%	0.23	0.32	0.38	36.3%	19.2%
		Houston	-1,259	-711	-30.9%	0.53	0.31	0.22	-41.6%	-28.9%
		Minneapolis	-1,917	-1,316	-24.4%	1.49	1.10	0.94	-26.2%	-14.7%
519190	All Other Information Services	Detroit	994	333	27.9%	0.69	4.27	5.53	517.9%	29.5%
		Cleveland	48	-8	-3.4%	0.90	1.20	1.27	34.5%	5.4%
		Houston	21	-11	-15.9%	0.14	0.18	0.15	31.2%	-18.0%
		Minneapolis	156	3	0.6%	1.55	2.19	2.32	40.9%	6.2%
541511	Custom Computer Programming Services	Detroit	1,178	514	3.7%	0.84	0.96	1.04	13.9%	8.8%
		Cleveland	-1,165	-891	-10.5%	0.87	0.82	0.81	-5.5%	-0.8%
		Houston	-1,385	-986	-6.8%	0.92	0.76	0.67	-17.4%	-11.0%
		Minneapolis	-300	-910	-6.9%	1.06	1.04	1.04	-2.2%	-0.2%
541512	Computer Systems Design Services	Detroit	-11,127	-6,829	-38.8%	1.76	1.13	0.82	-36.2%	-26.9%
		Cleveland	284	734	10.4%	0.56	0.63	0.74	12.0%	17.3%
		Houston	-3,293	-1,153	-7.1%	1.04	0.78	0.70	-24.9%	-11.2%
		Minneapolis	-1,351	-532	-3.5%	1.21	1.11	1.14	-8.1%	2.8%
Research and Development										
541711	Research and Development in Biotechnology	Detroit	-2,272	-587	-90.9%	1.03	0.24	0.06	-76.9%	-75.2%
		Cleveland	-340	-138	-31.9%	0.37	0.22	0.18	-39.8%	-20.7%
		Houston	-688	-264	-24.6%	0.54	0.30	0.22	-44.9%	-25.4%
		Minneapolis	-369	-177	-39.0%	0.34	0.19	0.13	-44.8%	-29.0%
541712	Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology)	Detroit	2,651	2,418	11.4%	2.46	2.93	3.42	19.2%	16.6%
		Cleveland	-539	-209	-7.8%	0.58	0.52	0.52	-10.5%	0.6%
		Houston	-2,424	-924	-16.1%	0.95	0.60	0.48	-36.5%	-19.8%

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611310	Colleges, Universities, and Professional Schools	Minneapolis	203	258	4.4%	0.90	0.93	1.02	3.6%	9.9%
		Detroit	-4,596	-3,281	-28.1%	0.51	0.38	0.31	-25.2%	-19.8%
		Cleveland	2,321	-510	-1.9%	1.07	1.26	1.34	17.4%	6.7%
		Houston	1,178	1,356	6.2%	0.56	0.54	0.53	-4.4%	-0.8%
		Minneapolis	845	-2,145	-6.9%	1.13	1.16	1.16	2.8%	-0.5%
Service Provision										
518210	Data Processing, Hosting, and Related Services	Detroit	232	344	7.8%	0.83	0.91	1.03	10.1%	0.1
		Cleveland	508	115	5.3%	0.45	0.63	0.72	40.3%	0.1
		Houston	-834	-547	-15.0%	0.78	0.58	0.47	-26.4%	-0.2
		Minneapolis	-855	-1,815	-29.6%	1.66	1.45	1.13	-12.2%	-0.2
524114	Direct Health and Medical Insurance Carriers	Detroit	667	-138	-1.8%	1.18	1.35	1.41	14.2%	0.0
		Cleveland	1,150	388	9.4%	0.68	1.02	1.18	49.2%	0.2
		Houston	-312	-578	-69.6%	0.17	0.11	0.05	-34.2%	-0.6
		Minneapolis	-2,681	-4,780	-36.4%	3.16	2.63	1.98	-16.9%	-0.2
562211	Hazardous Waste Treatment and Disposal	Detroit	75	0	0.1%	0.47	0.63	0.67	33.3%	0.1
		Cleveland	-81	5	1.6%	1.02	0.88	0.97	-13.2%	0.1
		Houston	594	268	17.5%	1.45	2.14	2.43	47.6%	0.1
		Minneapolis	83	24	12.6%	0.23	0.40	0.49	77.0%	0.2
621610	Home healthcare Services	Detroit	-2,101	-2,332	-8.5%	1.26	1.22	1.22	-3.2%	0.0
		Cleveland	-2,648	-3,233	-16.1%	1.32	1.25	1.21	-5.1%	0.0
		Houston	2,328	1,050	2.0%	1.88	1.78	1.70	-5.4%	0.0
		Minneapolis	3,924	1,861	9.6%	0.78	0.98	1.10	25.5%	0.1
621910	Ambulance Services	Detroit	117	0	0.0%	1.18	1.28	1.35	7.8%	0.1
		Cleveland	-877	-551	-21.4%	1.61	1.29	1.18	-19.8%	-0.1
		Houston	-360	-313	-9.5%	1.09	0.89	0.78	-18.5%	-0.1
		Minneapolis	144	-96	-6.6%	0.54	0.59	0.60	10.9%	0.0
621991	Blood and Organ Banks	Detroit	250	154	27.5%	0.27	0.50	0.65	88.1%	0.3
		Cleveland	-313	-375	-55.7%	1.15	0.84	0.48	-26.6%	-0.4

			Shift Share			Location Quotient				
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621999	All Other Miscellaneous Ambulatory healthcare Services	Houston	156	103	8.2%	0.82	0.84	0.85	3.3%	0.0
		Minneapolis	633	257	10.5%	1.83	2.48	2.85	35.0%	0.2
		Detroit	-204	-165	-14.7%	1.10	0.97	0.92	-11.8%	-0.1
		Cleveland	-427	-202	-24.2%	1.43	1.01	0.91	-28.9%	-0.1
		Houston	-323	-117	-11.9%	0.95	0.65	0.56	-32.0%	-0.1
		Minneapolis	-118	-566	-24.2%	2.42	2.31	2.02	-4.7%	-0.1
812210	Funeral Homes and Funeral Services	Detroit	-264	-160	-7.6%	1.32	1.22	1.19	-7.3%	0.0
		Cleveland	-62	-107	-5.8%	1.44	1.49	1.53	4.0%	0.0
		Houston	202	129	5.4%	1.06	1.05	1.04	-1.3%	0.0
		Minneapolis	6	-30	-3.4%	0.57	0.58	0.59	0.7%	0.0
812220	Cemeteries and Crematories	Detroit	5	-28	-5.9%	0.95	1.00	0.99	5.3%	0.0
		Cleveland	-52	-20	-4.9%	1.29	1.23	1.27	-4.3%	0.0
		Houston	86	69	11.3%	0.92	0.97	1.01	5.4%	0.0
		Minneapolis	-36	-44	-25.3%	0.50	0.42	0.33	-17.0%	-0.2
Service Provision—Centers, Facilities, and Hospitals										
621410	Family Planning Centers	Detroit	-41	-135	-23.6%	1.51	1.46	1.25	-2.8%	-0.1
		Cleveland	8	-104	-56.2%	0.59	0.67	0.39	12.2%	-0.4
		Houston	-91	-207	-52.4%	1.04	0.77	0.42	-26.4%	-0.5
		Minneapolis	99	42	16.4%	0.45	0.74	0.89	64.1%	0.2
621491	HMO Medical Centers	Detroit	323	277	7.7%	1.03	1.18	1.31	14.6%	0.1
		Cleveland	-3,363	-684	-125.0%	1.68	0.25	0.05	-85.0%	-0.8
		Houston	-268	13	1.0%	0.42	0.31	0.30	-25.5%	-0.1
		Minneapolis	-11,981	-2,187	-62.8%	5.80	1.31	0.81	-77.5%	-0.4
621492	Kidney Dialysis Centers	Detroit	1,354	683	34.2%	0.31	0.99	1.30	223.4%	0.3
		Cleveland	-539	-358	-21.6%	1.42	1.15	1.05	-18.9%	-0.1
		Houston	176	353	10.7%	1.29	1.24	1.25	-4.5%	0.0
		Minneapolis	25	-93	-9.3%	0.55	0.56	0.56	2.6%	0.0
621493		Detroit	-2,424	-1,289	-65.1%	1.83	0.86	0.50	-53.1%	-0.4

NAICS	Description	Region	Shift Share			Location Quotient				
			2007–2016 Competitive Advantage (Effect)	2016–2026 Competitive Advantage (Effect)	2016–2026 Competitive Advantage Percent	2007	2016	2026	2007–2016 Percent Change	2016–2026 Percent Change
	Freestanding Ambulatory Surgical and Emergency Centers	Cleveland	-361	-379	-24.2%	1.09	0.95	0.86	-12.7%	-0.1
		Houston	2,697	1,684	32.3%	0.92	1.71	1.97	87.3%	0.2
		Minneapolis	478	93	6.9%	0.43	0.67	0.74	54.4%	0.1
621498	All Other Outpatient Care Centers	Detroit	-816	-758	-37.4%	1.07	0.79	0.62	-25.7%	-0.2
		Cleveland	-1,364	-524	-53.8%	1.19	0.53	0.36	-55.2%	-0.3
		Houston	859	618	19.4%	0.76	0.95	1.01	23.7%	0.1
		Minneapolis	-945	-442	-107.0%	0.60	0.18	0.05	-69.6%	-0.7
621511	Medical Laboratories	Detroit	-1,274	-574	-34.7%	0.88	0.52	0.40	-41.1%	-0.2
		Cleveland	-319	-210	-29.4%	0.42	0.31	0.26	-25.7%	-0.2
		Houston	853	499	14.1%	0.70	0.84	0.87	19.2%	0.0
		Minneapolis	928	376	16.5%	0.48	0.82	0.97	68.5%	0.2
621512	Diagnostic Imaging Centers	Detroit	-244	-589	-55.4%	1.05	0.89	0.51	-15.2%	-0.4
		Cleveland	-215	-32	-4.8%	0.96	0.78	0.81	-18.9%	0.0
		Houston	122	101	3.7%	1.85	1.75	1.70	-5.4%	0.0
		Minneapolis	-58	-86	-31.6%	0.31	0.26	0.20	-17.4%	-0.2
622110	General Medical and Surgical Hospitals	Detroit	-7,782	-8,679	-8.0%	1.54	1.49	1.46	-2.8%	0.0
		Cleveland	4,614	760	0.8%	1.65	1.86	2.03	12.9%	0.1
		Houston	8,565	9,875	12.7%	0.80	0.81	0.85	1.6%	0.1
		Minneapolis	228	-426	-0.6%	1.05	1.06	1.11	0.4%	0.1
622210	Psychiatric and Substance Abuse Hospitals	Detroit	-203	177	13.0%	0.84	0.76	0.88	-9.2%	0.2
		Cleveland	182	241	26.8%	0.52	0.70	0.91	34.8%	0.3
		Houston	-257	121	3.6%	1.71	1.44	1.39	-15.9%	0.0
		Minneapolis	360	256	45.1%	0.13	0.36	0.51	173.2%	0.4
622310	Specialty (Except Psychiatric and Substance Abuse) Hospitals	Detroit	1,566	895	35.0%	0.27	0.72	0.97	168.9%	0.3
		Cleveland	388	324	16.8%	0.57	0.77	0.94	34.6%	0.2
		Houston	700	-80	-1.6%	1.02	1.07	1.00	5.1%	-0.1
		Minneapolis	390	-41	-2.1%	0.50	0.63	0.66	25.0%	0.0
623110		Detroit	1,070	886	3.7%	0.86	0.93	1.02	9.1%	0.1

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage (Effect)	2016–2026 Competitive Advantage (Effect)	2016–2026 Competitive Advantage Percent	2007	2016	2026	2007–2016 Percent Change	2016–2026 Percent Change
	Nursing Care Facilities (Skilled Nursing Facilities)	Cleveland	-2,092	-2,396	-7.4%	1.73	1.75	1.77	0.9%	0.0
		Houston	1,240	1,965	11.6%	0.51	0.50	0.52	-2.4%	0.0
		Minneapolis	-1,294	-2,681	-10.7%	1.16	1.10	1.05	-4.9%	0.0
623210	Residential Intellectual and Developmental Disability Facilities	Detroit	-1,141	-642	-7.2%	1.52	1.41	1.40	-7.6%	0.0
		Cleveland	1,748	642	7.5%	1.40	1.90	2.18	35.2%	0.2
		Houston	437	345	9.9%	0.41	0.42	0.43	3.4%	0.0
		Minneapolis	-1,499	-2,679	-20.4%	2.64	2.37	2.09	-10.2%	-0.1
623220	Residential Mental Health and Substance Abuse Facilities	Detroit	8	-437	-14.8%	0.81	0.84	0.79	4.5%	-0.1
		Cleveland	-779	-505	-46.1%	0.70	0.44	0.31	-37.2%	-0.3
		Houston	79	-21	-1.3%	0.38	0.36	0.34	-5.1%	-0.1
		Minneapolis	1,161	47	0.8%	1.55	1.92	2.05	24.4%	0.1
623311	Continuing Care Retirement Communities	Detroit	91	-1,092	-14.4%	0.96	1.02	0.97	5.5%	0.0
		Cleveland	-811	-437	-5.0%	1.66	1.63	1.71	-1.7%	0.0
		Houston	1,547	770	14.2%	0.43	0.55	0.57	26.5%	0.0
		Minneapolis	1,256	147	1.8%	1.05	1.25	1.33	18.2%	0.1
623312	Assisted Living Facilities for the Elderly	Detroit	649	103	1.2%	1.19	1.34	1.43	12.4%	0.1
		Cleveland	-1,296	-729	-22.1%	0.90	0.70	0.63	-22.9%	-0.1
		Houston	1,172	611	11.0%	0.55	0.63	0.64	14.6%	0.0
		Minneapolis	2,249	747	13.3%	0.58	0.96	1.11	67.0%	0.2
623990	Other Residential Care Facilities	Detroit	587	-124	-2.1%	1.94	2.25	2.33	15.9%	0.0
		Cleveland	21	-101	-8.1%	0.61	0.67	0.67	9.4%	0.0
		Houston	-162	-219	-20.2%	0.40	0.32	0.24	-21.4%	-0.2
		Minneapolis	4,735	2,997	46.8%	0.73	2.80	4.26	284.1%	0.5
Service Provision—Offices										
621111	Offices of Physicians (Except Mental Health Specialists)	Detroit	-2,167	-2,573	-6.0%	1.09	1.08	1.08	-0.8%	0.0
		Cleveland	-1,917	-2,785	-11.8%	0.84	0.83	0.82	-0.6%	0.0
		Houston	4,854	4,578	9.1%	0.96	0.96	0.97	0.1%	0.0
		Minneapolis	1,463	-587	-1.7%	0.98	1.02	1.07	4.3%	0.0

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			2007–2016 Competitive Advantage (Effect)	2016–2026 Competitive Advantage (Effect)	2016–2026 Competitive Advantage Percent	2007	2016	2026	2007–2016 Percent Change	2016–2026 Percent Change
621112	Offices of Physicians, Mental Health Specialists	Detroit	-326	-280	-12.8%	2.32	2.11	1.99	-9.2%	-0.1
		Cleveland	-43	0	0.0%	0.83	0.84	0.91	0.6%	0.1
		Houston	-53	-49	-5.1%	0.81	0.69	0.63	-14.3%	-0.1
		Minneapolis	650	484	42.4%	0.54	1.25	1.78	132.2%	0.4
621210	Offices of Dentists	Detroit	-2,110	-1,771	-9.0%	1.37	1.29	1.26	-5.9%	0.0
		Cleveland	-1,545	-1,293	-12.2%	1.04	0.98	0.95	-6.2%	0.0
		Houston	3,080	2,278	12.4%	0.84	0.92	0.95	8.7%	0.0
		Minneapolis	-1,057	-1,316	-11.1%	0.97	0.89	0.85	-8.1%	0.0
621310	Offices of Chiropractors	Detroit	-606	-304	-11.1%	1.33	1.13	1.08	-14.6%	0.0
		Cleveland	64	-1	0.0%	0.91	1.01	1.10	11.6%	0.1
		Houston	280	258	11.3%	0.70	0.72	0.74	3.0%	0.0
		Minneapolis	84	-133	-3.9%	1.54	1.58	1.61	2.6%	0.0
621320	Offices of Optometrists	Detroit	-214	-176	-6.9%	1.21	1.17	1.17	-3.8%	0.0
		Cleveland	-115	-146	-8.7%	1.07	1.08	1.09	0.6%	0.0
		Houston	626	348	8.9%	1.25	1.34	1.35	7.8%	0.0
		Minneapolis	74	36	2.1%	0.87	0.91	0.97	4.5%	0.1
621330	Offices of Mental Health Practitioners (Except Physicians)	Detroit	-505	-395	-23.1%	1.18	0.95	0.82	-19.6%	-0.1
		Cleveland	-416	-248	-25.4%	1.01	0.76	0.66	-24.6%	-0.1
		Houston	-175	130	7.6%	0.87	0.72	0.71	-18.0%	0.0
		Minneapolis	1,219	466	14.2%	1.30	2.07	2.43	59.3%	0.2
621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists	Detroit	-247	56	0.9%	1.04	1.04	1.11	0.3%	0.1
		Cleveland	-1,129	-616	-16.5%	1.06	0.88	0.84	-17.4%	0.0
		Houston	-107	-150	-4.0%	0.54	0.48	0.44	-12.1%	-0.1
		Minneapolis	659	-48	-1.8%	0.38	0.51	0.53	32.8%	0.0
621391	Offices of Podiatrists	Detroit	-133	-118	-8.7%	2.50	2.37	2.32	-5.1%	0.0
		Cleveland	7	-63	-10.9%	1.31	1.42	1.40	8.7%	0.0
		Houston	28	29	4.8%	0.84	0.80	0.78	-5.1%	0.0
		Minneapolis	-55	-46	-51.0%	0.29	0.18	0.11	-38.1%	-0.4

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621399	Offices of All Other Miscellaneous Health Practitioners	Detroit	-525	-283	-27.2%	0.63	0.44	0.38	-30.6%	-0.1
		Cleveland	-655	-101	-6.3%	1.24	0.95	0.99	-23.6%	0.0
		Houston	475	-32	-1.5%	0.60	0.69	0.65	15.7%	-0.1
		Minneapolis	310	-184	-9.8%	0.75	0.90	0.89	19.8%	0.0
Trade										
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers	Detroit	616	305	9.8%	0.76	0.98	1.13	29.9%	0.1
		Cleveland	-582	-348	-13.4%	1.30	1.15	1.09	-12.2%	0.0
		Houston	1,145	724	17.5%	0.79	0.98	1.07	25.1%	0.1
		Minneapolis	-171	42	1.0%	1.53	1.47	1.57	-4.0%	0.1
423460	Ophthalmic Goods Merchant Wholesalers	Detroit	-29	-17	-16.9%	0.40	0.32	0.28	-19.6%	-0.1
		Cleveland	-28	5	7.9%	0.37	0.28	0.32	-26.2%	0.2
		Houston	-44	-10	-22.6%	0.24	0.11	0.08	-55.1%	-0.3
		Minneapolis	88	38	17.8%	0.46	0.78	0.96	71.0%	0.2
446110	Pharmacies and Drug Stores	Detroit	-217	-679	-4.7%	1.22	1.25	1.26	2.7%	0.0
		Cleveland	-18	-1,190	-12.1%	1.11	1.19	1.14	7.3%	0.0
		Houston	2,272	1,955	14.0%	0.85	0.92	0.98	8.0%	0.1
		Minneapolis	494	367	4.1%	0.84	0.89	0.98	5.8%	0.1
446130	Optical Goods Stores	Detroit	-378	-203	-21.7%	1.10	0.82	0.70	-25.8%	-0.1
		Cleveland	-161	-205	-30.4%	0.96	0.83	0.66	-13.2%	-0.2
		Houston	279	268	19.7%	0.80	0.91	1.00	13.6%	0.1
		Minneapolis	-69	-164	-17.2%	1.02	0.95	0.86	-6.7%	-0.1
446199	All Other Health and Personal Care Stores	Detroit	660	402	18.1%	1.54	2.28	2.80	48.5%	0.2
		Cleveland	-271	-84	-9.1%	1.60	1.33	1.32	-17.0%	0.0
		Houston	-14	20	2.1%	0.83	0.74	0.71	-10.9%	0.0
		Minneapolis	215	61	5.8%	0.98	1.24	1.37	25.6%	0.1
532291	Home Health Equipment Rental	Detroit	-283	-125	-35.8%	0.97	0.56	0.38	-42.4%	-0.3
		Cleveland	-97	-109	-23.3%	1.19	1.06	0.88	-10.9%	-0.2
		Houston	-264	-167	-34.0%	1.02	0.60	0.37	-41.2%	-0.4

NAICS	Description	Region	Shift Share			Location Quotient				
			2007–2016 Competitive Advantage (Effect)	2016–2026 Competitive Advantage (Effect)	2016–2026 Competitive Advantage Percent	2007	2016	2026	2007–2016 Percent Change	2016–2026 Percent Change
		Minneapolis	-14	14	2.5%	1.09	1.07	1.15	-2.3%	0.1

APPENDIX III: SOC CODES—DETROIT

SOC Code	Description
15-1100	Computer Occupations
	15-1110 Computer and Information Research Scientists
	15-1120 Computer and Information Analysts
	15-1130 Software Developers and Programmers
	15-1140 Database and Systems Administrators and Network Architects
	15-1150 Computer Support Specialists
	15-1190 Miscellaneous Computer Occupations
15-2030	Operations Research Analysts
15-2090	Miscellaneous Mathematical Science Occupations
17-2030	Biomedical Engineers
17-2040	Chemical Engineers
17-2060	Computer Hardware Engineers
17-2070	Electrical and Electronics Engineers
17-2130	Materials Engineers
19-1020	Biological Scientists
19-1040	Medical Scientists
19-2030	Chemists and Materials Scientists
19-4020	Biological Technicians
19-4030	Chemical Technicians
29-1000	Health Diagnosing and Treating Practitioners
	29-1010 Chiropractors
	29-1020 Dentists
	29-1030 Dietitians and Nutritionists
	29-1040 Optometrists
	29-1050 Pharmacists
	29-1060 Physicians and Surgeons
	29-1070 Physician Assistants
	29-1080 Podiatrists
	29-1120 Therapists
	29-1130 Veterinarians
	29-1140 Registered Nurses
	29-1150 Nurse Anesthetists
	29-1160 Nurse Midwives
	29-1170 Nurse Practitioners
	29-1180 Audiologists
	20-1190 Miscellaneous Health Diagnosing and Treating Practitioners
29-2000	Health Technologists and Technicians
	29-2010 Clinical Laboratory Technologists and Technicians
	29-2020 Dental Hygienists
	29-2030 Diagnostic Related Technologists and Technicians
	29-2040 Emergency Medical Technicians
	29-2050 Health Practitioner Support Technologists and Technicians
	29-2060 Licensed Practical and Licensed Vocational Nurses
	29-2070 Medical Records and Health Information Technicians
	29-2080 Opticians, Dispensing
	29-2090 Miscellaneous Health Technologists and Technicians
29-9000	Other Healthcare Practitioners and Technical Occupations
	29-9010 Occupational Health and Safety Specialists and Technicians
	29-9090 Miscellaneous Health Practitioners and Technical Workers
31-1000	Nursing, Psychiatric, and Home Health Aides
31-2000	Occupational Therapy and Physical Therapist Assistants and Aides
31-9000	Other Healthcare Support Occupations

SOC Code	Description
51-2010	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers
51-2020	Electrical, Electronics, and Electromechanical Assemblers
51-2030	Engine and Other Machine Assemblers
51-4060	Model Makers and Patternmakers, Metal and Plastic
51-9040	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

APPENDIX IV: JOBS BY REGION AND SALARY—DETROIT

All Cluster Jobs and Average Salaries by Region

Region	2007	2016	2026	2016 Salaries
Detroit	373,905	409,748	460,552	\$60,253
Cleveland	275,710	308,237	347,210	\$50,645
Houston	295,401	380,684	490,206	\$61,400
Minneapolis	317,139	372,911	426,540	\$65,977
Michigan	644,760	712,856	814,531	\$57,488

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

All Jobs and Average Salaries by Region

Region	2007	2016	2026	2016 Salaries
Detroit	2,495,813	2,489,070	2,586,397	\$53,209
Cleveland	1,835,333	1,775,710	1,797,620	\$45,489
Houston	2,857,871	3,286,382	3,829,890	\$59,698
Minneapolis	2,104,313	2,186,986	2,270,737	\$55,161
Michigan	4,606,121	4,632,555	4,920,948	\$48,620
Minnesota	3,018,936	3,116,534	3,249,396	\$51,476
Ohio	5,853,705	5,843,021	6,108,143	\$45,611
Texas	11,613,084	13,262,304	15,552,797	\$51,610

SOURCE: EMSI Intl. 2017. "2017.3 U.S. Dataset." *EMSI Developer*.

APPENDIX V: CLUSTER COMPARISON REGIONS—WINDSOR

Region	2016 Population
Windsor (ON)	409,951
Essex County	402,951
Windsor City (estimate, includes Essex County Population)	330,000
Hamilton (ON)	1,575,362
Hamilton County	554,217
Halton County	573,853
Niagara County	447,292
London (ON)	561,998
Middlesex County	471,176
Elgin County	90,822
Surrey (BC)	525,220
Surrey County	525,220

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

APPENDIX VI: REGIONAL COMPARISON OF CLUSTER INDUSTRIES—WINDSOR

JOBS⁶

NAICS	Description	Region	Jobs					2016 Average Earnings
			2007	2016	2024	2007-2016 Percent Change	2016-2024 Percent Change	
Manufacturing								
3254	Pharmaceutical and Medicine Manufacturing	Windsor	774	1,418	1,567	83.1%	10.5%	\$55,074
		Hamilton	778	524	480	-32.7%	-8.4%	\$71,483
		London	83	130	132	57.5%	1.5%	\$74,428
		Surrey	52	82	92	57.7%	13.4%	\$57,714
3333	Commercial and Service Industry Machinery Manufacturing	Windsor	32	48	52	49.5%	8.3%	\$111,851
		Hamilton	1,266	1,242	1,314	-1.9%	5.8%	\$82,075
		London	319	451	518	41.4%	14.9%	\$82,723
		Surrey	49	36	36	-26.0%	0.0%	\$75,768
3345	Navigational, Measuring, Medical, and Control Instruments Manufacturing	Windsor	212	69	51	-67.7%	-26.1%	\$59,146
		Hamilton	1,083	1,001	951	-7.6%	-5.0%	\$55,411
		London	769	318	267	-58.6%	-16.0%	\$59,564
		Surrey	219	232	278	6.0%	19.8%	\$74,060
3391	Medical Equipment and Supplies Manufacturing	Windsor	127	120	125	-5.6%	4.2%	\$41,906
		Hamilton	718	736	715	2.4%	-2.9%	\$56,060
		London	502	631	672	25.7%	6.5%	\$65,632
		Surrey	243	119	121	-50.9%	1.7%	\$51,778
Medical Software								
5112	Software Publishers	Windsor	95	128	139	34.7%	8.6%	\$46,950
		Hamilton	538	773	844	43.7%	9.2%	\$91,499
		London	278	783	874	181.5%	11.6%	\$67,140
		Surrey	141	373	395	164.9%	5.9%	\$89,035
5191	Other Information Services	Windsor	291	288	298	-1.0%	3.5%	\$44,828

⁶ The industry-level data in this appendix includes the self-employed at the NAICS code level. Due to data limitations, particularly regarding wage data, self-employed numbers were not included in the aggregate analysis, which allowed for comparisons across regions and with the U.S.

NAICS	Description	Region	Jobs					
			2007	2016	2024	2007-2016 Percent Change	2016-2024 Percent Change	2016 Average Earnings
5415	Computer Systems Design and Related Services	Hamilton	1,505	1,431	1,426	-4.9%	-0.3%	\$48,886
		London	533	418	391	-21.5%	-6.5%	\$48,974
		Surrey	160	248	263	55.3%	6.0%	\$58,205
		Windsor	768	1,006	1,181	31.0%	17.4%	\$55,225
		Hamilton	5,973	10,608	12,329	77.6%	16.2%	\$82,700
		London	2,790	3,057	3,462	9.6%	13.2%	\$64,733
		Surrey	989	1,501	1,773	51.7%	18.1%	\$83,551
Research and Development								
5417	Scientific Research and Development Services	Windsor	126	164	201	30.5%	22.0%	\$53,437
		Hamilton	855	1,312	1,423	53.4%	8.5%	\$85,248
		London	844	1,027	1,202	21.8%	16.9%	\$65,255
		Surrey	188	115	107	-38.6%	-7.0%	\$88,461
6113	Universities	Windsor	3,318	3,228	3,421	-2.7%	6.0%	\$51,585
		Hamilton	10,409	12,876	14,205	23.7%	10.3%	\$52,567
		London	8,456	9,529	10,117	12.7%	6.2%	\$54,083
		Surrey	346	1,092	1,157	215.2%	6.0%	\$53,106
Service Provision								
5182	Data Processing, Hosting, and Related Services	Windsor	69	248	284	259.5%	14.5%	\$40,336
		Hamilton	683	755	779	10.5%	3.2%	\$80,068
		London	74	267	308	259.2%	15.4%	\$101,429
		Surrey	29	68	65	138.3%	-4.4%	\$93,203
5241	Insurance Carriers	Windsor	825	1,031	1,120	24.9%	8.6%	\$62,136
		Hamilton	2,892	3,556	3,860	23.0%	8.5%	\$58,344
		London	2,983	3,296	3,398	10.5%	3.1%	\$59,649
		Surrey	1,071	934	908	-12.8%	-2.8%	\$66,790
5622	Waste Treatment and Disposal	Windsor	140	232	218	65.7%	-6.0%	\$51,248
		Hamilton	648	693	662	7.0%	-4.5%	\$69,552
		London	143	197	193	38.2%	-2.0%	\$55,833
		Surrey	179	140	114	-21.6%	-18.6%	\$65,908

NAICS	Description	Region	Jobs					
			2007	2016	2024	2007-2016 Percent Change	2016-2024 Percent Change	2016 Average Earnings
6216	Home Healthcare Services	Windsor	559	960	1,169	71.8%	21.8%	\$28,786
		Hamilton	2,243	3,660	4,436	63.2%	21.2%	\$32,329
		London	1,174	1,139	1,234	-3.0%	8.3%	\$36,025
		Surrey	331	579	729	75.1%	25.9%	\$29,468
6219	Other Ambulatory Healthcare Services	Windsor	206	206	233	0.0%	13.1%	\$46,415
		Hamilton	508	517	577	1.7%	11.6%	\$43,672
		London	495	448	507	-9.4%	13.2%	\$57,299
		Surrey	19	225	314	1053.1%	40.0%	\$54,739
8122	Funeral Services	Windsor	239	305	346	27.7%	13.4%	\$55,649
		Hamilton	829	849	900	2.4%	6.0%	\$41,485
		London	264	239	252	-9.5%	5.4%	\$35,539
		Surrey	131	143	165	9.7%	15.4%	\$46,701
Service Provision—Centers, Facilities, and Hospitals								
6214	Out-patient Care Centres	Windsor	727	908	1,006	25.0%	10.7%	\$62,367
		Hamilton	2,356	3,206	3,822	36.1%	19.2%	\$53,697
		London	1,009	1,765	2,033	74.9%	15.2%	\$55,878
		Surrey	567	430	452	-24.1%	5.1%	\$47,162
6215	Medical and Diagnostic Laboratories	Windsor	181	226	264	24.6%	16.8%	\$41,470
		Hamilton	728	1,411	1,656	93.8%	17.4%	\$52,828
		London	361	583	700	61.5%	20.1%	\$47,103
		Surrey	383	255	227	-33.3%	-11.0%	\$46,867
6221	General Medical and Surgical Hospitals	Windsor	4,891	5,440	6,034	11.2%	10.9%	\$58,353
		Hamilton	22,740	21,028	23,066	-7.5%	9.7%	\$58,541
		London	13,737	14,839	16,847	8.0%	13.5%	\$57,745
		Surrey	4,262	7,472	9,029	75.3%	20.8%	\$56,162
6222	Psychiatric and Substance Abuse Hospitals	Windsor	0	0	0	N/A	0.0%	N/A
		Hamilton	154	710	813	362.0%	14.5%	\$59,274
		London	1,327	1,319	1,495	-0.6%	13.3%	\$57,224
		Surrey	151	220	266	45.2%	20.9%	\$57,230

NAICS	Description	Region	Jobs					
			2007	2016	2024	2007-2016 Percent Change	2016-2024 Percent Change	2016 Average Earnings
6223	Specialty (Except Psychiatric and Substance Abuse) Hospitals	Windsor	64	323	391	408.4%	21.1%	\$53,586
		Hamilton	258	312	375	21.1%	20.2%	\$54,887
		London	23	41	42	81.0%	2.4%	\$53,269
		Surrey	< 10	< 10	N/A	N/A	N/A	N/A
6231	Nursing Care Facilities	Windsor	1,670	2,375	2,723	42.2%	14.7%	\$29,041
		Hamilton	7,117	8,640	9,998	21.4%	15.7%	\$31,772
		London	2,574	3,295	3,752	28.0%	13.9%	\$33,384
		Surrey	903	1,969	2,268	118.1%	15.2%	\$41,702
6232	Residential Developmental Handicap, Mental Health, and Substance Abuse Facilities	Windsor	664	1,899	2,174	186.1%	14.4%	\$30,493
		Hamilton	2,894	2,743	2,949	-5.2%	7.5%	\$32,607
		London	475	1,340	1,617	181.9%	20.7%	\$35,439
		Surrey	908	718	775	-21.0%	7.9%	\$31,754
6233	Community Care Facilities for The Elderly	Windsor	404	1,008	1,161	149.4%	15.2%	\$31,306
		Hamilton	1,808	4,738	5,745	162.0%	21.3%	\$34,377
		London	755	1,652	1,950	118.8%	18.0%	\$35,304
		Surrey	544	801	967	47.1%	20.7%	\$40,796
6239	Other Residential Care Facilities	Windsor	357	741	833	107.8%	12.4%	\$30,949
		Hamilton	991	1,656	1,909	67.0%	15.3%	\$34,263
		London	1,138	1,237	1,312	8.7%	6.1%	\$36,284
		Surrey	127	209	231	65.1%	10.5%	\$50,992
Service Provision—Offices								
6211	Offices of Physicians	Windsor	1,491	1,681	1,838	12.7%	9.3%	\$45,717
		Hamilton	6,918	12,415	14,623	79.5%	17.8%	\$57,682
		London	2,170	3,261	3,604	50.3%	10.5%	\$55,922
		Surrey	1,225	1,457	1,548	18.9%	6.2%	\$62,657
6212	Offices of Dentists	Windsor	1,085	1,594	1,809	46.9%	13.5%	\$38,150
		Hamilton	4,224	5,505	6,278	30.3%	14.0%	\$43,078
		London	1,708	1,808	1,979	5.9%	9.5%	\$44,616
		Surrey	1,077	1,827	2,181	69.7%	19.3%	\$41,179

NAICS	Description	Region	Jobs					
			2007	2016	2024	2007-2016 Percent Change	2016-2024 Percent Change	2016 Average Earnings
6213	Offices of Other Health Practitioners	Windsor	1,180	1,433	1,532	21.5%	6.9%	\$31,424
		Hamilton	4,846	6,730	7,449	38.9%	10.7%	\$37,752
		London	2,280	2,850	3,114	25.0%	9.3%	\$38,897
		Surrey	898	1,534	1,848	70.8%	20.5%	\$38,433
Trade								
4145	Pharmaceuticals, Toiletries, Cosmetics, and Sundries Merchant Wholesalers	Windsor	138	203	235	47.0%	15.8%	\$46,638
		Hamilton	1,554	1,613	1,724	3.8%	6.9%	\$90,394
		London	436	399	415	-8.4%	4.0%	\$72,379
		Surrey	138	153	164	11.3%	7.2%	\$56,243
4461	Health and Personal Care Stores	Windsor	2,135	3,177	3,611	48.8%	13.7%	\$28,620
		Hamilton	7,113	9,820	10,884	38.1%	10.8%	\$30,931
		London	2,442	3,000	3,242	22.8%	8.1%	\$32,070
		Surrey	1,463	2,428	2,779	65.9%	14.5%	\$30,080
5322	Consumer Goods Rental	Windsor	326	72	50	-77.9%	-30.6%	\$24,972
		Hamilton	1,021	595	530	-41.7%	-10.9%	\$39,764
		London	505	238	219	-52.8%	-8.0%	\$29,012
		Surrey	430	148	102	-65.5%	-31.1%	\$40,443

SHIFT SHARE AND LOCATION QUOTIENT

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage	2016–2024 Competitive Advantage	2016–2024 Competitive Advantage Percent	2007	2016	2024	2007–2016 Percent Change	2016–2024 Percent Change
Manufacturing										
3254	Pharmaceutical and Medicine Manufacturing	Windsor	657	94	6.6%	2.60	5.17	5.53	98.7%	7.0%
		Hamilton	-241	-64	-12.2%	0.69	0.46	0.41	-32.6%	-12.2%
		London	49	-3	-2.0%	0.18	0.29	0.29	63.8%	-2.1%
		Surrey	31	8	10.3%	0.18	0.26	0.29	41.1%	11.5%
3333	Commercial and Service Industry Machinery Manufacturing	Windsor	9	-2	-4.5%	0.26	0.33	0.32	28.6%	-3.4%
		Hamilton	-288	-91	-7.3%	2.63	2.10	1.96	-20.1%	-7.0%
		London	66	8	1.9%	1.63	1.95	1.98	19.6%	1.5%
		Surrey	-23	-5	-12.8%	0.41	0.23	0.20	-44.4%	-13.0%
3345	Navigational, Measuring, Medical, and Control Instruments Manufacturing	Windsor	-97	-16	-23.8%	0.82	0.36	0.28	-55.6%	-23.7%
		Hamilton	155	-34	-3.4%	1.11	1.29	1.24	16.5%	-3.9%
		London	-283	-46	-14.6%	1.93	1.05	0.89	-45.9%	-15.0%
		Surrey	61	50	21.5%	0.90	1.10	1.32	21.9%	20.0%
3391	Medical Equipment and Supplies Manufacturing	Windsor	0	6	5.0%	0.58	0.62	0.65	6.4%	5.6%
		Hamilton	57	-18	-2.4%	0.86	0.92	0.89	6.7%	-3.0%
		London	156	44	7.0%	1.48	2.01	2.15	35.8%	6.8%
		Surrey	-110	2	1.5%	1.18	0.55	0.55	-53.5%	0.1%
Medical Software										
5112	Software Publishers	Windsor	8	4	3.4%	0.30	0.34	0.36	14.9%	3.8%
		Hamilton	96	32	4.1%	0.45	0.50	0.52	12.4%	3.3%
		London	433	51	6.5%	0.57	1.31	1.38	128.5%	6.0%
		Surrey	196	3	0.7%	0.47	0.90	0.89	89.6%	-1.1%
5191	Other Information Services	Windsor	-26	-4	-1.4%	0.91	0.89	0.88	-2.0%	-0.8%
		Hamilton	-189	-73	-5.1%	1.23	1.07	1.01	-13.0%	-5.4%
		London	-156	-47	-11.3%	1.08	0.80	0.71	-25.6%	-10.9%
		Surrey	76	3	1.1%	0.47	0.90	0.89	91.5%	-1.1%
5415		Windsor	-42	29	2.9%	0.34	0.35	0.36	3.0%	3.1%

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage	2016–2024 Competitive Advantage	2016–2024 Competitive Advantage Percent	2007	2016	2024	2007–2016 Percent Change	2016–2024 Percent Change
	Computer Systems Design and Related Services	Hamilton	2,456	181	1.7%	0.70	0.89	0.90	28.1%	0.9%
		London	-750	-41	-1.3%	0.80	0.66	0.65	-17.9%	-1.3%
		Surrey	151	54	3.6%	0.47	0.47	0.47	1.2%	-1.6%
Research and Development										
5417	Scientific Research and Development Services	Windsor	44	20	12.4%	0.22	0.32	0.36	45.2%	12.0%
		Hamilton	497	-7	-0.6%	0.39	0.62	0.61	58.5%	-1.1%
		London	223	81	7.8%	0.95	1.24	1.32	30.5%	7.0%
		Surrey	-64	-18	-16.0%	0.35	0.20	0.17	-42.2%	-15.0%
6113	Universities	Windsor	-755	-38	-1.2%	1.31	1.13	1.13	-13.6%	-0.5%
		Hamilton	383	402	3.1%	1.08	1.09	1.12	1.5%	2.4%
		London	-619	-98	-1.0%	2.16	2.07	2.05	-4.1%	-1.1%
		Surrey	676	-13	-1.2%	0.15	0.34	0.33	134.4%	-2.9%
Service Provision										
5182	Data Processing, Hosting, and Related Services	Windsor	161	31	12.4%	0.45	1.39	1.56	208.2%	12.8%
		Hamilton	-99	8	1.1%	1.18	1.02	1.03	-12.9%	0.5%
		London	174	35	13.2%	0.31	0.92	1.04	193.7%	12.7%
		Surrey	33	-4	-6.5%	0.20	0.31	0.34	57.6%	8.4%
5241	Insurance Carriers	Windsor	69	38	3.7%	0.69	0.78	0.82	13.5%	4.1%
		Hamilton	185	128	3.6%	0.63	0.66	0.67	3.9%	2.9%
		London	-180	-61	-1.8%	1.60	1.55	1.52	-3.1%	-1.9%
		Surrey	-314	-72	-7.7%	0.94	0.58	0.63	-38.8%	9.6%
5622	Waste Treatment and Disposal	Windsor	73	-15	-6.4%	0.86	1.34	1.26	56.1%	-5.8%
		Hamilton	-46	-34	-4.9%	1.05	0.97	0.92	-7.6%	-5.4%
		London	34	-5	-2.7%	0.57	0.71	0.69	23.7%	-2.9%
		Surrey	-64	-26	-18.8%	1.18	0.58	0.72	-50.7%	24.9%
6216	Home Healthcare Services	Windsor	166	50	5.2%	1.21	1.56	1.64	28.6%	5.1%
		Hamilton	478	170	4.7%	1.27	1.44	1.49	13.3%	3.4%
		London	-526	-93	-8.2%	1.64	1.14	1.06	-30.1%	-7.2%
		Surrey	110	55	9.4%	0.76	0.89	0.84	17.7%	-6.1%

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage	2016–2024 Competitive Advantage	2016–2024 Competitive Advantage Percent	2007	2016	2024	2007–2016 Percent Change	2016–2024 Percent Change
6219	Other Ambulatory Healthcare Services	Windsor	-80	-8	-4.0%	0.93	0.71	0.69	-23.3%	-2.8%
		Hamilton	-191	-28	-5.3%	0.60	0.43	0.41	-28.1%	-5.1%
		London	-241	-17	-3.7%	1.45	0.96	0.93	-33.6%	-3.4%
		Surrey	197	52	23.1%	0.09	0.82	0.69	774.6%	-15.2%
8122	Funeral Services	Windsor	15	18	5.9%	1.69	1.90	2.01	12.2%	6.1%
		Hamilton	-155	-12	-1.4%	1.54	1.28	1.26	-16.8%	-1.8%
		London	-81	-4	-1.7%	1.20	0.92	0.90	-23.7%	-1.8%
		Surrey	-15	11	7.7%	0.98	0.84	0.79	-14.3%	-5.3%
Service Provision—Centers, Facilities, and Hospitals										
6214	Out-patient Care Centres	Windsor	21	-15	-1.7%	0.77	0.83	0.83	8.4%	-0.9%
		Hamilton	330	223	7.0%	0.65	0.71	0.75	9.8%	5.6%
		London	533	51	2.9%	0.69	1.00	1.03	46.4%	2.4%
		Surrey	-262	-31	-7.2%	0.63	0.32	0.35	-48.7%	8.5%
6215	Medical and Diagnostic Laboratories	Windsor	9	8	3.4%	0.78	0.86	0.89	10.7%	3.6%
		Hamilton	541	54	3.8%	0.82	1.31	1.35	59.8%	2.8%
		London	152	37	6.4%	1.00	1.38	1.46	38.1%	5.5%
		Surrey	-202	-64	-24.9%	1.74	0.67	0.87	-61.5%	30.0%
6221	General Medical and Surgical Hospitals	Windsor	-193	-142	-2.6%	0.98	1.01	0.99	2.7%	-1.7%
		Hamilton	-5,163	-811	-3.9%	1.19	0.94	0.91	-20.9%	-3.9%
		London	-982	-3	0.0%	1.77	1.70	1.70	-4.2%	-0.2%
		Surrey	2,564	545	7.3%	0.90	1.29	1.23	43.0%	-4.6%
6222	Psychiatric and Substance Abuse Hospitals	Windsor	0	0	N/A	0.00	0.00	0.00	-70.5%	-51.3%
		Hamilton	550	34	4.8%	0.18	0.77	0.80	336.3%	3.8%
		London	-65	47	3.6%	3.73	3.64	3.75	-2.6%	3.1%
		Surrey	62	25	11.3%	0.70	0.95	0.87	35.6%	-8.0%
6223	Specialty (Except Psychiatric and Substance Abuse) Hospitals	Windsor	255	33	10.2%	0.14	0.73	0.80	419.7%	9.8%
		Hamilton	38	29	9.3%	0.15	0.17	0.18	11.9%	7.8%
		London	17	-3	-7.1%	0.03	0.06	0.05	73.6%	-6.5%
		Surrey	1	0		0.02	0.02	0.02	-0.9%	-3.5%

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage	2016–2024 Competitive Advantage	2016–2024 Competitive Advantage Percent	2007	2016	2024	2007–2016 Percent Change	2016–2024 Percent Change
6231	Nursing Care Facilities	Windsor	449	26	N/A	0.97	1.28	1.30	31.9%	1.6%
		Hamilton	431	189	2.2%	1.09	1.13	1.14	3.6%	1.4%
		London	327	11	0.3%	0.97	1.10	1.10	13.4%	0.1%
		Surrey	928	33	1.7%	0.56	0.94	0.95	69.3%	0.0%
6232	Residential Developmental Handicap, Mental Health, and Substance Abuse Facilities	Windsor	925	-6	-0.3%	1.40	2.91	2.92	108.1%	0.3%
		Hamilton	-1,508	-198	-7.2%	1.60	1.02	0.95	-36.5%	-6.8%
		London	642	80	6.0%	0.65	1.27	1.34	96.1%	5.1%
		Surrey	-616	-49	-6.8%	2.04	0.91	0.98	-55.3%	7.9%
6233	Community Care Facilities for The Elderly	Windsor	296	-27	-2.7%	0.66	1.00	0.98	51.1%	-1.7%
		Hamilton	1,550	156	3.3%	0.78	1.14	1.16	46.4%	2.2%
		London	321	1	0.1%	0.80	1.01	1.01	26.8%	-0.1%
		Surrey	-159	23	2.8%	0.94	0.71	0.71	-24.6%	-0.8%
6239	Other Residential Care Facilities	Windsor	306	4	0.5%	0.86	1.55	1.57	80.6%	1.0%
		Hamilton	445	56	3.4%	0.62	0.84	0.86	34.7%	2.5%
		London	-153	-73	-5.9%	1.76	1.60	1.52	-9.1%	-5.4%
		Surrey	54	-3	-1.3%	0.32	0.38	0.39	17.9%	2.8%
Service Provision—Offices										
6211	Offices of Physicians	Windsor	-236	-23	-1.4%	1.02	0.95	0.95	-6.5%	-0.7%
		Hamilton	3,522	879	7.1%	1.24	1.71	1.81	37.5%	5.8%
		London	472	-6	-0.2%	0.96	1.15	1.14	19.5%	-0.4%
		Surrey	-118	-65	-4.5%	0.89	0.70	0.74	-21.7%	5.8%
6212	Offices of Dentists	Windsor	201	-12	-0.8%	1.17	1.43	1.43	21.9%	-0.1%
		Hamilton	79	-11	-0.2%	1.20	1.19	1.19	-0.1%	-0.7%
		London	-386	-87	-4.8%	1.19	1.00	0.96	-15.8%	-4.4%
		Surrey	444	92	5.0%	1.23	1.50	1.46	21.7%	-2.7%
6213	Offices of Other Health Practitioners	Windsor	-392	-95	-6.7%	1.18	0.99	0.94	-16.5%	-5.3%
		Hamilton	-770	-191	-2.8%	1.27	1.13	1.09	-11.6%	-3.0%
		London	-678	-122	-4.3%	1.48	1.22	1.17	-17.5%	-3.9%
		Surrey	144	107	7.0%	0.95	0.99	0.94	3.4%	-4.4%

			Shift Share			Location Quotient				
NAICS	Description	Region	2007–2016 Competitive Advantage	2016–2024 Competitive Advantage	2016–2024 Competitive Advantage Percent	2007	2016	2024	2007–2016 Percent Change	2016–2024 Percent Change
Trade										
4145	Pharmaceuticals, Toiletries, Cosmetics, and Sundries Merchant Wholesalers	Windsor	47	18	8.8%	0.35	0.48	0.52	36.6%	8.8%
		Hamilton	-149	-5	-0.3%	1.02	0.92	0.91	-9.8%	-0.8%
		London	-95	-13	-3.3%	0.71	0.58	0.56	-17.5%	-3.3%
		Surrey	-3	0	0.1%	0.37	0.32	0.32	-13.3%	1.5%
4461	Health and Personal Care Stores	Windsor	375	107	3.4%	1.33	1.61	1.67	21.1%	3.6%
		Hamilton	482	53	0.5%	1.17	1.21	1.21	3.6%	-0.1%
		London	-206	-67	-2.2%	0.98	0.94	0.92	-4.4%	-2.2%
		Surrey	507	101	4.2%	0.97	1.12	1.10	15.7%	-2.2%
5322	Consumer Goods Rental	Windsor	-69	-8	-11.5%	1.02	0.55	0.48	-45.6%	-13.7%
		Hamilton	154	50	8.4%	0.84	1.11	1.22	32.7%	9.8%
		London	20	27	11.4%	1.02	1.13	1.29	11.5%	13.9%
		Surrey	-38	-18	-11.9%	1.42	0.85	1.01	-40.0%	19.0%

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

APPENDIX VII: NOC CODES—WINDSOR

NOC Code	Description
1243	Medical Administrative Assistants
2171	Information Systems Analysts
3011	Nursing Coordinators and Supervisors
3012	Registered Nurses and Registered Psychiatric Nurses
3131	Pharmacists
3219	Other Medical Technologists and Technicians, except Dental
3222	Dental Hygienists and Dental Therapists
3233	Licensed Practical Nurses
3411	Dental Assistants
3414	Other Assisting Occupations in Health Services
4011	University Professors and Lecturers
4012	Post-secondary Teaching and Research Assistants
9421	Chemical Plant Machine Operators
Combination	Support Occupations
	1221 Administrative Officers
	1241 Administrative Assistants
	1411 General Office Support
	1414 Receptionists
	3413 Nurse Aides, Orderlies, and Patient Service Associates
	4212 Social and Community Service Workers
	6211 Retail Sales Supervisors
	6421 Retail Salespersons
	6611 Cashiers
	6711 Food Counter Attendants, Kitchen Helpers, and Related Support Occupations
	6731 Light Duty Cleaners
	6733 Janitors, Caretakers, and Building Superintendents

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

APPENDIX VIII: JOBS BY REGION AND SALARY—WINDSOR

All Cluster Jobs and Average Salaries by Region

Region	2007	2016	2024	2016 Salaries
Hamilton	86,192	107,740	121,806	\$51,302
London	47,250	54,718	60,797	\$52,102
Surrey	15,189	22,885	26,504	\$51,149
Windsor	20,577	28,469	32,127	\$44,282
Canada	2,210,015	2,680,133		

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.

All Jobs and Average Salaries by Region

Region	2007	2016	2024	2016 Salaries
Hamilton	578,908	637,183	678,605	\$45,831
London	239,106	257,303	273,502	\$43,970
Surrey	136,819	167,698	181,200	\$49,809
Windsor	155,588	160,761	169,596	\$43,980
Canada		16,287,120		

SOURCE: EMSI Intl. 2017. "2017.1 Canadian Dataset." *EMSI Developer*.



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