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#### Introduction

The business services cluster is one of Tennessee's strongest traded clusters. Industries in this cluster are not only a significant source of employment in Tennessee. They also provide high average wages and generate substantial earnings, even during times of economic contraction. This cluster is composed of four types of industries: corporate offices, support services, computer services, and research and development. The activities in which these establishments engage vary significantly between industries. However, business services establishments share a common reliance on one another to create the services they provide.

#### **Overview**

Currently, business service industries employ 141,904 Tennesseans, an increase of 37,388 jobs between 2012 and 2017. This five-year growth rate of 36% was the highest in the region and the third highest in the U.S. behind Kansas and Nevada. The industries with the strongest growth rates in recent years were offices of other holding companies (362% increase) and process, physical distribution, and logistics consulting services (353%). Corporate, subsidiary, and regional managing offices, which added 9,695 jobs since 2012, had the largest net increase in employment.

The business services sub-cluster accounts for the most significant percentage of total employment (39.1%). In this sub-cluster, Tennessee currently ranks second in the nation for employment concentration in payroll services. Employment in the headquarters sub-cluster comprises 39.1% of cluster employment. For offices of other holding companies, Tennessee ranks third in the nation for employment concentration. Five years ago, Tennessee ranked thirtieth for this industry. Other cluster employment falls into the computer services sub-cluster (17.4% of total employment) and research and development (7.3%).

| Industry Category                                    | NAICS  | 2017<br>Employment | Business<br>Locations | Life Cycle |
|--|--------|--------------------|-----------------------|------------|
| Headquarters   |        |                    |                       |            |
| Corporate, Subsidiary, and Regional Managing Offices | 551114 | 40,991             | 1,150                 | Growing    |
| Offices of Holding Companies                         | 55111  | 4,085              | 132                   | Growing    |
| Business Support Services                            |        |                    |                       |            |
| Payroll Services                                     | 541214 | 6,257              | 190                   | Growing    |
| Telemarketing Bureaus and Answering Services         | 56142  | 13,831             | 254                   | Growing    |
| Engineering Services                                 | 541330 | 14,304             | 1,186                 | Growing    |
| Management Consulting Services                       | 54161  | 24,725             | 3,001                 | Growing    |
| Other Scientific and Technical Consulting Services   | 541690 | 2,608              | 460                   | Emerging   |
| Computer Services                                    |        |                    |                       |            |
| Data Processing, Hosting, and Related Services       | 518210 | 5,271              | 451                   | Emerging   |
| Computer Programming and Systems Design Services     | 54151  | 18,928             | 3,643                 | Emerging   |
| Computer Facilities Management Services              | 541513 | 211                | 32                    | Developing |
| Other Computer Related Services                      | 541519 | 333                | 62                    | Developing |
| Research and Development                             |        |                    |                       |            |
| Scientific and Research Development Services         | 5417   | 8,303              | 300                   | Growing    |
| Testing Laboratories                                 | 541380 | 2,058              | 162                   | Emerging   |

<sup>&</sup>lt;sup>1</sup> Industry data related to employment, business locations, earnings, and inputs-outputs were obtained from Economic Modeling Specialists (EMSI).

Tennessee currently has 11,021 businesses in this cluster. Business support services accounts for the largest percentage of overall establishments (5,090), followed by computer services (4,188), the headquarters sub-cluster (1,282), and research and development (462). A key trend for most business services industries in recent years has been an influx of new companies, particularly in computer services. Small and non-employer firms are common in this cluster. The diversity of products offered by these industries produces niche markets in which small industry players can remain competitive. This trend did not occur in the headquarters sub-cluster.

In 2017, Tennessee's business services companies generated \$16.9 billion in total earnings. Total sales for these industries were \$31.7 billion. The percentage of sales made in-region varied substantially between industries, ranging from 25% in payroll services to 93% in computer programming services. Transactions between business services companies accounted for a significant percentage of total sales.

### **Industry Life Cycles**

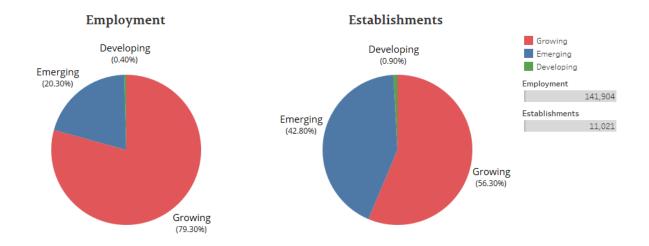
The strength of an industry depends on a number of factors, including employment growth, regional concentration, wages, and labor supply. However, no single factor can explain the economic benefit that an industry provides to a region. A strong cluster has a sum greater than its individual parts. It is the relationships between industries that provide the real benefit to a region. Industries in a cluster often rely on workers with similar skill sets, creating an insurance policy for the region's labor force if a mature industry were to decline. Moreover, a cluster of industries can make each individual industry stronger, both by augmenting demand and creating an economic climate in which innovation thrives. Success of local firms can result in spin-off businesses and knowledge exchange between local entrepreneurs.<sup>2</sup> Tennessee's growth in business services cannot be viewed in isolation from recent economic successes, such as the historic low in unemployment rates achieved during Governor Haslam's administration. Tennessee's approach to economic development has paid off by focusing on the state's unique advantages and playing to these strengths.

Industries in this cluster can be categorized according to their life cycle stage: mature, growing, emerging, and developing.<sup>3</sup> Mature industries have sizable presence in the state but experienced recent declines in employment. Growing industries have both sizable presence and increasing levels of employment. Emerging industries have low concentration in Tennessee but are experiencing rapid growth. Developing industries have low concentration and small employment totals. Each type of industry provides unique value, and the cluster benefits from having industries in different life cycles.

Tennessee's business services cluster is almost entirely composed of growing and emerging industries. The cluster does not currently have any industries that qualify as mature, which is a positive sign for the cluster's heath. Mature industries can endanger a region's economy if losses cannot be recouped by other industries. Given the strong performance of Tennessee's emerging industries, this cluster is not overly reliant on its largest industries. (Average establishment size is much smaller for emerging industries than growing industries, as demonstrated by the difference in total share of establishments.)

<sup>&</sup>lt;sup>2</sup> Keeble, D., & Nachum, L. (2001). Why do business service firms cluster? *Transactions of the Institute of British Geographers*, 27(1), 67-90.

<sup>&</sup>lt;sup>3</sup> For most industries in the cluster, we analyze them on a case-by-case basis using the 2017 six-digit North American Industry Classification System (NAICS). For industries with significant overlap, we defaulted to the five-digit NAICS codes then categorized these industries according to life cycle stage.



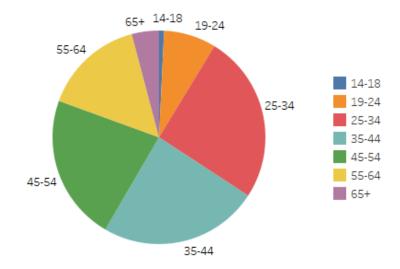
#### Workforce

Average wages in Tennessee's business services cluster (\$139,296) are more than double average wages across all industries in the state. The strength of these wages are due to the number of high-skilled laborers in these industries. Occupations in these industries have varying degrees of educational and professional requirements. High-paying opportunities exist for a wide cross-section of Tennessee's labor force.

| SOC                                      | Description  | 2017<br>Employment | Median<br>Hourly<br>Earnings |  |
|--|--|--------------------|------------------------------|--|
| Manageme                                 | nt Occupations                                     |                    |                              |  |
| 11-1021                                  | General and Operations Managers                    | 45,370             | \$40.97                      |  |
| 11-2022                                  | Sales Managers                                     | 8,898              | \$42.44                      |  |
| 11-3021                                  | Computer and Information Systems Managers          | 5,709              | \$48.66                      |  |
| 11-3031                                  | Financial Managers                                 | 13,990             | \$43.41                      |  |
| 11-9199                                  | Managers, All Other                                | 7,950              | \$37.35                      |  |
| Business ar                              | d Financial Operations Occupations                 |                    |                              |  |
| 13-1071                                  | Human Resources Specialists                        | 10,472             | \$24.00                      |  |
| 13-1111                                  | Management Analysts                                | 6,904              | \$35.92                      |  |
| 13-1161                                  | Market Research Analysts and Marketing Specialists | 7,586              | \$26.10                      |  |
| 13-1199                                  | Business Operations Specialists, All Other         | 13,523             | \$27.22                      |  |
| 13-2011                                  | Accountants and Auditors                           | 17,529             | \$28.43                      |  |
| Computer a                               | and Mathematical Occupations                       |                    |                              |  |
| 15-1121                                  | Computer Systems Analysts                          | 7,505              | \$34.99                      |  |
| 15-1131                                  | Computer Programmers                               | 4,111              | \$33.68                      |  |
| 15-1132                                  | Software Developers, Applications                  | 6,416              | \$39.78                      |  |
| 15-1133                                  | Software Developers, Systems Software              | 4,115              | \$39.97                      |  |
| 15-1142                                  | Network and Computer Systems Administrators        | 5,650              | \$35.72                      |  |
| 15-1151                                  | Computer User Support Specialists                  | 10,763             | \$21.88                      |  |
| Architecture and Engineering Occupations |  |                    |                              |  |
| 17-2051                                  | Civil Engineers                                    | 5,101              | \$43.40                      |  |
| Sales and R                              | elated Occupations                                 |                    |                              |  |

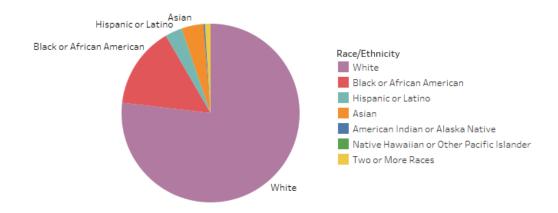
| soc   | Description   | 2017<br>Employment | Median<br>Hourly<br>Earnings |  |
|---|---|--------------------|------------------------------|--|
| 41-3099                                       | Sales Representatives, Services, All Other                                      | 17,129             | \$20.04                      |  |
| 41-9041                                       | Telemarketers   | 3,963              | \$12.38                      |  |
| Office and Administrative Support Occupations |   |                    |                              |  |
| 43-1011                                       | First-Line Supervisors of Office and Administrative Support Workers             | 35,021             | \$23.70                      |  |
| 43-3031                                       | Bookkeeping, Accounting, and Auditing Clerks                                    | 32,442             | \$17.34                      |  |
| 43-4051                                       | Customer Service Representatives  | 60,078             | \$14.21                      |  |
| 43-6011                                       | Executive Secretaries and Executive Administrative Assistants                   | 9,581              | \$21.78                      |  |
| 43-6014                                       | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | 63,954             | \$14.62                      |  |
| 43-9061                                       | Office Clerks, General  | 60,453             | \$14.26                      |  |

The business services work force is demographically similar to the overall labor force in Tennessee. The number of business services employees between the ages of 45-64 (37.5%) is nearly equal to the percentage of older workers in the overall Tennessee economy (37.7%). Business services industries have a slightly smaller share of workers aged 65 or older (4.1%) than the average Tennessee industry (5.2%).



The ratio of male-to-female workers in business services industries (51.7% male) is comparable to the overall labor force (50.9% male). The majority of employees in this cluster are Caucasian (76.9%). African-Americans account for 14.8% of total employment, followed by employees of Asian descent (4.0%) and Latino or Hispanic employees (3.1%). Individuals identifying as two or more races, American Indian or Native American, or Native Hawaiian or Pacific Islander account for less than 1.5% of cluster employment.

Post-secondary institutions in Tennessee offer 682 programs of study that prepare graduates for careers in business services. In 2016, these institutions produced 77,128 graduates with the skills necessary to fill key occupations in these industries.

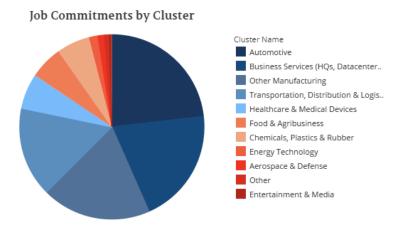


### **Recent Growth**

Tennessee's business services cluster has grown considerably as a result of recent projects. Since 2011, the Tennessee Department of Economic and Community Development has received 50 project commitments to create 25,248 jobs. Total capital investment has nearly reached \$2.5 billion.

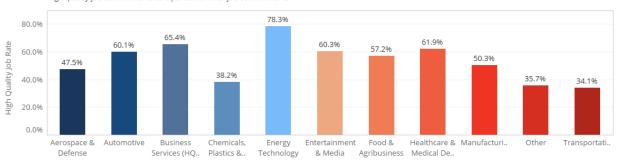
| Company                           | New Job<br>Commitments | Capital Investment (\$) | County   | Landed Date    |
|-----------------------------------|------------------------|-------------------------|----------|----------------|
| ALSAC St Jude Children's          | 1,800                  | \$1,000,000,000         | Shelby   | November 2016  |
| Community Health Systems Inc.     | 1,500                  | \$66,150,000            | Davidson | May 2015       |
| ARAMARK                           | 1,500                  | \$20,818,000            | Davidson | July 2013      |
| UBS                               | 1,000                  | \$36,500,000            | Davidson | August 2013    |
| Conduit Global                    | 1,000                  | \$5,100,000             | Shelby   | January 2014   |
| Service Source Delaware, Inc.     | 925                    | \$6,365,000             | Davidson | December 2011  |
| Philips North America, Inc.       | 815                    | \$17,000,000            | Davidson | August 2017    |
| Parallon Business Solutions, LLC. | 800                    | \$87,600,000            | Davidson | September 2012 |
| Asurion, Inc.                     | 800                    | \$25,000,000            | Davidson | October 2013   |
| Sprint                            | 673                    | \$6,000,000             | Sullivan | November 2011  |

The business services cluster accounts for the second largest percentage of total TNECD projects among Tennessee's industry clusters and has the second highest rate of high-quality job creation:



#### High Quality Jobs Rate By Cluster

High quality job commitments as a percent of total job commitments



### **Industries**

## **Headquarters**

The headquarters sub-cluster includes two types of industries: corporate, subsidiary, and regional managing offices and offices of holding companies. Both industries are currently in the growth stage in Tennessee. In recent years, Tennessee has worked on a number of projects to expand and recruit corporate offices into the state. These projects include a partnership with Philips North America to create a Middle Tennessee business center of expertise, a relocation of the Bridgestone Americas headquarters to Nashville, and a relocation of LEDIC Management's headquarters to Memphis.

439 companies are headquartered in Tennessee, including nearly one dozen Fortune 500 companies.<sup>4</sup> Major companies that call Tennessee home include FedEx, HCA, Nissan North America, Bridgestone Americas, International Paper, and Eastman Chemical. Companies enjoy several advantages by choosing to do business in Tennessee. In addition to a talented labor force and convenient access to major transportation routes, Tennessee has the lowest state debt per capita in the nation and the second lowest tax burden.<sup>5</sup>

## Corporate, Subsidiary, and Regional Managing Offices

Establishments in this industry handle the oversight and administration of companies, particularly strategic and organizational concerns. These establishments, which are involved with nearly every industry in Tennessee, include headquarters operations, regional administrative branches, and the front offices of subsidiary companies. Major offices in Tennessee include Community Health Systems (Williamson), HCA, Inc. (Davidson), Bridgestone Americas Tire Operations, LLC (Davidson), Dollar General Corporation (Davidson), and Tractor Supply Company (Williamson).

Currently, 40,991 Tennesseans are employed by these offices, a net increase of 9,695 jobs since 2012. This annual job growth rate of 6.2% was the highest in the region and the tenth highest in the nation. By 2022, offices in the state are expected to employ an additional 7,312 Tennesseans. Tennessee's projected growth rate (3.6% per year) will likely be the strongest in the region and one of the top-five strongest in the nation.

Employment in this industry is dispersed between 73 counties, although most of these jobs are concentrated within Tennessee's metropolitan statistical areas (MSAs). Williamson County leads the state in industry employment with a total of 9,161 jobs. Employment in Williamson increased 71% in the last five years. Davidson County, in which 8,237 industry jobs are located, had previously been the county with the most substantial employment. Offices in this county added 41% net new jobs since 2012. Shelby

<sup>&</sup>lt;sup>4</sup> This includes some U.S. headquarters of multinational corporations.

<sup>&</sup>lt;sup>5</sup> The Tax Foundation. (2017). Facts & Figures.

County and Knox County have roughly the same number of positions (5,819 and 5,365 jobs, respectively). However, Knox's five-year growth rate (42%) was one of the strongest in the state, while job creation in Shelby was marginal (7%).

Four other counties have employment exceeding 1,000: Washington (1,338 jobs), Sullivan (1,202), Hamilton (1,023), and Rutherford (1,011). Counties that made the largest gains during this time were Coffee County, which increased employment from 57 jobs in 2012 to 164, and Dickson County, which nearly doubled its employment for a total of 155 jobs today. At-risk and distressed counties also enjoyed a net increase in employment during this time. Employment growth in at-risk counties was accompanied by similar establishment growth in these areas, although distressed counties expanded employment without a substantial increase in total businesses.



Tennessee currently has 1,150 corporate, subsidiary, and regional managing offices. Like many business services industries, most establishments in this industry are located within or near a metropolitan area. Roughly 75% of corporate offices are located within an MSA, with more than 40% of all offices in the Nashville area specifically.

63 of the 73 counties in Tennessee with this type of industry have fewer than 15 total establishments. Since 2012, Tennessee has added 330 new corporate offices. Most of this establishment growth occurred in Davidson and Williamson Counties. Hamilton County also experienced substantial expansion, increasing its total number of establishments from 39 to 61 today. Washington County achieved a 100% growth in establishments (15 to 31 today) without a net increase in employment. Other areas with notable expansion growth were some of Tennessee's micropolitan areas. Greenville, Harriman, and Crossville each added several new establishments, although their share of total industry concentration in the state is still quite small. Average establishment size in this industry (~40 employees) is fairly constant between counties.

Tennessee's employment concentration in this industry has grown since 2012 and is expected to continue growing. By 2022, Tennessee's predicted location quotient will likely be the fourth strongest in the region.<sup>7</sup> Although Tennessee does not rank nationally in this industry, recent job growth occurred due to unique advantages enjoyed by the state. Of the 9,695 industry jobs created since 2012, only 4,086 were attributable to factors outside the local economy. Tennessee demonstrated the tenth highest competitive effect of any U.S. state during this time. Only five states in the region created jobs at a rate that outpaced overall industry growth.

In 2017, corporate offices in Tennessee earned \$6.2 billion after completing \$12.1 billion in sales transactions. Average wages in this industry (\$126,040) are strong due to the large number of analysts and financial managers employed by this industry. Corporate offices employ workers with a wide range of skill sets. Many occupations in this industry, including bookkeeping, customer service representatives, and

<sup>&</sup>lt;sup>6</sup> The other 10 counties are all located within an MSA: Davidson (187), Shelby (141), Williamson (129), Knox (97), Hamilton (61), Rutherford (40), Washington (31), Sullivan (28), Sumner (22), and Blount (16).

<sup>&</sup>lt;sup>7</sup> Tennessee's location quotient (0.97) is expected to increase to 1.02.

first-line supervisors of office and administrative support workers, require an associate's degree or high-school diploma. Moreover, Tennessee has cultivated a strong educational pipeline for corporate office occupations. Currently, post-secondary institutions in Tennessee offer 577 programs of study related to this field. In 2016, these institutions produced 62,985 graduates with the credentials necessary to pursue a career in this industry.

## Offices of Holding Companies

Offices of holding companies, currently in the growth stage in Tennessee, had arguably the strongest performance of any industry in the cluster in recent years.<sup>8</sup> Businesses in Tennessee include Tennessee Parent, Inc. (Knox), Ozburn-Hessey Holding Company, LLC (Williamson), Sedgwick CMS Holdings, Inc. (Shelby), The Bryce Corporation (Shelby), and Propex Holding, LLC (Hamilton).

In 2012, 956 Tennesseans were employed by these types of businesses. Within five years, 3,129 new jobs were created for a current employment total of 3,991. This 327% five-year growth rate was the highest of any U.S. state. Nearly all of this growth occurred in offices of other holding companies. The only states that came close to matching this rate of growth for this industry had extremely small levels of employment (less than 150 total employees) and are not expected to sustain this level of growth. States with similar sized industry to Tennessee, such as Kansas and North Carolina, experiencing at most a 50% increase. By 2022, Tennessee is projected to create an additional 1,063 jobs in this industry and continue to lead the nation in total job creation. For offices of other holding companies, Tennessee ranks second in the region and eighth nationally for industry employment.

Nearly all of these new jobs were created in Hamilton County. In 2012, offices of other holding companies in Hamilton only employed 16 Tennesseans. Today, total employment is 2,939 (an 18,269% increase). Job creation occurred in many counties in Tennessee, but to a much smaller extent than in Hamilton. Shelby County added 114 net new jobs. Total employment is now 571. Like Shelby, Davidson County experienced roughly a 25% increase, with total employment rising to 126. Hamblen County added its first 57 jobs since 2012. Tennessee has 25 other counties with a holding company, none of which have more than 25 total employees. These include primary MSA counties (Knox and Washington), outlying MSA counties (Blount, Loudon, Gibson, Madison, Maury, Rutherford, Williamson, Sumner, Trousdale, and Polk), micropolitan county areas (Putnam, Montgomery, Overton, Obion, Greene, Sevier, and Washington), atrisk counties (Monroe, Johnson, and Hardin), and distressed counties (McNairy, Haywood, and Lauderdale). Despite a net increase, several counties lost employment during this time. Washington County lost all 98 of its jobs in offices of other holding companies.



The number of establishments increased from 108 to 132 since 2012. The counties with the largest number of establishments are Shelby County (30) and Davidson County (21). Shelby County added seven establishments since 2012. Davidson added six. This industry is characterized by a wide range of establishment sizes. For instance, Hamilton County has the same number of establishments (8) as Knox

<sup>&</sup>lt;sup>8</sup> This group is a five-digit NAICS classification, which includes offices of bank holding companies (NAICS 551111) and offices of other holding companies (NAICS 551112).

County, yet Hamilton County has nearly 100 times as many industry jobs as Knox. Other counties with this type of employment have five or fewer holding companies.<sup>9</sup>

Tennessee's location quotient for offices of other holding companies (2.68) ranks first in the region and third nationally behind Delaware and Alaska. In 2012, Tennessee ranked thirtieth in the nation and had a location quotient of only 0.84. The gains made in this industry demonstrate an extremely strong competitive advantage for Tennessee in this industry. Of the 3,127 jobs created since 2012, only 79 of these positions can be attributed to either the improvement of the U.S. economy or industry-wide changes. Tennessee outperformed expectations more than any state. Employment growth in Tennessee (362%) dwarfed the national rate (9%). Part of Tennessee's success in this industry can be attributed to the high number of headquarters and corporate offices in the region. Holding companies are often located near a company's main business operations.

In 2017, Tennessee's holding companies earned \$718.9 million after completing \$1.4 billion in sales transactions. Offices of other holding companies grew so significantly in recent years that Tennessee companies are now export-oriented, with only 42% of sales being made to other businesses in the state. This industry is also beneficial to the regional economy from a labor perspective. Average wages in Tennessee (\$155,406) are some of the strongest in the region. For offices of bank holding companies specifically, Tennessee ranks first in the region and fourth in the nation for average wages (\$344,386). Moreover, holding companies employ workers with a wide variety of skill sets and educational attainment. Occupations that require a four-year degree, such as financial manager and accountants, are as common as positions that require an associate's or high-school degree, such as bookkeepers and secretaries.

## **Business Support Services**

Nearly all of the industries in the support services sub-cluster are in the growth stage in Tennessee. Scientific and technical consulting is an emerging industry that has made significant gains in recent years. Tennessee ranks strongly in this sub-cluster, particularly for payroll services and management consulting. Key projects related to business support services include a commitment by Parallon Business Solutions to create 800 jobs in Davidson County, 600 new jobs at Ryder's Spring Hill facility in Maury County, and a \$6 million investment by Martin Technologies to create 240 jobs at a new facility in Lawrenceburg. This project commitment by Martin, which was announced in December 2017, was the largest project in Lawrence County since 2011.

#### **Payroll Services**

The payroll services industry is a growing industry in Tennessee and one of the strongest in the cluster. Businesses in this industry provide accounting, bookkeeping, and other billing services, such as collecting information on hours worked and generating paychecks based on this information. Major businesses in Tennessee include Paymaxx, Inc. (Williamson), Administrative Resources, Inc. (Knox), and Paychex, Inc. (Shelby).

This industry currently employs 6,257 Tennesseans, an increase of 498 jobs since 2012. Employment in Tennessee for this industry is the third largest in the region and eighth nationally. The five-year growth rate (9%) outpaced both the national growth rate (1%) and the regional growth rate (-9%). Several states in the region experienced significant declines in this industry, including a 49% loss of employment in Georgia (6,987 total jobs), 40% loss in Arkansas, 36% loss in Mississippi, 34% loss in Louisiana, 15% loss in Alabama, and 13% loss in Mississippi. Over the next few years, Tennessee is expected to grow industry employment at nearly 2% per year. By 2022, businesses in the state will likely create an additional 500 jobs. Growth in this industry has been partly due to Tennessee's unique

<sup>&</sup>lt;sup>9</sup> The total establishments for these 21 counties are: Rutherford (4), Madison (4), Sullivan (2), Wilson (2), Monroe (2), and Gibson (2). All other counties have one.

competitive strength.<sup>10</sup> Businesses in Tennessee enjoy several key advantages. The large regional labor force creates consistent demand for bookkeeping and payroll companies. Moreover, billing service companies are closely connected to the healthcare cluster, which is one of Tennessee's strongest clusters. Rising incomes and higher rates of health insurance coverage have produced greater demand for healthcare services. Billing service companies process the sales transactions between patients and medical providers.<sup>11</sup>

Industry employment for payroll services is more geographically concentrated than most industries in this cluster. 30 counties in Tennessee have this type of industry. 4,616 jobs (73% of total employment) are located in Davidson County, where employment grew 23% since 2012. Williamson County, the county with the second highest employment level, has only 480 jobs. Employment in Williamson contracted 8% per year in the last five years. Knox County, which experienced the strong growth rate in this industry (162%), currently has 233 jobs. Other counties with more than 50 jobs in this industry are primary and outlying MSA counties: Hamilton (79 jobs), Rutherford (75), Shelby (67), Anderson (61), Blount (59), and Bradley (51). Several micropolitan areas in Tennessee have 20 or fewer jobs in this industry, specifically Shelbyville, McMinnville, Dyersburg, Crossville, and Cookeville. The only other counties with this type of employment are Giles, at-risk Claiborne and Lewis, and distressed Lake and McNairy. Businesses in at-risk counties employ 69 Tennesseans (69% growth rate). Distressed counties employ 20 workers, as compared with none in 2012.



Currently, Tennessee has 190 payroll service establishments, an increase of 36 businesses since 2012. Establishments are more evenly distributed throughout the state than employment, demonstrating the variance in establishment size. For instance, Davidson County has 69 times as many employees as Shelby County but only twice as many businesses. Every county in Tennessee has five or fewer establishments in this industry with the exception of Davidson (36 businesses), Williamson (13), Shelby (17), Hamilton (14), Knox (13), and Rutherford (6). The average establishment size in this industry has shrunk in recent years, and every county except Jefferson experienced a net increase in businesses. Anderson County lost 68% of its total employment but still managed to add two new payroll companies. Similarly, Williamson experienced a 40% decline in employment while increasing the number of establishments by five. Despite the trend towards smaller establishments, Tennessee's businesses remain larger on average than many states with comparable employment in this industry.<sup>13</sup>

The location quotient for this industry (1.84) is the highest in the region and second highest in the nation behind Oklahoma. By 2022, Tennessee will likely hold its position nationally while widening its

<sup>&</sup>lt;sup>10</sup> When considering only regional industry growth and performance of the national economy, Tennessee's projected growth was 30 jobs. Regional industry decline mostly canceled out the impact of economic recovery.

<sup>&</sup>lt;sup>11</sup> IBISWorld. (2017). Base value: The improving labor market will boost demand for industry services.

<sup>&</sup>lt;sup>12</sup> Other MSAs with employment in this industry include Clarksville (Montgomery County, 11 jobs), Jackson (Chester, 17; Madison, 14), Johnson City (Washington, 46), Kingsport-Bristol (Sullivan, 10), Morristown (Hamblen, 21; Jefferson, 11), and other counties within the Nashville area (Sumner, 43; Wilson, 42; Dickson, 10).

<sup>&</sup>lt;sup>13</sup> Tennessee ranks sixteenth in the nation for total establishments.

advantage over other states in the region. In 2017, payroll businesses in Tennessee earned \$1.0 billion and completed \$1.7 billion in sales transactions. Average wages in this industry (\$177,191) rank first in the nation by more than \$65,000.

The primary occupation in this industry (accountants and auditors) typically requires a four-year degree. However, payroll businesses in Tennessee offer many positions that require an associate's degree or less, such as bookkeeping and auditing clerks, secretaries and administrative assistants, tax preparers, billing and posting clerks, customer-service representatives, and first-line supervisors of office and administrative support workers. In 2017, Tennessee post-secondary institutions produced 31,982 graduates with the requisite skill set to fill positions in this industry. These graduates collected degrees in 256 programs of study related to this industry.

### **Telemarketing Bureaus and Telephone Answering Services**

These businesses are part of a growing industry subset in Tennessee, having made significant expansion in the last five years. <sup>14</sup> Telemarketing bureaus and other contact centers handle telephone, email, or other forms of communication on behalf of a company they represent. The purposes of these call centers including product promotion, processing customer orders, soliciting contributions, and customer relations. Telephone answering services are responsible for answering calls and relaying messages to the clients, such as emergency dispatch or call forwarding services.

Major companies in Tennessee include Asurion, Inc. (Davidson), Advanced Call Center Technologies, LLC (Washington), Convergys Corporation (Hamilton), and IBEX Global (Maury).

Currently, Tennessee's contact centers and telephone answering services employ 13,831 individuals, a net increase of 4,974 jobs since 2012. Employment in Tennessee is the fourth highest in the region. The five-year growth rate (56%) significantly outpaced the national growth rate (17%). Tennessee businesses added 35% more jobs in telephone answering services specifically, while the U.S. as a whole lost 8% of its employment in this industry. By 2022, companies in Tennessee are predicted to add an additional 2,105 jobs.

Nearly all of Tennessee's employment in these industries falls under telemarketing bureaus and other contact centers (13,316 total jobs). 35 counties in Tennessee have a presence in this industry. Davidson County, which added 879 net new jobs since 2012, leads the state with 2,388 total employees. Businesses in Montgomery County employ 1,586 individuals, a net increase of 1,157 jobs in the last five years (270% growth rate). Geographic concentration of telemarketing bureaus differs from other cluster industries in a few ways. While counties in Tennessee's largest MSAs comprise a significant portion of total employment, the most explosive growth in recent years occurred near smaller population centers. Employment in Sullivan County rose from 54 jobs to 822 today (a 1,422% increase). Maury County achieved nearly the same level of growth. In 2012, businesses in this county employed 38 workers, as compared to 495 today (a 1,203% increase). Significant growth also occurred in Bradley County (51 jobs to 376 today) and Hamblen County (36 to 241 today). In 2012, Coffee County did not have any telemarketing bureaus. Today, this county has three establishments and 326 total workers.

Total number of establishments has been growing across the state. Today, Tennessee has 214 telemarketing bureaus, as compared with 159 in 2012. Davidson County has the lion's share of the state's businesses with 44 total companies, followed by Shelby (27), Knox (26), and Williamson (14). Every other county in Tennessee has 10 or fewer telemarketing bureaus. Interestingly, the counties with the highest employment growth rates experienced no establishment growth at this time. Employment in Sullivan, Maury, and Hamblen Counties increased by 1,430 jobs without adding any new businesses. Counties with less pronounced growth rates, such as Davidson (58% increase), were the areas in which new businesses were being formed. Average establishment size varies substantially between counties. Establishments in

<sup>&</sup>lt;sup>14</sup> This subset includes telephone answering services (NAICS 561421) and telemarketing bureaus (NAICS 561422).

areas like Sullivan County, where the trend was expansion of pre-existing business, have average sizes ranging from 120 to 240 employees. Telemarketing bureaus in Davidson, Knox, and Shelby Counties employ 50 or so workers on average.

Overall establishment growth is consistent with industry-wide trends. Fixed costs for telemarketing bureaus are decreasing due to greater technological efficiency, making it easier for new companies to enter the market. Rising corporate profits in the U.S. have also created greater demand for industry services. More and more companies are choosing to outsource their customer relations departments to telemarketing companies. However, a key challenge for this industry in coming years will be increased competition from foreign companies, which can provide the same services with lower overhead.<sup>15</sup>

<sup>15</sup> IBISWorld. (2017). *Telemarketing & Call Centers in the US*.



Employment in telephone answering services, which is substantially lower than telemarketing bureaus, is concentrated most heavily in Davidson County (156 jobs), Hamblen County (150), and Shelby County (115). Both Davidson and Hamblen added more than 100 net new jobs since 2012. The other 17 counties in Tennessee with this type of industry employ 30 or fewer workers.

Like telemarketing bureaus, telephone answering companies vary in size. Shelby and Knox Counties each have five total establishments. Businesses in Shelby employ 115 workers, as compared with 29 total employees in Knox. Moreover, although Davidson and Hamblen Counties have roughly the same level of total employment, Davidson has nine business establishments, while Hamblen has one. The other counties in Tennessee with this industry have two or fewer establishments, with an average size of five to ten employees.



Tennessee's location quotient for these industries grew from 0.98 in 2012 to 1.28 today. By 2022, the location quotient will likely reach 1.33. Tennessee's employment concentration in telemarketing bureaus (1.32) is currently stronger than concentration in answering service companies (0.71). Employment growth between 2012 and 2017 revealed a strong competitive effect for Tennessee. Of the 4,974 jobs created in these industries, 3,425 are directly attributable to unique advantages to doing business in the state. In the case of telemarketing bureaus, Tennessee created 4,841 net new jobs, only 1,681 of which could be attributed to regional industry growth or overall growth in the national economy. For telephone answering services, Tennessee was predicted to lose 29 jobs but managed to create 161 net new positions. Employment projections through 2022 suggest a continuance of this competitive effect for Tennessee.

In 2017, Tennessee's telemarketing and telephone answering service companies earned \$556.4 million. Revenue from telemarketing bureaus accounted for most earnings in these industries (\$538.5 million). These businesses sold \$1.1 billion in total product. Telemarketing bureaus had a higher percentage of sales made out-of-region (27%) as compared to telephone answering services (9%).

Average wages in this industry (\$43,256) tell an incomplete picture in terms of the value these industries provide. Opportunities exist in these industries regardless of educational credentials. Many positions, such as customer service representatives, telemarketers, and switchboard operators, require a

high school diploma or less. Other positions, like computer user support specialists and medical transcriptionists, can be filled by individuals with an associate's degree or post-secondary non-degree award. These industries also seek out graduates of four-year institutions to fill training and development specialist roles as well as managerial positions.

#### **Engineering Services**

This industry encompasses the design, development, and utilization of engineering devices. Services provided by this industry have application to a wide number of industry areas, including scientific research, mining and exploration, civil engineering, construction, and transportation. <sup>16</sup> This industry also includes engineering consulting services. In Tennessee, major providers of engineering services include National Aerospace Solutions at Arnold Air Force Base (Coffee), US Army Corps of Engineers (Davidson, Shelby), Integrity Management (Knox), Leidos Engineering LLC (Anderson), and Smith, Seckman, and Reid, Inc. (Davidson).

Currently, 14,304 Tennesseans are employed by the engineering services industry, an increase of 292 jobs since 2012. Tennessee's five-year growth rate in employment (2%) was slightly below the national and regional averages. Growth is expected to accelerate slightly in coming years. By 2022, engineering service companies in Tennessee will likely add an additional 584 jobs for a total employment of 14,888.

Employment in this industry is distributed across 71 counties in the state, although industry jobs are more concentrated in some areas that others. Davidson County, in which 3,287 jobs are currently located, increased employment by 28%. Several other counties employ 1,000 or more Tennesseans in this industry, including Shelby (1,576), Coffee (1,440), Knox (1,369), Anderson (1,221), Roane (1,046), and Hamilton (1,026). Most of these counties experienced a net decrease in employment since 2012, ranging from a loss of 43 jobs in Knox County (3% decline) to a net decrease of 433 jobs in Coffee County (24% decline). Roane County, on the other hand, achieved an exact two-fold increase in employment within five years.

Counties with a moderate level of employment in this industry mostly experienced a net increase in jobs in recent years. Williamson County, in which 602 jobs are located, increased employment by 27%. Employment in Humphreys (293 jobs), Madison (253), and Blount (172) increased by roughly 100 jobs per county. Most counties have limited presence in this industry. 45 of the 71 counties with engineering service companies have less than 25 total employees. 33 counties have 10 or fewer employees.



Tennessee has 1,186 establishments in the engineering services industry, a net increase of 129 businesses since 2012. Because this industry includes engineering consulting offices, the average establishment size is quite small. Large engineering firms tend to be the exception to the rule. Engineering

<sup>&</sup>lt;sup>16</sup> NAICS 541330 includes the following areas of engineering design and consulting: acoustical systems, boat and maritime, chemical, civil engineering, combustion, construction, electrical, environmental, erosion control, geological, geophysical, heating, industrial, logging, marine, mechanical, mining, petroleum, and traffic.

service companies in Davidson County, where 161 businesses are presently located, have an average size of roughly 20 employees. In Shelby County, home to 114 engineering service providers, establishments employ only 14 workers on average. The trend across Tennessee has been towards new, small-scale companies entering the market rather than consolidation among existing companies. In Williamson County, total establishments increased from 59 in 2012 to 95 today, but businesses in this county only added 128 net new positions. Establishment growth occurred in several areas with shrinking employment, including Coffee, Shelby, Knox, Sullivan, Washington, Montgomery, and Hardin Counties. In the case of Hardin County, the number of establishments increased from three to four, even as total employment declined from 189 to 17 today. Coffee County lost 23% of its industry employment but added three new businesses for a total of 15 today. 52 counties in Tennessee have ten or fewer establishments in this industry, although these counties vary in average establishment size. Humphreys and Smith County each have three total engineering services companies, but employment in Humphreys (293) is far more substantial than Smith (less than 10). In some counties, industry establishments are almost exclusively non-employer firms. Loudon County, for example, has ten businesses but less than 15 total employees.

Tennessee currently does not currently rank among top states for employment concentration.<sup>17</sup> However, average wages in this industry (\$114,954) are the highest in the region and the third highest in the nation. Employees in this industry tend to garnish high wages due to the number of occupations that require four-year engineering degrees. Businesses in this industry also employ a substantial number of positions that require an associate's degree, including architectural and civil drafters, civil engineering technicians, and electrical and electronics engineering technicians. Median hourly earnings for these positions range from \$24 to nearly \$30. Positions that require only a high school diploma or equivalent, such as construction inspectors and surveying technicians are also in great demand in this industry and have median hourly earnings ranging from \$20 to \$28.

In 2017, engineering service companies in Tennessee generated \$1.6 billion in total earnings. Of the \$3.2 billion in total sales, 74% were made to other businesses in the state. Key buyers for this industry include governmental agencies, telecommunication carriers, and plumbing, heating, and air-conditioning contractors. Industry revenue is expected to grow in the next few years. Engineering consultants will enjoy greater demand from mining and mineral operations as well as new construction projects. Growth of the real estate market has been particularly strong in the Southeast, providing a unique opportunity for Tennessee businesses. New market entrants may have difficulty breaking into these new markets. Firms with proven track records will have the best chance of securing the most lucrative contracts.<sup>18</sup>

Engineering service companies make significant purchases from other business services industries, providing a direct benefit to the overall cluster. Major purchases made by engineering service companies in Tennessee include intra-industry sales, management consulting services, and services provided by corporate, subsidiary, and regional managing offices.

#### **Management Consulting Services**

In Tennessee, management consulting services are in the growing life cycle stage. <sup>19</sup> Management consultants offer their clients expertise on a wide range of business activities, such as administrative and human resources concerns, marketing and public relations, and operations and logistics. Establishments range in size from non-employer boutique firms to major consulting agencies with numerous clients. Tennessee's major companies include the following:

<sup>&</sup>lt;sup>17</sup> The location quotient for this industry is 0.75.

<sup>&</sup>lt;sup>18</sup> IBISWorld. (2017). High rise: Recovery in private investment will drive industry's return to growth.

<sup>&</sup>lt;sup>19</sup> This group is a five-digit NAICS classification, which includes administrative and general management consulting services (NAICS 541611), human resources consulting (NAICS 541612), marketing consulting services (NAICS 541613), and process, physical distribution, and logistics consulting services (NAICS 541614).

| Business  | Consulting Service City |                | County     |
|---|-------------------------|----------------|------------|
| Parallon Business Solutions                           | General Management      | Franklin       | Williamson |
| Primeritus Financial Services                         | General Management      | Nashville      | Davidson   |
| Southern Benefit Administrators, Inc.                 | Human Resources         | Goodlettsville | Sumner     |
| Bryan, Pendleton, Swats & McAllister-Wells Fargo, LLC | Human Resources         | Brentwood      | Williamson |
| Harvard Corporation                                   | Marketing               | Cookeville     | Putnam     |
| Sullivan Branding, Inc.                               | Marketing               | Memphis        | Shelby     |
| Ryder Integrated Logistics                            | Logistics               | Spring Hill    | Maury      |
| CTSI-Global   | Logistics               | Memphis        | Shelby     |

Currently, management consulting companies employ 24,725 Tennesseans. Roughly half of this employment belongs to administrative and general management consulting services. Tennessee companies have added 12,190 jobs since 2012 (a 97% increase). Tennessee had the second strongest growth rate in the nation between 2012 and 2017. By 2022, Tennessee's total employment for management consulting is predicted to increase to 33,562 jobs, the third highest in the region and ninth nationally.



Process, distribution, and logistics consulting is Tennessee's strongest area in management consulting. Since 2012, Tennessee has led the nation in net employment growth (4,788 new jobs) as well as percent increase in employment (353%). Currently, the state ranks third in the region behind Virginia and Florida and fifth nationally for total employment. By 2022, Tennessee is predicted to surpass Florida.

Management consulting companies are widely distributed across the state. Tennessee has a total of 88 counties with this type of employment. 84 of these counties achieved net job growth between 2012 and 2017. Only one county (Maury) experienced a net decrease greater than 10 jobs. Blount County experienced the largest growth rate since 2012, nearly quadrupling the size of its industry. Davidson County companies created the most number of jobs during this time period. Employers in this county added 5,157 new jobs for a current total of 7,207 (a 252% increase). Shelby County also enjoyed rapid growth. Today, consulting firms based in Shelby County employ 6,843 Tennesseans, a net increase of 3,739 jobs. Counties with significant employment (100 or more employees) are mostly located within Tennessee's MSAs. However, some of Tennessee's smaller counties are carving out a niche in specific types of consulting services. Obion County has a logistics consulting industry similar in size to that of Wilson County (roughly 50 to 60 employees), although Wilson's management consulting industry is much larger overall.

Tennessee has seen a rapid increase in the number of establishments. Today, Tennessee has 3,001 companies in this industry, a net increase of 623 establishments since 2012. Most of these new establishments popped up in areas with significant concentrations of employment (100 or greater employees). <sup>20</sup> At-risk and distressed counties in Tennessee made significant establishment gains, with at-

<sup>&</sup>lt;sup>20</sup> Sevier County, located in the Sevierville micropolitan area, has 102 jobs and is the only non-MSA county with employment exceeding 100. The Nashville MSA counties include Williamson (3,132 jobs), Sumner (960), Rutherford (445), and Wilson (233). The

risk counties adding 43 new companies and distressed counties adding 18. The average establishment in this industry tends to be a small firm with less than 10 employees. Average size varies little between metropolitan and non-metropolitan areas. The growth in establishments demonstrates that small companies with specialized expertise can remain competitive in this industry. Counties that experienced a net decrease in employment between 2012 and 2017 (Johnson, Warren, White, and Maury) actually enjoyed establishment growth during this time. Maury County, for example, lost 64 jobs (roughly half of its 2012 employment) but increased the number of consulting companies from 16 to 25.

Tennessee has a strong employment concentration in management consulting services.<sup>21</sup> Tennessee's increase in location quotient since 2012 was the largest of any state besides Minnesota, and by 2022, Tennessee is predicted to rank second in the region and ninth in the nation for management consulting. Human resources consulting was an area in which Tennessee made notable gains in employment concentration, with the location quotient increasing from 0.72 to 1.29 today. For logistics consulting, Tennessee currently ranks second in the nation behind Virginia for location quotient and fifth in the nation for total employment. Tennessee achieved an employment growth rate of 353% between 2012 and 2017 for logistics consulting services, while Virginia lost 11% of its total employment. This trend is predicted to continue through 2022. Tennessee is expected to increase employment by 50% (3,098) new jobs, while Virginia's predicted growth is only 3%.

Another demonstration of Tennessee's competitive strength is the margin by which Tennessee companies exceeded job growth projections. When considering factors like regional industry growth and overall improvement of the economy, Tennessee was expected to add 3,533 new jobs. Tennessee's actual job creation since 2012 was 8,657 jobs, demonstrating the state's unique advantage in this sector. Six of the seven top-ranked states for this industry fell short of expectations by several thousand jobs. Virginia, for example, created 12,393 fewer jobs than could be explained by regional or national growth. Through 2022, roughly half of all new job creation in Tennessee for this industry will likely be due to advantages unique to the state.

Multiple explanations exist for why the consulting industry has thrived in Tennessee. Rising corporate profits have increased demand for management consulting. Businesses are using increased revenues as an opportunity to hire outside consultants. This industry also benefits from Tennessee's strong healthcare cluster. Healthcare companies rely on consultants for advice on operational concerns, like digitization of health records, as well as regulatory issues. The Patient Protection and Affordable Care Act (PPACA) created many regulations by which healthcare providers must now comply. Management consultants provide companies with a strategy for meeting these regulatory burdens in efficient and cost-saving ways. Estimates show that healthcare management consultancies have experienced double-digit increases in demand every year since 2012.<sup>22</sup>

In 2017, the management consulting industry in Tennessee generated \$2.5 billion in earnings after completing \$4.0 billion in sales transactions. The most significant share in earnings came from administrative and general management consulting (\$1.5 billion), followed by marketing consulting (\$0.4 billion), logistics consulting (\$0.3 billion), and human resources consulting (\$0.2 billion).

Consulting services also have indirect impact on the regional economy. Management and human resources consultants assist businesses in implementing practices that attract and retain talented employees. Regional consultancies are important because they offer expertise unique to the locale and

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Knoxville MSA counties are Knox (990), Blount (376), and Anderson (353). The other counties in this group are the primary counties of their respective MSA: Hamilton (765), Washington County (151), Montgomery County (106), and Sullivan (102).

<sup>&</sup>lt;sup>21</sup> Tennessee's location quotient for management consulting rose from 0.73 in 2012 to 1.10 today. The location quotients for each subsector are 3.25 for logistics (as compared to 2.55 in 2012), 1.29 in human resources (0.72 in 2012), 1.11 in administrative and general management (0.88 in 2012), and 0.62 for marketing (0.56 in 2012).

<sup>&</sup>lt;sup>22</sup> IBISWorld. (2017). Help wanted: Improved economic conditions will boost consulting demand.

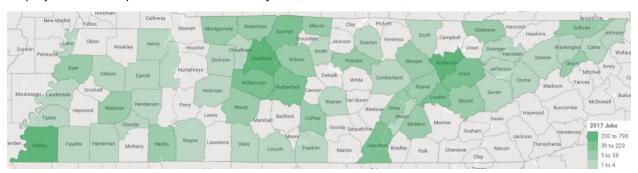
the challenges it faces.<sup>23</sup> Continued growth will hinge on successful workforce recruitment. More than 40% of today's labor force will be retired by 2025.<sup>24</sup> The retirement of the Baby Boomers could result in the loss of decades of accumulated knowledge and expertise if a company fails to transition this knowledge to the next generation of workers. 65% of sales by management consultants in Tennessee were made to other businesses in the state, demonstrating the impact made by this industry on the local economy.

Post-secondary institutions in the state offer 592 programs of study that prepare graduates for careers in consulting services. In 2016, these institutions produced 70,847 graduates with the skills necessary to fill key occupations such as management analysts, general and operations managers, and operations specialists. Moreover, many occupations in this industry require less than a four-year degree, ensuring employment opportunities for large parts of Tennessee's workforce.

### Other Scientific and Technical Consulting Services

Establishments in this industry provide consultations and other types of assistance on scientific and technical issues to companies and other institutions. The types of scientific and technical consulting covered by this industry include agricultural, security and safety, communications and entertainment, economic, energy, and matters related to physical, biological, and chemical processes. Major establishments in Tennessee include Restoration Services, Inc. (Anderson), Progressive Communication Services, Inc. (Davidson), Balfour Beatty Energy Solutions, LLC (Davidson), Ensafe, Inc. (Shelby), and Integrated Biometric Technology, LLC.

Currently, these types of companies employ 2,608 Tennesseans. Employment has increased 24% in the last five years (512 net new jobs). Tennessee ranks fourth in the region for total employment. Almost one-third of Tennessee's employment is located in Anderson County, specifically Oak Ridge. Employment in Anderson County increased 37% since 2012. Other counties with significant industry employment (100 or more employees) enjoyed substantial growth during this time. Hamilton County employers, for example, added 134 net new jobs (an 893% increase).



Tennessee has 460 scientific and technical consulting companies, a net increase of 112 establishments in the last five years. 14 counties in Tennessee added their first establishment during this time. Davidson County has the most establishments in this industry (50 businesses), followed by Knox (45), Shelby (43), Williamson (38), and Hamilton (23). Average establishment size varies substantially between counties. Anderson County has three times as much employment as any other county but only 21 establishments in total. In most counties, small consulting firms tend to be the norm. 53 of the 66 counties with employment in this industry have 10 or fewer total employees. Wilson County has nine businesses of this kind but only 27 employees. Montgomery County has nine companies and 16

<sup>&</sup>lt;sup>23</sup> Keeble, D., & Nachum, L. (2001). Why do business service firms cluster? *Transactions of the Institute of British Geographers*, 27(1), 67-90

<sup>&</sup>lt;sup>24</sup> Bruyere, S., Tishman, F, & Van Looy, S. (2012). *Employer Strategies for Responding to an Aging Workforce*. https://www.dol.gov/odep/pdf/NTAR\_Employer\_Strategies\_Report.pdf

employees. Moreover, the trend in recent years has been toward smaller establishment size. Knox County lost 9% of its employment but added eight new businesses. In many counties, establishment creation outpaced employment growth, as in the case of Rutherford County. This county added 20 net new establishments (18 to 38 today) but only 50 new employees.

Tennessee's employment concentration has steadily increased in recent years and is predicted to continue increasing.<sup>25</sup> Tennessee has demonstrated a competitive effect in this industry. Of the 512 jobs created since 2012, 495 of these positions are attributable to Tennessee's key strengths. The expected change in Tennessee's industry was only 17 jobs. Scientific and technical consulting services are expected to be in greater demand. An increase in business confidence will motivate companies to utilize cash holdings for research and development purposes. R&D related to medical, biotechnological, and pharmaceutical technologies are most likely to grow revenue in the next few years. Small and non-employer firms can remain competitive by targeting niche research areas. Specialization will be less necessary for large research institutions, which can maximize their market share by acquiring smaller competitors. By offering a wide range of consulting services, large establishments will be able to avoid the impact of reduced demand for a particular type of research.<sup>26</sup>

In 2017, total earnings for this industry in Tennessee were \$307.0 million. 79% of the \$467.0 million in sales were made to other businesses in the state, including business service industries. Key buyers include corporate, subsidiary, and regional managing offices and engineering service companies. Average wages in Tennessee for this industry (\$101,082) are the third highest in the region and eighth highest in the nation. Employment in this industry is fairly evenly split between occupations requiring a four-year college degree, such as management analysts and general managers, and occupations requiring a high school diploma, such as customer service representatives and administrative assistants.

## **Computer Services**

Industries in this sub-cluster are currently in the emerging and developing stages in Tennessee. Despite low employment concentration, these industries are a strong benefit to the regional economy and show signs of continued growth. Tennessee has adopted a comprehensive strategy for strengthening these industries. Key initiatives include a partnership with Science Applications International Corporation (SAIC) to create the Technology Integration Gateway, an accessibility grant to expand broadband access to unserved areas, and numerous educational programs aimed at increasing secondary and post-secondary STEM completions.

#### Data Processing, Hosting, and Related Services

Data processing and hosting is an emerging industry in Tennessee. Currently, businesses in this industry employ 5,271 Tennesseans. This industry has added 487 jobs since 2012. Employment will likely grow at roughly the same rate (2% per year) through 2022. Data processing companies in Tennessee include Change Healthcare (Davidson), Mmodal (Williamson), Comdata (Davidson), HCA Information Services (Davidson), and Windstream Communications (Williamson).

Tennessee, which ranks fifth in the region for employment, has 45 counties with this type of business. However, most employment is concentrated in Tennessee's metropolitan areas. Almost 70% of employment is located within the Nashville metropolitan area. Davidson County alone accounts for 51% of employment in the state, although this county lost 240 jobs in the last five years. The Nashville area experienced net job growth during this time due to gains made in other counties: 346 new jobs in Williamson County (88% increase), 79 jobs in Sumner County (243% increase), and 38 new jobs in

<sup>&</sup>lt;sup>25</sup> The 2017 location quotient (0.66) improved from 0.55 in 2012. The predicted location quotient for 2022 is 0.71.

<sup>&</sup>lt;sup>26</sup> IBISWorld. (2017). Expert Opinion: Already highly popular, industry demand will rise further in coming years.

Rutherford County (60% increase). Knox, Shelby, and Hamilton Counties are Tennessee's only other counties with more than 100 employees.



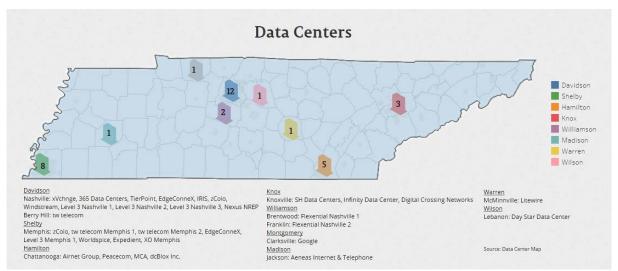
Tennessee businesses in this industry primarily serve local clientele. More than two-thirds of sales by these businesses are made in-region, and the industry has more growth to accomplish before it can meet all local demand.<sup>27</sup> The emerging nature of this industry has been a boon for new market entrants. Since 2012, Tennessee has added more than 102 additional data processing centers for a total of 451 businesses. Small-scale establishments are viable operations in this business climate. 12 counties added their first data processing center since 2012, none of which employ more than 10 individuals. These new businesses popped up all over the state, but one key trend was establishment growth in Tennessee's biggest metropolitan statistical areas. Businesses in the Knoxville area increased from 30 to 41. The Nashville MSA added 36 new establishments for a total of 100 today. The trend also occurred in the Memphis and Chattanooga areas.<sup>28</sup>

In addition to these industry locations, Tennessee is home to a number of data centers. These centers do not have a separate classification under NAICS, meaning much of the employment at these locations is not captured in this industry. Tennessee has a total of 33 colocation data centers (and 1 cloud server in Hamilton County). Google's data center in Clarksville, which opened in February 2018, is considered to be the world's most advanced data center.<sup>29</sup>

<sup>&</sup>lt;sup>27</sup> The location quotient of 0.84 demonstrates that this industry is not export-oriented. Moreover, 41% of data processing demand in Tennessee was met by out-of-state suppliers in 2017.

<sup>&</sup>lt;sup>28</sup> Net establishment growth in Davidson County occurred in Cheatham (2), Dickson (1), Rutherford (3), Sumner (6), and Williamson (19). In the Knoxville MSA, new establishments emerged in Blount (5) and Knox (6). New businesses in the Chattanooga MSA formed in Hamilton (4) and Marion (1). In Memphis, business formation occurred in Shelby (8). Fayette County in the Memphis area lost one business, the only county with net establishment loss in a Tennessee MSA exceeding 500,000. The trend reversed in smaller MSAs, with areas like the Tri-Cities and Jackson-Humboldt experiencing net declines.

<sup>&</sup>lt;sup>29</sup> Settle, J. (Feb. 2018). *Google in Clarksville will be most advanced data center worldwide*. https://www.theleafchronicle.com/story/news/local/clarksville/2018/02/16/google-clarksville-most-advanced-data-center-yet/341171002/



The data processing and hosting industry has been growing rapidly in the United States primarily due to outsourcing of data tasks to specialized companies. Companies of all kinds are now responsible for managing enormous amounts of data, creating demand for outside IT specialists. Large- and small-scale data processors benefit from growing demand, with each capturing a different part of the market. Service providers with significant employment and resources will secure long-term contracts with large companies, particularly healthcare companies. Small industry players will attract clients that require data processing but cannot afford services offered by major data firms.<sup>30</sup>

Most of Tennessee's gains in this industry can be explained by industry growth at the national level.<sup>31</sup> Despite lacking the competitive edge of states like California, Tennessee has benefited greatly from having a presence in this industry. In 2017, the data processing industry in Tennessee generated more than \$647 million in earnings and completed more than \$1.89 billion in sales. This industry also plays an important role in the overall cluster, both as a seller and a buyer. Data processing centers rely on services from other cluster businesses, including temporary employment agencies and management consultants. Moreover, Tennessee's data processing businesses make significant sales to corporate, subsidiary, and regional managing offices in the state.

The data processing industry also provides value from a labor force perspective. Average wages in this industry (\$127,074) are the ninth highest in the nation and fourth highest in the region. Wages are high on average due to the large number of software developers and computer analysts employed by this industry, but many opportunities exist for less specialized workers as well. These businesses rely greatly on occupations like customer service representatives and data entry specialists.

#### **Programming and Systems Design Services**

Computer programming and design, currently in the emerging stage in Tennessee, is one of the fastest growing industry areas in the entire cluster.<sup>32</sup> Businesses in this group have two primary activities. Programming companies engage in writing, testing, and modifying software to meet client needs. The major companies in this industry in Tennessee include MEDHOST (Williamson), ProTech Systems Group (Shelby), L-3 ForceX (Davidson), COOK Systems International (Shelby), and the Whitestone Group (Knox). Systems design companies perform systems integration, a process by which computer software and

<sup>&</sup>lt;sup>30</sup> IBISWorld. (March 2018). Cloud nine: Companies will increasingly capture more data, requiring industry operators.

<sup>&</sup>lt;sup>31</sup> Since 2012, the industry grew at the rate of 13% regionally and 21% nationally. Tennessee added fewer jobs than expected based on the national growth rate and overall economic growth (1,027 expected versus 487 actual).

<sup>&</sup>lt;sup>32</sup> This industry grouping includes custom computer programming services (NAICS 541511) and computer systems design services (541512). The four industries included in NAICS 54151 have been separated into two categories based to their life cycle stage.

hardware are combined into an integrated whole. This industry also includes companies that offer a diverse portfolio of hardware and software solutions, which customers can purchase to build an integrated system. Major employers include emids (Williamson), Qualifacts Systems, Inc. (Davidson), Integrated Tech Group, LLC (Sumner), Wipro (Williamson), and Science Applications International Corporation (Anderson).

Currently, 18,928 Tennesseans are employed by programming and design companies. Roughly 60% of these jobs are related to systems design services. Businesses in the state have added 5,492 new jobs since 2012 for an annual growth rate exceeding 8%. Growth is likely to remain strong in the next few years. By 2022, total employment is expected to increase by an additional 3,647 jobs. Tennessee is expected to make especially strong gains in systems design services. Tennessee's predicted growth through 2022 will likely be one of the highest in the U.S., outpacing the projected regional and national growth rates.



The programming and design industries bear many similarities to data processing and hosting. Programming and design businesses, which tend to be small-scale establishments with local customers, are spread out across the state. Tennessee has 68 counties with businesses that specialize in programming services. 52 of these counties have less than 25 total employees. 74 counties in Tennessee have employment in systems design services. Of these counties, 53 have less than 25 total employees. These industries differ in geographic concentration of employment. For programming services, roughly 60% of employment is located within Davidson, Williamson, Shelby and Knox Counties. Systems design employment is more evenly distributed throughout the state. The counties with the largest employment (Davidson, Williamson, and Shelby) account for only one-third of total employment.

Like data processing and hosting, job creation since 2012 has occurred more so in the outermost MSA counties than in the central counties. The growth rate in Davidson County for programming services employment (30%) was lower than the rate of growth in Williamson (65%) and Rutherford (43%). The same trend occurred in the Knoxville area, with net job growth in Blount (71%) exceeding Knox (43%). Significant growth occurred in Tennessee's micropolitan areas. Putnam County, for example, achieved a growth rate of 431% for programming services and 146% for systems design services. Coffee County added 195 new jobs in programming services, more than doubling its employment. For systems design services, Tennessee's smaller MSAs had the most expansive growth. Washington County in the Tri-Cities area had a growth rate of 278%. Sullivan County, part of Kingsport-Bristol, had a 133% increase in employment.

Tennessee has 3,643 programming and systems design companies, a net increase of 863 establishments since 2012. 19 counties in Tennessee added their first programming services company during Governor Haslam's administration, including 4 distressed counties and 13 at-risk counties.<sup>33</sup> Every distressed and at-risk county in Tennessee besides Chester avoided net declines in employment and industry establishments.

<sup>&</sup>lt;sup>33</sup> These distressed counties were Grundy, Fentress, Cocke, and Campbell. The at-risk counties were Hardin, McMinn, Grainger, Obion, Johnson, Pickett, Unicoi, Lewis, Gibson, Henderson, Meigs, Carroll, and Claiborne.

Roughly 60% of new businesses were systems design providers. Establishment growth mirrored trends in other computer service industries. The largest increase in establishments occurred in Tennessee's MSAs, particularly central counties. Davidson County, which currently has 318 businesses, more than doubled its number of establishments since 2012. Shelby County added 76 new businesses for a total of 224 today. Knox County increased its number of establishments from 64 to 127 today, and Hamilton added 28 businesses for a current total of 83. The outlying MSA counties also achieved strong growth. Williamson County, which trails Davidson for the most businesses in the state, has 203 companies of this kind today as compared to 91 in 2012. Several outlying counties in the Nashville MSA, including Robertson, Loudon, Lawrence, and Wilson, contributed to net growth in the area. The Knoxville MSA also enjoyed an expansion of this industry thanks to establishment growth in counties like Blount. The Tullahoma-Manchester micropolitan area was another key growth area, particularly in Coffee County. Tennessee's at-risk counties added 28 net new locations during this time. Distressed counties added an additional 4.

Average establishment size is quite small (5 employees per company). Non-employer firms are very common. Start-up companies are well-poised to succeed in these industries. For programming services, nearly 93% of all sales are made to other businesses in Tennessee, and two-thirds of demand in the state is met by local suppliers. The rate of establishment growth exceeded employment growth for programming services, suggesting the adeptness of local providers at carving out their own niche service areas. Some places like Wilson County saw a net increase in establishments even as total employment declined. The programming services industry supports the market strategy of both large- and small-scale operators. The biggest industry players focus on developing customized software for large companies. Non-employer firms modify existing software based on their customer's specific request. Moreover, new market entrants have a good chance of succeeding regardless of size due to low start-up costs, the recession-proof nature of this industry, and the diverse IT needs of customers. The key for small firms has to been to offer specialized services, such as disaster recovery and online retail development, and to focus on geographic areas frequently overlooked by large IT consultants. In Tennessee, the growth in establishments outside metropolitan areas suggests that small companies are finding success in niche geographic areas rather than having to compete for large corporate clients within major cities.

The market for systems design has a similar dynamic. Large- and small-scale firms differ in the types of services they offer and therefore avoid competition with one another. Large industry players work with high-value corporate clients to combine IT components, including online databases, communication technologies, and security management, into a single system. Non-employer firms offer integration solutions to companies that require these services but do not have the budget for brand-name IT companies. In many cases, these non-employer firms are purchasing software and hardware from large industry players and then integrating these components into a customized system for their customers. Non-employer firms also specialize in value-added services, such as integrating customers' existing IT technology into a single system.<sup>34</sup>

Tennessee is currently unranked among U.S. states in computer programming and design services.<sup>35</sup> However, these industries have been growing rapidly. Systems design companies in Tennessee have created jobs at twice the regional and national rates. Only 55% of the jobs created in this industry since 2012 can be attributed to regional industry growth or economic recovery, demonstrating advantages unique to Tennessee.<sup>36</sup> Tennessee's competitive edge in these industries might be explained

the national growth effect.

<sup>&</sup>lt;sup>34</sup> IBISWorld. (2017). All systems go: Rising corporate profit will lead to increased use of industry services.

<sup>&</sup>lt;sup>35</sup> Tennessee's location quotient for programming services is 0.44, an increase of 0.1 since 2012. For systems design services, the location quotient increased from 0.48 in 2012 to 0.57 today. By 2022, employment concentration is expected to increase to 0.60.

<sup>36</sup> The growth rate was 22% regionally and 26% nationally. Only three states (Alaska, Vermont, Michigan) had a net decrease in employment. Tennessee's predicted increase was 1,913 jobs, of which 1,325 were attributable to the industrial mix effect and 588 to

by the strength of other regional clusters. In the case of programming services, Tennessee's competitive strength can likely be attributed to the local healthcare sector. Custom programming providers in Tennessee provide a large percentage of their services to medical and surgical hospitals in the region. The software industry benefits from having some of the world's best medical centers in close proximity.

These industries provide a bi-directional benefit to the overall cluster. Programming and design businesses sell much of their product to other cluster industries. Key customers include financial companies, corporate managing offices, and data processing centers. Programming and design companies are also buyers of other business services products. Tennessee's software companies make substantial purchases from consulting agencies and office administrative service providers.

In 2017, total earnings for these industries in Tennessee were \$2.1 billion. Earning for design services (\$1.2 billion) accounted for a larger percentage of earnings than programming services (\$871.6 million). A higher percentage of sales by design companies were made to out-of-state businesses than for programming services. Both industries have strong average wages. Average wages in design services (\$112,717) are the third highest in the region, while average programming wages (\$109,467) are the fifth highest in the Southeast. Wages are high due to the number of software developers and computer systems analysts. However, less-specialized positions like support specialists and sales representatives are common in these industries. Both occupations require less than a four-year degree for entry level positions and have median hourly earnings between \$20 and \$22.

#### **Computer Facilities Management Services**

Businesses in this industry primarily provide on-site management of clients' computer systems and data processors. Tennessee businesses include Core Ideas, LLC (Shelby) and the Nexus Group, Inc. (Davidson).

This industry is still in the developing stages in Tennessee. Employment is more geographically concentrated than other sub-cluster industries. 13 counties have presence in this industry. Only 3 of these counties (Anderson, Davidson, and Shelby) have more than 10 total employees. Total employment declined slightly from 258 in 2012 to 211 today. Most of this decline occurred in Anderson County, in which employment decreased from 158 to 86. Davidson County currently has 67 employees, a 139% increase in the last few years. Shelby County added 7 new jobs for a total of 30. By 2022, Tennessee will likely recuperate most of these job losses.



Despite declining employment, the number of establishments in Tennessee has been increasing. Tennessee has 32 businesses of this kind as compared with 18 in 2012. Most of these new businesses emerged in Davidson and Shelby Counties, although Hamilton and Montgomery each added their first two companies since 2012. Establishment growth is likely a better predictor of industry performance than job creation, given the number of non-employer firms. Anderson County added a third establishment in recent years, despite losing roughly half of its total employment. Williamson County added two new companies, despite experiencing a net decrease in employment. The average establishment size is now 6 employees, approximately half the average size in 2012.

Tennessee has yet to demonstrate a competitive edge in this industry compared to other U.S. states.<sup>37</sup> Given the large overlap between industries in this sub-cluster, it could be that Tennessee's strengths in facilities management are underrepresented by this data. In 2017, Tennessee businesses earned \$26.5 million after completing \$55.7 million in sales. Roughly 87% of these sales were made to other businesses in the region. Average wages (\$94,304) are higher than most industries in Tennessee. Many key occupations in facilities management require less than a four-year degree. These positions include technicians, repairers, clerks, and support specialists.

### **Other Computed Related Services**

This industry provides services not included in other sub-cluster industries, such as data recovery or software installation services. Tennessee businesses include Ncontracts, LLC (Williamson) and United Data Technologies, Inc. (Davidson).

Like facilities management, this industry is in the developing stage of its life cycle in Tennessee. Currently, 333 Tennesseans are employed by this industry, a net decrease of 55 jobs since 2012. By 2022, employment is expected to contract by 30 or so additional jobs. 20 counties in Tennessee have employment in this industry, only seven of which have more than 10 employees. Most counties expanded employment during the last five years. However, these modest gains were unable to offset larger declines in places like Knox County. Tennessee's at-risk and distressed counties experienced a net increase in employment. The number of establishments has been increasing despite declining employment. Tennessee now has 62 businesses in this industry. 11 counties in Tennessee added their first business in this industry since 2012. These 11 counties, all of which were located within an MSA or micropolitan area, included at-risk Grainger, Johnson, and Union Counties.



Tennessee still lacks the employment concentration necessary to be a leader in this industry.<sup>38</sup> However, earnings for this industry were quite strong for an industry of this size. Tennessee businesses generated \$48.2 million in earnings in 2017. 90% of sales were made to other businesses in the region. Moreover, average wages in Tennessee (\$110,185) are the third highest in the region. Businesses in this industry require the same types of occupations as computer facilities management companies.

# **Research and Development**

#### **Scientific Research and Development Services**

Companies in this industry specialize in a wide variety of subject areas, including life sciences, nanotechnology, biotechnology, and social sciences and humanities. In addition to producing original

<sup>&</sup>lt;sup>37</sup> Job creation in Tennessee between 2012 and 2017 underperformed expectations by roughly 126 jobs. The location quotient for this industry declined from 0.25 to 0.15.

<sup>&</sup>lt;sup>38</sup> Since 2012, the location quotient for this industry has declined from 0.18 to 0.15.

research, these companies use scientific findings to improve product development.<sup>39</sup> Major Tennessee establishments in this industry include UT-Batelle, LLC (Anderson), Lockheed Martin Energy Research Corporation (Anderson), Lanxess Solutions US, Inc. (Shelby), SEC Radcon Alliance, LLC (Knox), and Protherics, Inc. (Williamson).

Currently, these companies employ 8,303 Tennesseans at 300 total establishments in the state. Nearly 90% of this employment is related to physical, engineering, and life sciences research. Total employment contracted by roughly 60 jobs in the last five years. This 1% decline in employment was consistent with national trends for this industry. Tennessee has the fourth highest employment in the region for this type of research and development. The other research areas covered by these industries—nanotechnology, biotechnology, and social sciences and humanities—each employ less than 500 Tennesseans. However, employment in these research areas has been growing by roughly 6% per year, substantially above the regional and national growth rates. By 2022, Tennessee is expected to gain an additional 137 jobs. Revenues are expected to increase in coming years, due to increased investment from key life sciences industries. The R&D sector went through a transitional period since 2013. Federal spending on R&D, which declined substantially due to budget cutbacks, has since been supplanted by private investment.<sup>40</sup>



Roane County and Anderson County are Tennessee's hotspots in this industry, in large part due to the partnership between Oak Ridge National Laboratory and UT-Batelle. Roane County businesses account for 60% of total employment in life sciences research. These businesses employ more than 4,500 Tennesseans and have added 329 net new jobs since 2012. Anderson County is also an important location for R&D in Tennessee. Total employment for life sciences research in Anderson is 956, a decrease of 350 jobs since 2012. Other counties with substantial life sciences employment include Knox (412 jobs), Davidson (323), Coffee (309), Shelby (159), and Bradley (159). Tennessee has 38 counties with companies engaged in life sciences research, although most counties have 25 or fewer employees. Average establishment size varies substantially between the counties, with Tennessee's metropolitan areas more likely to have small and non-employer firms. Roane has far and away the largest research institutions. Companies in Anderson, Coffee, and Bradley Counties employ roughly 150 workers on average. Knox, Davidson, and Shelby Counties have much smaller average establishment sizes (approximately 15 employees).

Biotechnology research is concentrated mostly in Shelby County. Currently, 243 Tennesseans are employed by companies in Shelby County, a net increase of 55 jobs since 2012. This county also added seven new establishments for a total of 17 today. Knox and Davidson Counties have a small presence in this industry. Every other county in Tennessee has 25 or fewer employees. Life sciences and biotechnology companies will enjoy greater revenues in the years ahead, due to increasing demand in the healthcare

<sup>&</sup>lt;sup>39</sup> NAICS 5417 includes three six-digit industries (541711, 541712, and 541720) and encompasses hundreds of different areas of scientific research.

<sup>&</sup>lt;sup>40</sup> Industry trends referenced in this section are taken from: IBISWorld. (2018). *Scientific breakthrough: Improving private investment will help long-term growth.* 

sector. The aging of the US population and higher rates of chronic illness are the primary drivers of this downstream demand.

21 counties in Tennessee currently have nanotechnology R&D operations. Roane County companies employ 124 Tennesseans in this research area, a net increase of 88 jobs since 2012. Anderson County, which has 26 nanotechnology research jobs, is the only other county besides Roane with 15 or more employees. Like general life sciences research, nanotechnology research is expected to increase in the next five years.

16 counties in Tennessee have R&D related to social sciences and humanities. Davidson County, in which 103 of the 273 total jobs are located, increased employment by 24% in the last five years. Other counties with employment in this type of research include Anderson (36 jobs) and Shelby (35). Average establishment size in this industry (5.9 employees per business) is only slightly smaller than the average size of biotechnology companies (6.4 employees). Due to the wide range of research areas in this industry, revenue does not fluctuate from year to year.

Tennessee's location quotient for these industries declined slightly in recent years. However, Tennessee's R&D sector ranks well on other metrics. Average wages in this sub-cluster in Tennessee (\$126,891) are the third highest in the region. In 2017, these industries earned \$984.2 million in total revenue. Revenue from life sciences research accounted for the largest share of total earnings (\$862.5 million), followed by biotechnology (\$74.7 million), nanotechnology (\$24.6 million), and social sciences and humanities (\$22.5 million). More than half of all sales by life sciences companies were made to out-of-state businesses, while the other sub-cluster industries had mostly local clientele. The percentage of sales made in-region for social sciences and humanities research (93%) and biotechnology research (89%) were higher than for nanotechnology in-region sales (63%).

#### **Testing Laboratories**

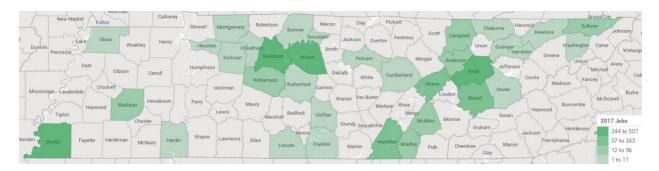
This industry provides physical, chemical, and other analytical testing services, except medical or veterinary services. Types of testing included in this industry range from acoustics and vibrational testing, product and food testing, environment testing, electrical and electronic testing, and so on. Major establishments in this industry are Environmental Science Corporation (Wilson), Aegis Toxicology Sciences Corporation (Davidson), Testamerica Laboratories, Inc. (Davidson), Quest Diagnostics, Inc. (Shelby), and Molecular Pathology Laboratory Network, Inc. (Blount). Testing laboratories are currently in the emerging stages in Tennessee.

Currently, 2,058 Tennesseans are employed by this industry, a net increase of 70 jobs since 2012. This five-year growth rate of 4% was exactly equal to the regional and national averages. By 2022, testing laboratories in Tennessee are expected to add an additional 123 jobs. This expected growth (6%) is slightly stronger than projected national growth rate. Revenue has been increasing in this industry due to new corporate investments. Companies are purchasing more services from testing laboratories as a result of new safety and quality regulations as well as a declining average lifespan for consumer products. Laboratories have also benefited from greater levels of international trade since imports must be tested upon arrival in the U.S.<sup>42</sup>

Roughly one-quarter of employment is located in Shelby County (507 jobs). Businesses in Shelby have been steadily adding new positions over the last five years. Employment in Davidson County declined from 406 jobs in 2012 to 365 today. Other important counties for this industry include Wilson (298 jobs), Knox (275), and Hamilton (110). Roane County also has a sizable concentration of employment (98 jobs). 36 counties in Tennessee have some kind of testing laboratory. Of these counties, 21 have less than 10 total employees.

<sup>&</sup>lt;sup>41</sup> Tennessee's location quotient for life sciences (0.88) is the highest in the research industry sub-cluster.

<sup>&</sup>lt;sup>42</sup> IBISWorld. (2017). Passing grade: Revenue will grow as increasing regulation causes companies to seek testing.



Tennessee has 162 testing laboratories, as compared with 149 in 2012. Nearly all counties avoided a net loss of establishments in the last five years. Some counties, including Davidson and Hamilton, added new businesses even as total employment declined. Average establishment size is quite small (roughly 13 employees per laboratory). Several counties in Tennessee have more than one laboratory but less than 10 total employees. Rutherford County, for example, has five establishments but one of the lowest employment levels in the state. Sumner County increased its number of laboratories from two to four, even as employment declined into single-digits. Wilson County, which has 298 jobs but only four establishments, is the exception to this pattern.

Trends in this industry will likely mirror what has been happening in the R&D sector. Small laboratories will maintain revenue by offering very specialized services, while large establishments will diversify their product offerings and acquire smaller competitors to maximize market share.

Employment concentration in this industry (0.61) is expected to remain unchanged through 2022. Average industry wages in Tennessee (\$75,536) are comparable to most states. Wages are likely to increase as the share of highly-specialized workers within the industry continues to grow. In 2017, Tennessee's testing laboratories generated \$146.0 million in total earnings. 84% of total sales (\$295.3 million) were made to other businesses in the region. Major buyers of industry products include governmental agencies, engineering services, and telecommunication carriers. Testing laboratories rely heavily on other business services industries for production inputs. Key suppliers for testing laboratories include engineering services, management consulting services, and corporate, subsidiary, and regional managing offices.