ECONOMIC STRUCTURE IN APPALACHIA’S URBAN REGIONS: SUPPLEMENT 1

Clustering and Diversification Strategies
ECONOMIC STRUCTURE IN APPALACHIA’S URBAN REGIONS: SUPPLEMENT 1

Clustering and Diversification Strategies

Prepared by the Regional Research Institute, West Virginia University

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Key words: Industrial Clusters, Location Quotients, Shift-Share, Input-Output Analysis, Cluster Analysis and Diversification (CADS)
# Table of Contents

Chapter 1. Albertville, AL .................................................................................................................. 1
Chapter 2. Alexander City, AL .......................................................................................................... 8
Chapter 3. Altoona, PA ..................................................................................................................... 14
Chapter 4. Anderson, SC .................................................................................................................. 21
Chapter 5. Anniston-Oxford, AL ..................................................................................................... 29
Chapter 6. Asheville, NC .................................................................................................................. 36
Chapter 7. Ashtabula, OH ............................................................................................................... 45
Chapter 8. Athens, OH ..................................................................................................................... 53
Chapter 9. Athens, TN ..................................................................................................................... 59
Chapter 10. Beckley, WV ............................................................................................................... 65
Chapter 11. Binghamton, NY .......................................................................................................... 73
Chapter 12. Birmingham-Hoover, AL ............................................................................................. 79
Chapter 13. Blacksburg-Christiansburg-Radford, VA ...................................................................... 87
Chapter 14. Bloomsburg-Berwick, PA ............................................................................................ 95
Chapter 15. Bluefield, WV-VA ...................................................................................................... 103
Chapter 16. Boone, NC ................................................................................................................. 110
Chapter 17. Bradford, PA ............................................................................................................... 116
Chapter 18. Brevard, NC ............................................................................................................... 123
Chapter 19. Calhoun, GA .............................................................................................................. 129
Chapter 20. Cambridge, OH ......................................................................................................... 135
Chapter 21. Cedartown, GA .......................................................................................................... 143
Chapter 22. Charleston, WV ......................................................................................................... 150
Chapter 23. Chattanooga, TN-GA ................................................................................................ 156
Chapter 24. Chillicothe, OH .......................................................................................................... 162
Chapter 25. Clarksburg, WV ......................................................................................................... 168
Chapter 26. Cleveland, TN .......................................................................................................... 175
Chapter 27. Columbus, MS ......................................................................................................... 184
Chapter 28. Cookeville, TN .......................................................................................................... 192
Chapter 29. Corbin, KY ................................................................................................................. 199
Chapter 30. Corinth, MS .............................................................................................................. 206
Chapter 1. Albertville, AL

Study Area Overview

The Albertville, AL study region occupies 566 square-miles and had a 2018 population of 96,109. The employed share of the regional labor force during the 2014-2018 period averaged 95.4%. The Animal Slaughtering and Processing industry was the region’s largest employer in 2018, followed by Food Services and Drinking Places and Elementary and Secondary Schools. These three industries account for a combined 32.72% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 39.94, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Albertville, AL can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 820 followed by Animal Slaughtering and Processing and Other Fabricated Metal Product Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.16, 55.39, and 10.54.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>820</td>
<td>98</td>
<td>1.16</td>
</tr>
<tr>
<td>20</td>
<td>Animal Slaughtering and Processing</td>
<td>738</td>
<td>536</td>
<td>55.39</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>348</td>
<td>353</td>
<td>10.54</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>342</td>
<td>336</td>
<td>0.66</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>303</td>
<td>257</td>
<td>0.75</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>290</td>
<td>313</td>
<td>4.61</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>258</td>
<td>257</td>
<td>3.72</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>252</td>
<td>48</td>
<td>1.16</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>249</td>
<td>219</td>
<td>0.81</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>166</td>
<td>72</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Chapter 1. Albertville, AL

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Albertville, AL, the cluster with the largest CLQ in 2018 is Agribusiness, Food Processing and Technology with a CLQ of 7.15, followed by Transportation Equipment and Primary and Fabricated Metal Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Albertville, AL cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
## Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>6.49</td>
<td>7.15</td>
<td>6,987</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>0.84</td>
<td>1.03</td>
<td>3,953</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.67</td>
<td>0.55</td>
<td>3,950</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.78</td>
<td>0.90</td>
<td>3,753</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>1.98</td>
<td>2.01</td>
<td>2,459</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.04</td>
<td>0.85</td>
<td>2,322</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.23</td>
<td>0.27</td>
<td>1,423</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>3.80</td>
<td>5.11</td>
<td>1,414</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>2.60</td>
<td>2.75</td>
<td>1,093</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>1.03</td>
<td>2.34</td>
<td>853</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>1.99</td>
<td>1.92</td>
<td>687</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.19</td>
<td>1.08</td>
<td>290</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.39</td>
<td>1.06</td>
<td>269</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>1.16</td>
<td>0.93</td>
<td>241</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.88</td>
<td>0.57</td>
<td>93</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>3.92</td>
<td>1.01</td>
<td>92</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.71</td>
<td>0.05</td>
<td>16</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Chapter 1. Albertville, AL

Figure 1: Cluster Bubble Chart of Albertville, AL

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Agribusiness, Food Processing and Technology (6,987)</td>
</tr>
<tr>
<td>- Biomedical/Biotechnical (Life Sciences) (3,953)</td>
</tr>
<tr>
<td>- Business and Financial Services (3,950)</td>
</tr>
<tr>
<td>- Arts, Entertainment, Recreation and Visitor Industries (3,753)</td>
</tr>
<tr>
<td>- Education and Knowledge Creation (2,459)</td>
</tr>
<tr>
<td>- Transportation and Logistics (2,322)</td>
</tr>
<tr>
<td>- Defense and Security (1,423)</td>
</tr>
<tr>
<td>- Transportation Equipment (1,414)</td>
</tr>
<tr>
<td>- Primary and Fabricated Metal Products (1,093)</td>
</tr>
<tr>
<td>- Chemicals and Chemical-Based Products (853)</td>
</tr>
<tr>
<td>- Forest and Wood Products (687)</td>
</tr>
<tr>
<td>- Energy (Fossil and Renewable) (290)</td>
</tr>
<tr>
<td>- Information Technology and Telecommunications (269)</td>
</tr>
<tr>
<td>- Machinery (241)</td>
</tr>
<tr>
<td>- Mining, Glass and Ceramics (93)</td>
</tr>
<tr>
<td>- Apparel and Textiles (92)</td>
</tr>
<tr>
<td>- Computer, Electronic, and Electrical Products (16)</td>
</tr>
</tbody>
</table>
2. CADS Analysis

The 2018 CADS analysis of the economy of Albertville, AL identifies 2 anchor industries in 2 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Animal Slaughtering and Processing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

**Table 3. Anchors, Clusters, and Employment**

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>20</td>
<td>Animal Slaughtering and Processing</td>
<td>5,971</td>
<td>6,709</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>340</td>
<td>630</td>
</tr>
</tbody>
</table>

**Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates**

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Animal Slaughtering and Processing</td>
<td>55.39</td>
<td>536</td>
<td>3.38</td>
<td>12.36</td>
<td>0.43</td>
<td>0.47</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>4.61</td>
<td>313</td>
<td>-6.65</td>
<td>85.29</td>
<td>0.89</td>
<td>0.05</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were
Chapter 1. Albertville, AL

reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 20
Animal Slaughtering and Processing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-1,029</td>
</tr>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>-6,619</td>
</tr>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-68</td>
</tr>
<tr>
<td>5</td>
<td>Support Activities for Agriculture and Forestry</td>
<td>-233</td>
</tr>
<tr>
<td>15</td>
<td>Animal Food Manufacturing</td>
<td>-190</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>-399</td>
</tr>
<tr>
<td>102</td>
<td>Scenic and Sightseeing Transportation and Support Activities for Transportation</td>
<td>-76</td>
</tr>
<tr>
<td>103</td>
<td>Couriers and Messengers</td>
<td>-111</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design and Related Services</td>
<td>-63</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-87</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>-81</td>
</tr>
</tbody>
</table>

Table 6. Phase 2 Deficits Adding Anchor Industry 42
Plastics Product Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-1,036</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>-6,619</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-68</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Support Activities for Agriculture and Forestry</td>
<td>-234</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Animal Food Manufacturing</td>
<td>-190</td>
<td>0</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>-413</td>
<td>13</td>
</tr>
<tr>
<td>102</td>
<td>Scenic and Sightseeing Transportation and Support Activities for Transportation</td>
<td>-81</td>
<td>5</td>
</tr>
<tr>
<td>103</td>
<td>Couriers and Messengers</td>
<td>-114</td>
<td>3</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design and Related Services</td>
<td>-68</td>
<td>5</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-105</td>
<td>18</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>-86</td>
<td>5</td>
</tr>
</tbody>
</table>
Chapter 2. Alexander City, AL

Study Area Overview

The Alexander City, AL study region occupies 1,368 square-miles and had a 2018 population of 51,212. The employed share of the regional labor force during the 2014-2018 period averaged 94.36%. The Motor Vehicle Parts Manufacturing industry was the region’s largest employer in 2018, followed by Employment Services and Government and Unclassified. These three industries account for a combined 25.19% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 41.73, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Alexander City, AL can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Motor Vehicle Parts Manufacturing, whose employment grew by 1,127 followed by Employment Services and Hospitals. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 24.95, 3.64, and 1.97.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>1,127</td>
<td>1,151</td>
<td>24.95</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>759</td>
<td>756</td>
<td>3.64</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>252</td>
<td>134</td>
<td>1.97</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>162</td>
<td>165</td>
<td>3.94</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>142</td>
<td>142</td>
<td>16.63</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>102</td>
<td>65</td>
<td>0.99</td>
</tr>
<tr>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>78</td>
<td>78</td>
<td>2.61</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>74</td>
<td>-191</td>
<td>0.89</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>56</td>
<td>16</td>
<td>0.56</td>
</tr>
<tr>
<td>86</td>
<td>Household and Institutional Furniture and Kitchen</td>
<td>54</td>
<td>139</td>
<td>12.32</td>
</tr>
<tr>
<td></td>
<td>Manufacturing, Excluding Wood TV, Radio and Sewing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine Cabinet Manufacturing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 2. Alexander City, AL

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Alexander City, AL, the cluster with the largest CLQ in 2018 is Transportation Equipment with a CLQ of 12.97, followed by Apparel and Textiles and Forest and Wood Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Alexander City, AL cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.59</td>
<td>0.82</td>
<td>2,266</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.59</td>
<td>1.48</td>
<td>2,210</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>1.49</td>
<td>12.97</td>
<td>1,391</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.79</td>
<td>0.84</td>
<td>1,358</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.51</td>
<td>2.37</td>
<td>1,124</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.43</td>
<td>0.52</td>
<td>1,088</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>4.51</td>
<td>6.44</td>
<td>893</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.81</td>
<td>0.37</td>
<td>386</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.86</td>
<td>1.77</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>27.37</td>
<td>6.93</td>
<td>244</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>1.91</td>
<td>0.91</td>
<td>140</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.56</td>
<td>0.37</td>
<td>140</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.16</td>
<td>0.79</td>
<td>102</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.54</td>
<td>0.66</td>
<td>69</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.92</td>
<td>0.53</td>
<td>52</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.18</td>
<td>0.17</td>
<td>10</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Alexander City, AL

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red: Business and Financial Services (2,266)</td>
</tr>
<tr>
<td>Orange: Biomedical/Biotechnical (Life Sciences) (2,210)</td>
</tr>
<tr>
<td>Yellow: Transportation Equipment (1,391)</td>
</tr>
<tr>
<td>Green: Arts, Entertainment, Recreation and Visitor Industries (1,358)</td>
</tr>
<tr>
<td>Purple: Education and Knowledge Creation (1,124)</td>
</tr>
<tr>
<td>Blue: Defense and Security (1,088)</td>
</tr>
<tr>
<td>Light Pink: Forest and Wood Products (893)</td>
</tr>
<tr>
<td>Grey: Transportation and Logistics (386)</td>
</tr>
<tr>
<td>Light Blue: Chemicals and Chemical-Based Products (250)</td>
</tr>
<tr>
<td>Pink: Apparel and Textiles (244)</td>
</tr>
<tr>
<td>Gold: Primary and Fabricated Metal Products (140)</td>
</tr>
<tr>
<td>Light Orange: Agribusiness, Food Processing and Technology (140)</td>
</tr>
<tr>
<td>Pinkish Red: Computer, Electronic, and Electrical Products (102)</td>
</tr>
<tr>
<td>Blueish Grey: Energy (Fossil and Renewable) (69)</td>
</tr>
<tr>
<td>Greenish Yellow: Information Technology and Telecommunications (52)</td>
</tr>
<tr>
<td>Yellowish Orange: Mining, Glass and Ceramics (10)</td>
</tr>
<tr>
<td>White: Machinery (0)</td>
</tr>
</tbody>
</table>
Chapter 2. Alexander City, AL

2. CADS Analysis
The 2018 CADS analysis of the economy of Alexander City, AL identifies 2 anchor industries in 2 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Motor Vehicle Parts Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>209</td>
<td>1,336</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>47</td>
<td>209</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>24.95</td>
<td>1,151</td>
<td>-11.56</td>
<td>539.93</td>
<td>0.45</td>
<td>0.36</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>3.94</td>
<td>165</td>
<td>-6.65</td>
<td>344.49</td>
<td>0.65</td>
<td>0.04</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were
Chapter 2. Alexander City, AL

reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 81
Motor Vehicle Parts Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-58</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-39</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-133</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-60</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-146</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-43</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-38</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-79</td>
</tr>
<tr>
<td>91</td>
<td>Wholesale Trade</td>
<td>-130</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-114</td>
</tr>
</tbody>
</table>

Table 6. Phase 2 Deficits Adding Anchor Industry 42
Plastics Product Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-59</td>
<td>-0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-40</td>
<td>-0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-133</td>
<td>-0</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-60</td>
<td>-0</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-147</td>
<td>-1</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-43</td>
<td>-1</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-38</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-80</td>
<td>-1</td>
</tr>
<tr>
<td>91</td>
<td>Wholesale Trade</td>
<td>-136</td>
<td>-6</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-118</td>
<td>-4</td>
</tr>
</tbody>
</table>
Chapter 3. Altoona, PA

Study Area Overview

The Altoona, PA study region occupies 526 square-miles and had a 2018 population of 122,492. The employed share of the regional labor force during the 2014-2018 period averaged 96.1%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by All Other Retail and Hospitals. These three industries account for a combined 20.57% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 32.08, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Altoona, PA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Other Food Manufacturing, whose employment grew by 847 followed by Business Support Services and Individual and Family Services. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 11.62, 2.45, and 1.57.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>847</td>
<td>804</td>
<td>11.62</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>695</td>
<td>678</td>
<td>2.45</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>689</td>
<td>-91</td>
<td>1.57</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>618</td>
<td>341</td>
<td>1.82</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>482</td>
<td>287</td>
<td>1.21</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>370</td>
<td>118</td>
<td>1.22</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>280</td>
<td>-228</td>
<td>2.07</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>277</td>
<td>-254</td>
<td>2.69</td>
</tr>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>272</td>
<td>272</td>
<td>4.96</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>272</td>
<td>234</td>
<td>0.88</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Altoona, PA, the cluster with the largest CLQ in 2018 is Forest and Wood Products with a CLQ of 3.38, followed by Mining, Glass and Ceramics and Apparel and Textiles. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Altoona, PA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

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<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.74</td>
<td>1.80</td>
<td>10,903</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.65</td>
<td>0.62</td>
<td>7,017</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.96</td>
<td>0.89</td>
<td>5,802</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.61</td>
<td>1.18</td>
<td>5,052</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.59</td>
<td>2.20</td>
<td>4,233</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.64</td>
<td>1.31</td>
<td>2,018</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>2.87</td>
<td>3.38</td>
<td>1,905</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.23</td>
<td>0.21</td>
<td>1,751</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.90</td>
<td>1.24</td>
<td>709</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>2.90</td>
<td>2.59</td>
<td>664</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.90</td>
<td>0.87</td>
<td>543</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>1.02</td>
<td>1.12</td>
<td>458</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>1.03</td>
<td>0.79</td>
<td>419</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>1.62</td>
<td>2.55</td>
<td>364</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.83</td>
<td>0.91</td>
<td>361</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.70</td>
<td>0.58</td>
<td>255</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.61</td>
<td>0.51</td>
<td>216</td>
</tr>
</tbody>
</table>

*Note: Increasing cluster concentrations are highlighted in blue.*
Chapter 3. Altoona, PA

Figure 1: Cluster Bubble Chart of Altoona, PA

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (10,903)</td>
</tr>
<tr>
<td>Business and Financial Services (7,017)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (5,802)</td>
</tr>
<tr>
<td>Transportation and Logistics (5,052)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (4,233)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (2,018)</td>
</tr>
<tr>
<td>Forest and Wood Products (1,905)</td>
</tr>
<tr>
<td>Defense and Security (1,751)</td>
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<tr>
<td>Chemicals and Chemical-Based Products (709)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (664)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (543)</td>
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<tr>
<td>Information Technology and Telecommunications (361)</td>
</tr>
<tr>
<td>Transportation Equipment (255)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (216)</td>
</tr>
</tbody>
</table>
Chapter 3. Altoona, PA

2. CADS Analysis

The 2018 CADS analysis of the economy of Altoona, PA identifies 4 anchor industries in 3 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Other Food Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>102</td>
<td>949</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>146</td>
<td>Offices of Physicians</td>
<td>1,138</td>
<td>1,756</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>137</td>
<td>Business Support Services</td>
<td>149</td>
<td>844</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>151</td>
<td>Home Health Care Services</td>
<td>317</td>
<td>687</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>11.62</td>
<td>804</td>
<td>41.93</td>
<td>830.39</td>
<td>0.65</td>
<td>0.07</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>1.82</td>
<td>341</td>
<td>24.38</td>
<td>54.31</td>
<td>0.90</td>
<td>0.04</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>2.45</td>
<td>678</td>
<td>11.43</td>
<td>466.65</td>
<td>0.91</td>
<td>0.01</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>1.22</td>
<td>118</td>
<td>79.39</td>
<td>116.43</td>
<td>0.89</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Chapter 3. Altoona, PA

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 23

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-560</td>
</tr>
<tr>
<td>5</td>
<td>Support Activities for Agriculture and Forestry</td>
<td>-46</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-28</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing</td>
<td>-10</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-12</td>
</tr>
<tr>
<td>127</td>
<td>Specialized Design Services</td>
<td>-5</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 6. Phase 2 Deficits Adding Anchor Industry 146

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-562</td>
<td>-2</td>
</tr>
<tr>
<td>5</td>
<td>Support Activities for Agriculture and Forestry</td>
<td>-47</td>
<td>-0</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-28</td>
<td>0</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing</td>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-12</td>
<td>-1</td>
</tr>
<tr>
<td>127</td>
<td>Specialized Design Services</td>
<td>-10</td>
<td>-5</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-8</td>
<td>-12</td>
</tr>
</tbody>
</table>

Table 7. Phase 3 Deficits Adding Anchor Industry 137

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Support Services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry #</td>
<td>Industry Name</td>
<td>Employment</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-563</td>
</tr>
<tr>
<td>5</td>
<td>Support Activities for Agriculture and Forestry</td>
<td>-47</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-28</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing</td>
<td>-10</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-12</td>
</tr>
<tr>
<td>127</td>
<td>Specialized Design Services</td>
<td>-11</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-14</td>
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</table>

Table 8. Phase 4 Deficits Adding Anchor Industry 151

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-563</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Support Activities for Agriculture and Forestry</td>
<td>-47</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-28</td>
<td>0</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing</td>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-13</td>
<td>0</td>
</tr>
<tr>
<td>127</td>
<td>Specialized Design Services</td>
<td>-11</td>
<td>0</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-16</td>
<td>-2</td>
</tr>
</tbody>
</table>
Chapter 4. Anderson, SC

Study Area Overview

The Anderson, SC study region occupies 715 square-miles and had a 2018 population of 200,482. The employed share of the regional labor force during the 2014-2018 period averaged 95.4%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and All Other Retail. These three industries account for a combined 23.58% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 37.08, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Anderson, SC can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Converted Paper Product Manufacturing, whose employment grew by 847 followed by Agriculture, Construction, and Mining Machinery Manufacturing and Individual and Family Services. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 8.59, 7.76, and 0.85.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>Converted Paper Product Manufacturing</td>
<td>847</td>
<td>870</td>
<td>8.59</td>
</tr>
<tr>
<td>62</td>
<td>Agriculture, Construction, and Mining Machinery Manufacturing</td>
<td>691</td>
<td>691</td>
<td>7.76</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>689</td>
<td>480</td>
<td>0.85</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>688</td>
<td>-1,075</td>
<td>1.33</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>677</td>
<td>396</td>
<td>2.13</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>519</td>
<td>634</td>
<td>20.84</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>519</td>
<td>-663</td>
<td>10.21</td>
</tr>
<tr>
<td>91</td>
<td>Wholesale Trade</td>
<td>429</td>
<td>421</td>
<td>0.83</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>399</td>
<td>202</td>
<td>1.62</td>
</tr>
<tr>
<td>95</td>
<td>All Other Retail</td>
<td>370</td>
<td>494</td>
<td>1.30</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Anderson, SC, the cluster with the largest CLQ in 2018 is Apparel and Textiles with a CLQ of 12.89, followed by Transportation Equipment and Chemicals and Chemical-Based Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Anderson, SC cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.49</td>
<td>1.31</td>
<td>8,984</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.18</td>
<td>1.07</td>
<td>7,880</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.52</td>
<td>0.50</td>
<td>6,289</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.86</td>
<td>2.82</td>
<td>6,110</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.77</td>
<td>0.81</td>
<td>3,915</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>5.58</td>
<td>6.17</td>
<td>3,032</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>3.27</td>
<td>4.18</td>
<td>2,698</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.27</td>
<td>0.27</td>
<td>2,534</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>11.64</td>
<td>12.89</td>
<td>2,076</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>2.73</td>
<td>3.05</td>
<td>1,817</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.49</td>
<td>2.54</td>
<td>1,610</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>2.18</td>
<td>2.63</td>
<td>1,121</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>1.30</td>
<td>1.66</td>
<td>1,175</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.34</td>
<td>0.29</td>
<td>505</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>2.13</td>
<td>1.74</td>
<td>502</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.59</td>
<td>0.59</td>
<td>282</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.11</td>
<td>0.49</td>
<td>221</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Anderson, SC

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Biomedical/Biotechnical (Life Sciences) (8,984)</td>
</tr>
<tr>
<td>- Arts, Entertainment, Recreation and Visitor Industries (7,880)</td>
</tr>
<tr>
<td>- Business and Financial Services (6,289)</td>
</tr>
<tr>
<td>- Education and Knowledge Creation (6,110)</td>
</tr>
<tr>
<td>- Transportation and Logistics (3,915)</td>
</tr>
<tr>
<td>- Transportation Equipment (3,032)</td>
</tr>
<tr>
<td>- Chemicals and Chemical-Based Products (2,698)</td>
</tr>
<tr>
<td>- Defense and Security (2,534)</td>
</tr>
<tr>
<td>- Apparel and Textiles (2,076)</td>
</tr>
<tr>
<td>- Computer, Electronic, and Electrical Products (1,817)</td>
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<tr>
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<tr>
<td>- Machinery (1,211)</td>
</tr>
<tr>
<td>- Primary and Fabricated Metal Products (1,175)</td>
</tr>
<tr>
<td>- Agribusiness, Food Processing and Technology (505)</td>
</tr>
<tr>
<td>- Mining, Glass and Ceramics (502)</td>
</tr>
<tr>
<td>- Energy (Fossil and Renewable) (282)</td>
</tr>
<tr>
<td>- Information Technology and Telecommunications (221)</td>
</tr>
</tbody>
</table>
2. CADS Analysis
The 2018 CADS analysis of the economy of Anderson, SC identifies 6 anchor industries in 5 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Motor Vehicle Parts Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>2,724</td>
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</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and</td>
<td>76</td>
<td>Household Appliance Manufacturing</td>
<td>1,352</td>
<td>1,563</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-</td>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>666</td>
<td>1,185</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>32</td>
<td>Converted Paper Product</td>
<td>108</td>
<td>955</td>
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<td></td>
<td></td>
<td></td>
<td>Manufacturing</td>
<td></td>
<td></td>
</tr>
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<td>Machinery</td>
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<td>Agriculture, Construction, and</td>
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<td>693</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mining Machinery Manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-</td>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>928</td>
<td>1,136</td>
</tr>
<tr>
<td></td>
<td>Based Products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>12.33</td>
<td>612</td>
<td>-11.56</td>
<td>10.91</td>
<td>0.66</td>
<td>0.22</td>
</tr>
<tr>
<td>76</td>
<td>Household Appliance Manufacturing</td>
<td>59.94</td>
<td>549</td>
<td>-25.03</td>
<td>15.58</td>
<td>0.74</td>
<td>0.07</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>20.84</td>
<td>634</td>
<td>-17.19</td>
<td>78.00</td>
<td>0.87</td>
<td>0.06</td>
</tr>
<tr>
<td>32</td>
<td>Converted Paper Product Manufacturing</td>
<td>8.59</td>
<td>870</td>
<td>-21.07</td>
<td>784.26</td>
<td>0.69</td>
<td>0.05</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 81**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
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<tbody>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-77</td>
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<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-10</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-132</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-89</td>
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<tr>
<td>52</td>
<td>Foundries</td>
<td>-301</td>
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<td>53</td>
<td>Forging and Stamping</td>
<td>-72</td>
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<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
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<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
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<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
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<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
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**Table 6. Phase 2 Deficits Adding Anchor Industry 76**

<table>
<thead>
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<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
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</thead>
<tbody>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
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<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
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</table>
### Chapter 4. Anderson, SC

<table>
<thead>
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<th>Employment</th>
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</thead>
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<tr>
<td>48</td>
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<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-115</td>
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<td>52</td>
<td>Foundries</td>
<td>-324</td>
<td>-23</td>
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<td>53</td>
<td>Forging and Stamping</td>
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</tr>
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<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-177</td>
<td>-70</td>
</tr>
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<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
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<td>-18</td>
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<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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<td>Management of Companies and Enterprises</td>
<td>-137</td>
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**Table 7. Phase 3 Deficits Adding Anchor Industry 43**

**Rubber Product Manufacturing**

<table>
<thead>
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<td>Pulp, Paper, and Paperboard Mills</td>
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<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
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<td>-8</td>
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<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-119</td>
<td>-4</td>
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<tr>
<td>52</td>
<td>Foundries</td>
<td>-326</td>
<td>-2</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-133</td>
<td>-10</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-215</td>
<td>-38</td>
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<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-104</td>
<td>-16</td>
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<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-311</td>
<td>-24</td>
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<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-79</td>
<td>-1</td>
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<td>133</td>
<td>Management of Companies and Enterprises</td>
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</table>

**Table 8. Phase 4 Deficits Adding Anchor Industry 32**

**Converted Paper Product Manufacturing**

<table>
<thead>
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<th>Industry #</th>
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<th>Employment</th>
<th>Added to Deficit</th>
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<tbody>
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<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
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<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-176</td>
<td>-2</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-121</td>
<td>-2</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-327</td>
<td>-1</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-137</td>
<td>-4</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-248</td>
<td>-33</td>
</tr>
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<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-124</td>
<td>-20</td>
</tr>
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<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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<td>-15</td>
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<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-80</td>
<td>-1</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-224</td>
<td>-43</td>
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</table>

**Table 9. Phase 5 Deficits Adding Anchor Industry 62**

**Agriculture, Construction, and Mining Machinery Manufacturing**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
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<td>Apparel, Leather and Allied Product Manufacturing</td>
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<td>-1</td>
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<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-119</td>
<td>-1</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-201</td>
<td>-25</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-134</td>
<td>-13</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-347</td>
<td>-20</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-159</td>
<td>-23</td>
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</table>
Table 10. Phase 6 Deficits Adding Anchor Industry 42

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-84</td>
<td>-1</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-120</td>
<td>-2</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-202</td>
<td>-2</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-135</td>
<td>-1</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-348</td>
<td>-2</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-160</td>
<td>-1</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-285</td>
<td>-9</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-135</td>
<td>-7</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-360</td>
<td>-34</td>
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<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-87</td>
<td>-7</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-280</td>
<td>-56</td>
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</table>
Chapter 5. Anniston-Oxford, AL

Study Area Overview

The Anniston-Oxford, AL study region occupies 606 square-miles and had a 2018 population of 114,277. The employed share of the regional labor force during the 2014-2018 period averaged 92.2%. The Government and Unclassified industry was the region’s largest employer in 2018, followed by Food Services and Drinking Places and All Other Retail. These three industries account for a combined 28.04% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 29, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Anniston-Oxford, AL can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Plastics Product Manufacturing, whose employment grew by 379 followed by Junior Colleges, Colleges, Universities, and Professional Schools and Other Transportation Equipment Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 2.44, 2.15, and 40.13.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>379</td>
<td>380</td>
<td>2.44</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>313</td>
<td>125</td>
<td>2.15</td>
</tr>
<tr>
<td>85</td>
<td>Other Transportation Equipment Manufacturing</td>
<td>310</td>
<td>323</td>
<td>40.13</td>
</tr>
<tr>
<td>95</td>
<td>All Other Retail</td>
<td>244</td>
<td>317</td>
<td>1.14</td>
</tr>
<tr>
<td>141</td>
<td>Other Support Services</td>
<td>188</td>
<td>186</td>
<td>2.05</td>
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<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>167</td>
<td>94</td>
<td>0.93</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>167</td>
<td>155</td>
<td>1.72</td>
</tr>
<tr>
<td>29</td>
<td>Veneer, Plywood, and Engineered Wood Product Manufacturing</td>
<td>119</td>
<td>138</td>
<td>7.80</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>114</td>
<td>-243</td>
<td>0.66</td>
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<td>52</td>
<td>Foundries</td>
<td>107</td>
<td>341</td>
<td>29.44</td>
</tr>
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</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Anniston-Oxford, AL, the cluster with the largest CLQ in 2018 is Transportation Equipment with a CLQ of 6.43, followed by Primary and Fabricated Metal Products and Education and Knowledge Creation. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Anniston-Oxford, AL cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
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<tr>
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<td>1.27</td>
<td>5,851</td>
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<td>8</td>
<td>Defense and Security</td>
<td>0.92</td>
<td>0.88</td>
<td>5,649</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.05</td>
<td>1.05</td>
<td>5,226</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.58</td>
<td>0.57</td>
<td>4,923</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.91</td>
<td>2.89</td>
<td>4,230</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.16</td>
<td>0.81</td>
<td>2,642</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>4.29</td>
<td>6.43</td>
<td>2,133</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>3.84</td>
<td>4.42</td>
<td>2,114</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>1.40</td>
<td>1.72</td>
<td>740</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.38</td>
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<td>Agribusiness, Food Processing and Technology</td>
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<td>0.34</td>
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<tr>
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<td>Mining, Glass and Ceramics</td>
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<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.03</td>
<td>0.81</td>
<td>246</td>
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<td>Apparel and Textiles</td>
<td>4.69</td>
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<td>0.10</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.14</td>
<td>0.07</td>
<td>29</td>
</tr>
</tbody>
</table>

*Note: Increasing cluster concentrations are highlighted in blue.*
Chapter 5. Anniston-Oxford, AL

Figure 1: Cluster Bubble Chart of Anniston-Oxford, AL

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
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</thead>
<tbody>
<tr>
<td>◆ Biomedical/Biotechnical (Life Sciences) (5,851)</td>
</tr>
<tr>
<td>◆ Defense and Security (5,649)</td>
</tr>
<tr>
<td>◆ Arts, Entertainment, Recreation and Visitor Industries (5,226)</td>
</tr>
<tr>
<td>◆ Business and Financial Services (4,923)</td>
</tr>
<tr>
<td>◆ Education and Knowledge Creation (4,230)</td>
</tr>
<tr>
<td>◆ Transportation and Logistics (2,642)</td>
</tr>
<tr>
<td>◆ Transportation Equipment (2,133)</td>
</tr>
<tr>
<td>◆ Primary and Fabricated Metal Products (2,114)</td>
</tr>
<tr>
<td>◆ Forest and Wood Products (740)</td>
</tr>
<tr>
<td>◆ Chemicals and Chemical-Based Products (667)</td>
</tr>
<tr>
<td>◆ Agribusiness, Food Processing and Technology (397)</td>
</tr>
<tr>
<td>◆ Mining, Glass and Ceramics (299)</td>
</tr>
<tr>
<td>◆ Energy (Fossil and Renewable) (267)</td>
</tr>
<tr>
<td>◆ Information Technology and Telecommunications (246)</td>
</tr>
<tr>
<td>◆ Apparel and Textiles (78)</td>
</tr>
<tr>
<td>◆ Machinery (30)</td>
</tr>
<tr>
<td>◆ Computer, Electronic, and Electrical Products (29)</td>
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</table>
Chapter 5. Anniston-Oxford, AL

2. CADS Analysis

The 2018 CADS analysis of the economy of Anniston-Oxford, AL identifies 4 anchor industries in 4 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Foundries, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>52</td>
<td>Foundries</td>
<td>868</td>
<td>975</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>80</td>
<td>Motor Vehicle Body and Trailer Manufacturing</td>
<td>498</td>
<td>564</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>136</td>
<td>Employment Services</td>
<td>1,583</td>
<td>1,750</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>788</td>
<td>1,101</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National Growth Rate (%)</th>
<th>Regional Growth Rate (%)</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>Foundries</td>
<td>29.44</td>
<td>341</td>
<td>-26.93</td>
<td>12.35</td>
<td>0.66</td>
<td>0.05</td>
</tr>
<tr>
<td>80</td>
<td>Motor Vehicle Body and Trailer Manufacturing</td>
<td>12.36</td>
<td>83</td>
<td>-3.45</td>
<td>13.12</td>
<td>0.76</td>
<td>0.04</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>1.72</td>
<td>155</td>
<td>0.78</td>
<td>10.55</td>
<td>0.92</td>
<td>0.03</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>2.15</td>
<td>125</td>
<td>23.90</td>
<td>39.69</td>
<td>0.89</td>
<td>0.02</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

### Table 5. Phase 1 Deficits for Anchor Industry 52

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-10</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-6</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-31</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-36</td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>-25</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>N/A</td>
</tr>
<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-4</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-8</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-25</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 6. Phase 2 Deficits Adding Anchor Industry 80

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-19</td>
<td>-9</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-12</td>
<td>-6</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-46</td>
<td>-15</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-41</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>-27</td>
<td>-2</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-9</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-10</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-11</td>
<td>-3</td>
</tr>
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</table>
### Table 7. Phase 3 Deficits Adding Anchor Industry 136

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-19</td>
<td>-0</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-12</td>
<td>-0</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-46</td>
<td>-0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-42</td>
<td>-0</td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>-28</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-10</td>
<td>-1</td>
</tr>
<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-11</td>
<td>-0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-11</td>
<td>-0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-54</td>
<td>-3</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-14</td>
<td>-37</td>
</tr>
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</table>

### Table 8. Phase 4 Deficits Adding Anchor Industry 144

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-19</td>
<td>-0</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-12</td>
<td>-0</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-46</td>
<td>-0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-42</td>
<td>-0</td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>-28</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-11</td>
<td>-1</td>
</tr>
<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-11</td>
<td>-0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-12</td>
<td>-0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-56</td>
<td>-2</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-24</td>
<td>-10</td>
</tr>
</tbody>
</table>
Chapter 6. Asheville, NC

Study Area Overview

The Asheville, NC study region occupies 2,034 square-miles and had a 2018 population of 459,585. The employed share of the regional labor force during the 2014-2018 period averaged 96.66%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Hospitals and All Other Retail. These three industries account for a combined 23.57% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 28.21, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Asheville, NC can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 5,956 followed by Hospitals and Food and Beverage Stores. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.39, 2.11, and 1.85.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>5,956</td>
<td>1,716</td>
<td>1.39</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>3,600</td>
<td>1,902</td>
<td>2.11</td>
</tr>
<tr>
<td>93</td>
<td>Food and Beverage Stores</td>
<td>2,594</td>
<td>2,293</td>
<td>1.85</td>
</tr>
<tr>
<td>24</td>
<td>Beverage Manufacturing</td>
<td>1,223</td>
<td>1,042</td>
<td>4.87</td>
</tr>
<tr>
<td>95</td>
<td>All Other Retail</td>
<td>1,146</td>
<td>1,494</td>
<td>1.25</td>
</tr>
<tr>
<td>162</td>
<td>Museums, Historical Sites, and Similar Institutions</td>
<td>1,030</td>
<td>650</td>
<td>10.11</td>
</tr>
<tr>
<td>148</td>
<td>Offices of Other Health Practitioners</td>
<td>969</td>
<td>524</td>
<td>1.32</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>826</td>
<td>300</td>
<td>0.89</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>783</td>
<td>97</td>
<td>1.34</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>743</td>
<td>-394</td>
<td>1.70</td>
</tr>
</tbody>
</table>
Chapter 6. Asheville, NC

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Asheville, NC, the cluster with the largest CLQ in 2018 is Apparel and Textiles with a CLQ of 2.86, followed by Computer, Electronic, and Electrical Products and Education and Knowledge Creation. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Asheville, NC cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.80</td>
<td>1.70</td>
<td>34,064</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.31</td>
<td>1.39</td>
<td>30,142</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.67</td>
<td>0.66</td>
<td>24,445</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.70</td>
<td>2.23</td>
<td>14,171</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.35</td>
<td>0.36</td>
<td>10,067</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.84</td>
<td>0.64</td>
<td>9,058</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>1.89</td>
<td>2.48</td>
<td>4,343</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.57</td>
<td>0.76</td>
<td>3,868</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>1.57</td>
<td>1.99</td>
<td>3,771</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>1.31</td>
<td>1.32</td>
<td>2,461</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>1.38</td>
<td>1.44</td>
<td>2,070</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>2.08</td>
<td>1.10</td>
<td>1,489</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>3.07</td>
<td>2.86</td>
<td>1,353</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.63</td>
<td>0.62</td>
<td>1,289</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.05</td>
<td>1.01</td>
<td>851</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.47</td>
<td>0.50</td>
<td>661</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.48</td>
<td>0.46</td>
<td>636</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Asheville, NC

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (34,064)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (30,142)</td>
</tr>
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<td>Transportation and Logistics (9,058)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (4,343)</td>
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<tr>
<td>Agribusiness, Food Processing and Technology (3,868)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (3,771)</td>
</tr>
<tr>
<td>Forest and Wood Products (2,461)</td>
</tr>
<tr>
<td>Transportation Equipment (2,070)</td>
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<tr>
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<tr>
<td>Primary and Fabricated Metal Products (1,289)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (851)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (661)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (636)</td>
</tr>
</tbody>
</table>
Chapter 6. Asheville, NC

2. CADS Analysis
The 2018 CADS analysis of the economy of Asheville, NC identifies 6 anchor industries in 4 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Hospitals, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>153</td>
<td>Hospitals</td>
<td>9,390</td>
<td>12,990</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>14,210</td>
<td>20,166</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>1,880</td>
<td>2,324</td>
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<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>77</td>
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<td>2,442</td>
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<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>166</td>
<td>Accommodation</td>
<td>3,788</td>
<td>4,432</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>162</td>
<td>Museums, Historical Sites, and Similar Institutions</td>
<td>1,079</td>
<td>2,109</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>2.11</td>
<td>1,902</td>
<td>18.09</td>
<td>38.34</td>
<td>0.92</td>
<td>0.11</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>1.39</td>
<td>1,716</td>
<td>29.84</td>
<td>41.91</td>
<td>0.96</td>
<td>0.07</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>3.26</td>
<td>568</td>
<td>-6.65</td>
<td>23.57</td>
<td>0.96</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Chapter 6. Asheville, NC

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>14.45</td>
</tr>
<tr>
<td>166</td>
<td>Accommodation</td>
<td>1.80</td>
</tr>
<tr>
<td>162</td>
<td>Museums, Historical Sites, and Similar Institutions</td>
<td>10.11</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 153

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Hospitals</strong></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-7</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-1</td>
</tr>
<tr>
<td>21</td>
<td>Seafood Product Preparation and Packaging</td>
<td>N/A</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-3</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-3</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-2</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-5</td>
</tr>
<tr>
<td>69</td>
<td>Computer and Peripheral Equipment Manufacturing, Excluding Digital Camera Manufacturing</td>
<td>-7</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>N/A</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-6</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-3</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-261</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>N/A</td>
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### Table 6. Phase 2 Deficits Adding Anchor Industry 167

Food Services and Drinking Places

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>-68</td>
<td>-102</td>
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<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-49</td>
<td>-42</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>21</td>
<td>Seafood Product Preparation and Packaging</td>
<td>-14</td>
<td>-18</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-4</td>
<td>-2</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-6</td>
<td>-3</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-7</td>
<td>-5</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-8</td>
<td>-3</td>
</tr>
<tr>
<td>69</td>
<td>Computer and Peripheral Equipment Manufacturing, Excluding Digital Camera Manufacturing</td>
<td>-12</td>
<td>-4</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>N/A</td>
<td>-12</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-13</td>
<td>-7</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-6</td>
<td>-4</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-290</td>
<td>-29</td>
</tr>
<tr>
<td>170</td>
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<td>-32</td>
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### Table 7. Phase 3 Deficits Adding Anchor Industry 42

Plastics Product Manufacturing

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<thead>
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<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>-70</td>
<td>-2</td>
</tr>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-49</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-5</td>
<td>-2</td>
</tr>
<tr>
<td>21</td>
<td>Seafood Product Preparation and Packaging</td>
<td>-14</td>
<td>0</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-10</td>
<td>-6</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-10</td>
<td>-4</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-10</td>
<td>-3</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-13</td>
<td>-5</td>
</tr>
<tr>
<td>69</td>
<td>Computer and Peripheral Equipment Manufacturing, Excluding Digital Camera Manufacturing</td>
<td>-17</td>
<td>-5</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>N/A</td>
<td>-38</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-33</td>
<td>-20</td>
</tr>
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<td>Cable and Other Subscription Programming</td>
<td>-7</td>
<td>-1</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-299</td>
<td>-9</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>N/A</td>
<td>-15</td>
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</table>

### Table 8. Phase 4 Deficits Adding Anchor Industry 77

Electrical Equipment Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>-71</td>
<td>-1</td>
</tr>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-49</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-18</td>
<td>-13</td>
</tr>
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</table>
### Table 9. Phase 5 Deficits Adding Anchor Industry 166

**Accommodation**

<table>
<thead>
<tr>
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<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
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<td>2</td>
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</tr>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
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<td>-7</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-18</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>Seafood Product Preparation and Packaging</td>
<td>-17</td>
<td>-3</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-17</td>
<td>-1</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-41</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-24</td>
<td>-1</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-101</td>
<td>1</td>
</tr>
<tr>
<td>69</td>
<td>Computer and Peripheral Equipment Manufacturing, Excluding Digital Camera Manufacturing</td>
<td>-22</td>
<td>-3</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-40</td>
<td>-4</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-41</td>
<td>-2</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-10</td>
<td>-3</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-321</td>
<td>-12</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-16</td>
<td>-10</td>
</tr>
</tbody>
</table>

### Table 10. Phase 6 Deficits Adding Anchor Industry 162

**Museums, Historical Sites, and Similar Institutions**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>-86</td>
<td>-1</td>
</tr>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-56</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-18</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>Seafood Product Preparation and Packaging</td>
<td>-17</td>
<td>0</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-17</td>
<td>0</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-41</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-24</td>
<td>0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-101</td>
<td>0</td>
</tr>
<tr>
<td>69</td>
<td>Computer and Peripheral Equipment Manufacturing, Excluding Digital Camera Manufacturing</td>
<td>-23</td>
<td>-1</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-42</td>
<td>-2</td>
</tr>
<tr>
<td>Code</td>
<td>Industry Description</td>
<td>2019</td>
<td>2020</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-42</td>
<td>-0</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-11</td>
<td>-1</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-339</td>
<td>-18</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-19</td>
<td>-3</td>
</tr>
</tbody>
</table>
Chapter 7. Ashtabula, OH

Study Area Overview

The Ashtabula, OH study region occupies 702 square-miles and had a 2018 population of 97,493. The employed share of the regional labor force during the 2014-2018 period averaged 94.3%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and Hospitals. These three industries account for a combined 21.62% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 39.44, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Ashtabula, OH can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Accounting, Tax Preparation, Bookkeeping, and Payroll Services, whose employment grew by 477 followed by Hospitals and Converted Paper Product Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 2.6, 1.87, and 9.56.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>Accounting, Tax Preparation, Bookkeeping, and Payroll Services</td>
<td>477</td>
<td>464</td>
<td>2.60</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>411</td>
<td>153</td>
<td>1.87</td>
</tr>
<tr>
<td>32</td>
<td>Converted Paper Product Manufacturing</td>
<td>256</td>
<td>307</td>
<td>9.56</td>
</tr>
<tr>
<td>135</td>
<td>Facilities Support Services</td>
<td>228</td>
<td>204</td>
<td>10.41</td>
</tr>
<tr>
<td>156</td>
<td>Community and Vocational Rehabilitation Services</td>
<td>189</td>
<td>190</td>
<td>3.15</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>156</td>
<td>27</td>
<td>1.63</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>149</td>
<td>149</td>
<td>8.15</td>
</tr>
<tr>
<td>176</td>
<td>Religious Organizations</td>
<td>139</td>
<td>137</td>
<td>0.63</td>
</tr>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>127</td>
<td>122</td>
<td>26.21</td>
</tr>
<tr>
<td>24</td>
<td>Beverage Manufacturing</td>
<td>117</td>
<td>99</td>
<td>2.93</td>
</tr>
</tbody>
</table>
Chapter 7. Ashtabula, OH

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Ashtabula, OH, the cluster with the largest CLQ in 2018 is Chemicals and Chemical-Based Products with a CLQ of 8.8, followed by Machinery and Primary and Fabricated Metal Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Ashtabula, OH cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.57</td>
<td>1.52</td>
<td>4,859</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.05</td>
<td>0.99</td>
<td>3,435</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.38</td>
<td>0.46</td>
<td>2,738</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>3.45</td>
<td>2.67</td>
<td>2,709</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>8.88</td>
<td>8.80</td>
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</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.66</td>
<td>0.65</td>
<td>1,466</td>
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<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.24</td>
<td>0.27</td>
<td>1,192</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
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<td>Forest and Wood Products</td>
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<td>Machinery</td>
<td>2.73</td>
<td>3.81</td>
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<td>Transportation Equipment</td>
<td>4.34</td>
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<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.68</td>
<td>1.38</td>
<td>385</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.14</td>
<td>0.43</td>
<td>346</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.64</td>
<td>1.13</td>
<td>153</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.07</td>
<td>0.58</td>
<td>130</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.51</td>
<td>0.58</td>
<td>121</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.93</td>
<td>1.40</td>
<td>106</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Ashtabula, OH
Chapter 7. Ashtabula, OH

2. CADS Analysis
The 2018 CADS analysis of the economy of Ashtabula, OH identifies 5 anchor industries in 4 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Basic Chemical Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>632</td>
<td>759</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>153</td>
<td>Hospitals</td>
<td>1,429</td>
<td>1,840</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>32</td>
<td>Converted Paper Product Manufacturing</td>
<td>242</td>
<td>498</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>489</td>
<td>447</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>534</td>
<td>577</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>26.21</td>
<td>122</td>
<td>0.73</td>
<td>20.09</td>
<td>0.64</td>
<td>0.28</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>1.87</td>
<td>153</td>
<td>18.09</td>
<td>28.76</td>
<td>0.74</td>
<td>0.07</td>
</tr>
<tr>
<td>32</td>
<td>Converted Paper Product Manufacturing</td>
<td>9.56</td>
<td>307</td>
<td>-21.07</td>
<td>105.76</td>
<td>0.66</td>
<td>0.05</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>16.78</td>
<td>42</td>
<td>-17.19</td>
<td>-8.59</td>
<td>0.82</td>
<td>0.04</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 35**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-226</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-10</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-18</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-6</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-4</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-17</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-18</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-36</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-1</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-33</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-8</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-23</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-23</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-70</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>-17</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-20</td>
</tr>
</tbody>
</table>
Table 6. Phase 2 Deficits Adding Anchor Industry 153

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-229</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-11</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-19</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-9</td>
<td>2</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-5</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-17</td>
<td>1</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation</td>
<td>-19</td>
<td>1</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component</td>
<td>-39</td>
<td>3</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-23</td>
<td>22</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-33</td>
<td>1</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-65</td>
<td>57</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related</td>
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<td>8</td>
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<td>129</td>
<td>Management, Scientific, and Technical</td>
<td>-81</td>
<td>58</td>
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<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-99</td>
<td>29</td>
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<td>137</td>
<td>Business Support Services</td>
<td>-33</td>
<td>16</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and</td>
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<td>9</td>
</tr>
<tr>
<td></td>
<td>Equipment (except Automotive and Electronic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repair and Maintenance</td>
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Table 7. Phase 3 Deficits Adding Anchor Industry 32

<table>
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<tbody>
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<td>9</td>
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<td>3</td>
<td>Forestry and Logging</td>
<td>-29</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-20</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-31</td>
<td>22</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-62</td>
<td>57</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-18</td>
<td>1</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation</td>
<td>-23</td>
<td>5</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component</td>
<td>-48</td>
<td>9</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-23</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-40</td>
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<td>117</td>
<td>Insurance Carriers</td>
<td>-68</td>
<td>2</td>
</tr>
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<td>126</td>
<td>Architectural, Engineering, and Related</td>
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<td>13</td>
</tr>
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<td>129</td>
<td>Management, Scientific, and Technical</td>
<td>-90</td>
<td>9</td>
</tr>
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<td>133</td>
<td>Management of Companies and Enterprises</td>
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<td>23</td>
</tr>
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<td>137</td>
<td>Business Support Services</td>
<td>-40</td>
<td>7</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and</td>
<td>-33</td>
<td>5</td>
</tr>
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<td></td>
<td>Equipment (except Automotive and Electronic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repair and Maintenance</td>
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<td></td>
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</table>

Table 8. Phase 4 Deficits Adding Anchor Industry 43

<table>
<thead>
<tr>
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<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-248</td>
<td>9</td>
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</tbody>
</table>
Chapter 7. Ashtabula, OH

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-51</td>
<td>-22</td>
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<td>6</td>
<td>Oil and Gas Extraction</td>
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<td>-1</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-66</td>
<td>-35</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-63</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-19</td>
<td>-1</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-24</td>
<td>-1</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-57</td>
<td>-9</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-23</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-41</td>
<td>-2</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-70</td>
<td>-2</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
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<td>-7</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-96</td>
<td>-6</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-138</td>
<td>-16</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>-44</td>
<td>-5</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-36</td>
<td>-2</td>
</tr>
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</table>

Table 9. Phase 5 Deficits Adding Anchor Industry 66

Metalworking Machinery Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-248</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-51</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-21</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-66</td>
<td>0</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-63</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-19</td>
<td>0</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-25</td>
<td>-1</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-66</td>
<td>-8</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-23</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-42</td>
<td>-1</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-71</td>
<td>-1</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-55</td>
<td>-3</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-101</td>
<td>-6</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-172</td>
<td>-33</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>-47</td>
<td>-3</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-37</td>
<td>-1</td>
</tr>
</tbody>
</table>
Chapter 8. Athens, OH

Study Area Overview

The Athens, OH study region occupies 504 square-miles and had a 2018 population of 65,818. The employed share of the regional labor force during the 2014-2018 period averaged 94.4%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and All Other Retail. These three industries account for a combined 28.75% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 36.48, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Athens, OH can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Individual and Family Services, whose employment grew by 431 followed by Food Services and Drinking Places and Offices of Physicians. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 2.45, 2.03, and 1.67.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>431</td>
<td>187</td>
<td>2.45</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>338</td>
<td>-343</td>
<td>2.03</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>191</td>
<td>122</td>
<td>1.67</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>181</td>
<td>169</td>
<td>0.85</td>
</tr>
<tr>
<td>145</td>
<td>Other Educational Services</td>
<td>173</td>
<td>165</td>
<td>1.78</td>
</tr>
<tr>
<td>93</td>
<td>Food and Beverage Stores</td>
<td>171</td>
<td>143</td>
<td>1.73</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>155</td>
<td>23</td>
<td>2.94</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>152</td>
<td>151</td>
<td>1.56</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>148</td>
<td>148</td>
<td>4.65</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>145</td>
<td>-15</td>
<td>2.92</td>
</tr>
</tbody>
</table>
Chapter 8. Athens, OH

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Athens, OH, the cluster with the largest CLQ in 2018 is Education and Knowledge Creation with a CLQ of 3.93, followed by Biomedical/Biotechnical (Life Sciences) and Arts, Entertainment, Recreation and Visitor Industries. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Athens, OH cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.37</td>
<td>1.61</td>
<td>3,109</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.94</td>
<td>1.68</td>
<td>3,011</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>7.38</td>
<td>3.93</td>
<td>2,228</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.47</td>
<td>0.54</td>
<td>1,783</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.58</td>
<td>0.37</td>
<td>934</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.37</td>
<td>0.50</td>
<td>627</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.48</td>
<td>1.38</td>
<td>162</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.03</td>
<td>0.92</td>
<td>155</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.31</td>
<td>1.18</td>
<td>142</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.97</td>
<td>0.71</td>
<td>89</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.17</td>
<td>0.15</td>
<td>68</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.46</td>
<td>0.34</td>
<td>57</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.34</td>
<td>0.26</td>
<td>41</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.06</td>
<td>0.95</td>
<td>40</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.21</td>
<td>0.11</td>
<td>20</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.23</td>
<td>0.19</td>
<td>15</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Athens, OH

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Arts, Entertainment, Recreation and Visitor Industries (3,109)</td>
</tr>
<tr>
<td>- Biomedical/Biotechnical (Life Sciences) (3,011)</td>
</tr>
<tr>
<td>- Education and Knowledge Creation (2,228)</td>
</tr>
<tr>
<td>- Business and Financial Services (1,783)</td>
</tr>
<tr>
<td>- Defense and Security (934)</td>
</tr>
<tr>
<td>- Transportation and Logistics (627)</td>
</tr>
<tr>
<td>- Information Technology and Telecommunications (162)</td>
</tr>
<tr>
<td>- Chemicals and Chemical-Based Products (155)</td>
</tr>
<tr>
<td>- Machinery (142)</td>
</tr>
<tr>
<td>- Energy (Fossil and Renewable) (89)</td>
</tr>
<tr>
<td>- Agribusiness, Food Processing and Technology (68)</td>
</tr>
<tr>
<td>- Forest and Wood Products (57)</td>
</tr>
<tr>
<td>- Computer, Electronic, and Electrical Products (41)</td>
</tr>
<tr>
<td>- Apparel and Textiles (40)</td>
</tr>
<tr>
<td>- Primary and Fabricated Metal Products (20)</td>
</tr>
<tr>
<td>- Mining, Glass and Ceramics (15)</td>
</tr>
<tr>
<td>- Transportation Equipment (0)</td>
</tr>
</tbody>
</table>
2. CADS Analysis

The 2018 CADS analysis of the economy of Athens, OH identifies 3 anchor industries in 2 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Offices of Physicians, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>146</td>
<td>Offices of Physicians</td>
<td>285</td>
<td>476</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>156</td>
<td>311</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>145</td>
<td>Other Educational Services</td>
<td>17</td>
<td>190</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>1.67</td>
<td>122</td>
<td>24.38</td>
<td>67.17</td>
<td>0.82</td>
<td>0.05</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>2.94</td>
<td>23</td>
<td>84.40</td>
<td>99.36</td>
<td>0.88</td>
<td>0.02</td>
</tr>
<tr>
<td>145</td>
<td>Other Educational Services</td>
<td>1.78</td>
<td>165</td>
<td>44.75</td>
<td>1,021.35</td>
<td>0.87</td>
<td>0.01</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can
be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 146
Offices of Physicians

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-6</td>
</tr>
<tr>
<td>150</td>
<td>Medical and Diagnostic Laboratories</td>
<td>-7</td>
</tr>
</tbody>
</table>

Table 6. Phase 2 Deficits Adding Anchor Industry 149
Outpatient Care Centers

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-10</td>
<td>-4</td>
</tr>
<tr>
<td>150</td>
<td>Medical and Diagnostic Laboratories</td>
<td>-14</td>
<td>-7</td>
</tr>
</tbody>
</table>

Table 7. Phase 3 Deficits Adding Anchor Industry 145
Other Educational Services

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-12</td>
<td>-1</td>
</tr>
<tr>
<td>150</td>
<td>Medical and Diagnostic Laboratories</td>
<td>-14</td>
<td>-0</td>
</tr>
</tbody>
</table>
Chapter 9. Athens, TN

Study Area Overview

The Athens, TN study region occupies 430 square-miles and had a 2018 population of 53,285. The employed share of the regional labor force during the 2014-2018 period averaged 94.2%. The Motor Vehicle Parts Manufacturing industry was the region’s largest employer in 2018, followed by Food Services and Drinking Places and Elementary and Secondary Schools. These three industries account for a combined 26.49% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 42.48, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Athens, TN can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Motor Vehicle Parts Manufacturing, whose employment grew by 697 followed by Foundries and Employment Services. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 33.95, 43.2, and 1.44.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>697</td>
<td>880</td>
<td>33.95</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>466</td>
<td>497</td>
<td>43.20</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>450</td>
<td>449</td>
<td>1.44</td>
</tr>
<tr>
<td>19</td>
<td>Dairy Product Manufacturing</td>
<td>285</td>
<td>285</td>
<td>16.83</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>250</td>
<td>-86</td>
<td>1.02</td>
</tr>
<tr>
<td>93</td>
<td>Food and Beverage Stores</td>
<td>219</td>
<td>201</td>
<td>1.38</td>
</tr>
<tr>
<td>91</td>
<td>Wholesale Trade</td>
<td>210</td>
<td>209</td>
<td>0.79</td>
</tr>
<tr>
<td>76</td>
<td>Household Appliance Manufacturing</td>
<td>176</td>
<td>176</td>
<td>24.67</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>163</td>
<td>-116</td>
<td>9.12</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>132</td>
<td>101</td>
<td>0.57</td>
</tr>
</tbody>
</table>
Chapter 9. Athens, TN

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Athens, TN, the cluster with the largest CLQ in 2018 is Transportation Equipment with a CLQ of 19.41, followed by Primary and Fabricated Metal Products and Mining, Glass and Ceramics. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Athens, TN cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>12.15</td>
<td>19.41</td>
<td>2,615</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.44</td>
<td>0.52</td>
<td>1,810</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.80</td>
<td>0.85</td>
<td>1,717</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.15</td>
<td>0.90</td>
<td>1,692</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.32</td>
<td>2.21</td>
<td>1,314</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>1.68</td>
<td>4.93</td>
<td>957</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.91</td>
<td>0.64</td>
<td>853</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.18</td>
<td>0.27</td>
<td>706</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>5.78</td>
<td>3.90</td>
<td>691</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>5.00</td>
<td>3.60</td>
<td>627</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.56</td>
<td>0.90</td>
<td>431</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.00</td>
<td>2.36</td>
<td>386</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>4.49</td>
<td>4.59</td>
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</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.18</td>
<td>1.06</td>
<td>138</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>4.22</td>
<td>2.98</td>
<td>132</td>
</tr>
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<td>4.51</td>
<td>0.76</td>
<td>96</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.26</td>
<td>0.25</td>
<td>31</td>
</tr>
</tbody>
</table>

**Note:** Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Athens, TN

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Transportation Equipment (2,615)</td>
</tr>
<tr>
<td>▼ Business and Financial Services (1,810)</td>
</tr>
<tr>
<td>▲ Arts, Entertainment, Recreation and Visitor Industries (1,717)</td>
</tr>
<tr>
<td>◼ Biomedical/Biotechnical (Life Sciences) (1,692)</td>
</tr>
<tr>
<td>▼ Education and Knowledge Creation (1,314)</td>
</tr>
<tr>
<td>▼ Primary and Fabricated Metal Products (957)</td>
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</tr>
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</tr>
<tr>
<td>▼ Agribusiness, Food Processing and Technology (431)</td>
</tr>
<tr>
<td>▼ Computer, Electronic, and Electrical Products (386)</td>
</tr>
<tr>
<td>▲ Mining, Glass and Ceramics (363)</td>
</tr>
<tr>
<td>▼ Energy (Fossil and Renewable) (138)</td>
</tr>
<tr>
<td>▼ Apparel and Textiles (132)</td>
</tr>
<tr>
<td>▲ Machinery (96)</td>
</tr>
<tr>
<td>▼ Information Technology and Telecommunications (31)</td>
</tr>
</tbody>
</table>
2. CADS Analysis

The 2018 CADS analysis of the economy of Athens, TN identifies 1 anchor industry in 1 cluster. Identified anchor and its parent cluster are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industry and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Motor Vehicle Parts Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

### Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>1,586</td>
<td>2,283</td>
</tr>
</tbody>
</table>

### Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>33.95</td>
<td>880</td>
<td>-11.56</td>
<td>43.96</td>
<td>0.51</td>
<td>0.40</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The
tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 81**

Motor Vehicle Parts Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-100</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-67</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-103</td>
</tr>
<tr>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>-65</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-201</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-76</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-201</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>-82</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-80</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-219</td>
</tr>
</tbody>
</table>
Chapter 10. Beckley, WV

Study Area Overview

The Beckley, WV study region occupies 605 square-miles and had a 2018 population of 74,254. The employed share of the regional labor force during the 2014-2018 period averaged 93.7%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Hospitals and All Other Retail. These three industries account for a combined 23.25% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 34, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Beckley, WV can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 631 followed by Individual and Family Services and Offices of Physicians. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.29, 2.07, and 2.66.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>631</td>
<td>-88</td>
<td>1.29</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>597</td>
<td>152</td>
<td>2.07</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>523</td>
<td>313</td>
<td>2.66</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>478</td>
<td>368</td>
<td>1.67</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>449</td>
<td>338</td>
<td>1.94</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>349</td>
<td>307</td>
<td>2.70</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>248</td>
<td>214</td>
<td>3.15</td>
</tr>
<tr>
<td>92</td>
<td>Motor Vehicle and Parts Dealers</td>
<td>212</td>
<td>180</td>
<td>2.33</td>
</tr>
<tr>
<td>7</td>
<td>Coal Mining</td>
<td>184</td>
<td>605</td>
<td>161.07</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>180</td>
<td>104</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Beckley, WV, the cluster with the largest CLQ in 2018 is Energy (Fossil and Renewable) with a CLQ of 8.07, followed by Education and Knowledge Creation and Biomedical/Biotechnical (Life Sciences). The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Beckley, WV cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.66</td>
<td>1.91</td>
<td>6,245</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.16</td>
<td>1.18</td>
<td>4,170</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.63</td>
<td>0.59</td>
<td>3,600</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.41</td>
<td>0.50</td>
<td>2,266</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>3.13</td>
<td>2.07</td>
<td>2,146</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.02</td>
<td>0.80</td>
<td>1,847</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>8.07</td>
<td>8.07</td>
<td>1,838</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.57</td>
<td>0.53</td>
<td>179</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.43</td>
<td>0.58</td>
<td>128</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.06</td>
<td>0.57</td>
<td>123</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.20</td>
<td>0.12</td>
<td>98</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.39</td>
<td>0.30</td>
<td>87</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.61</td>
<td>0.29</td>
<td>87</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.19</td>
<td>0.24</td>
<td>74</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.26</td>
<td>0.30</td>
<td>70</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.33</td>
<td>0.22</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.01</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Beckley, WV

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (6,245)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (4,170)</td>
</tr>
<tr>
<td>Business and Financial Services (3,600)</td>
</tr>
<tr>
<td>Defense and Security (2,266)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (2,146)</td>
</tr>
<tr>
<td>Transportation and Logistics (1,847)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (1,838)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (179)</td>
</tr>
<tr>
<td>Machinery (128)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (123)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (98)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (87)</td>
</tr>
<tr>
<td>Forest and Wood Products (87)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (74)</td>
</tr>
<tr>
<td>Transportation Equipment (70)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (30)</td>
</tr>
<tr>
<td>Apparel and Textiles (0)</td>
</tr>
</tbody>
</table>
2. CADS Analysis

The 2018 CADS analysis of the economy of Beckley, WV identifies 5 anchor industries in 3 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Coal Mining, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>7</td>
<td>Coal Mining</td>
<td>1,482</td>
<td>1,666</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>146</td>
<td>Offices of Physicians</td>
<td>862</td>
<td>1,385</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>627</td>
<td>1,105</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>166</td>
<td>Accommodation</td>
<td>467</td>
<td>544</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>151</td>
<td>Home Health Care Services</td>
<td>140</td>
<td>589</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Coal Mining</td>
<td>161.07</td>
<td>605</td>
<td>-28.42</td>
<td>12.42</td>
<td>0.66</td>
<td>0.34</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>2.66</td>
<td>313</td>
<td>24.38</td>
<td>60.67</td>
<td>0.78</td>
<td>0.06</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>1.67</td>
<td>368</td>
<td>17.58</td>
<td>76.20</td>
<td>0.82</td>
<td>0.02</td>
</tr>
<tr>
<td>166</td>
<td>Accommodation</td>
<td>1.35</td>
<td>28</td>
<td>10.44</td>
<td>16.49</td>
<td>0.82</td>
<td>0.02</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>1.94</td>
<td>338</td>
<td>79.39</td>
<td>320.71</td>
<td>0.77</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Chapter 10. Beckley, WV

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 7**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-39</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing</td>
<td>-25</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-27</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>-46</td>
</tr>
<tr>
<td>47</td>
<td>Lime, Gypsum and Other Nonmetallic Mineral Product Manufacturing</td>
<td>-15</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-14</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-19</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-51</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-12</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-15</td>
</tr>
<tr>
<td>122</td>
<td>Commercial and Industrial Machinery and Equipment Rental and Leasing</td>
<td>-16</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design and Related Services</td>
<td>-11</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-11</td>
</tr>
</tbody>
</table>

**Table 6. Phase 2 Deficits Adding Anchor Industry 146**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-40</td>
<td>0</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing</td>
<td>-25</td>
<td>0</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-27</td>
<td>-1</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>-46</td>
<td>0</td>
</tr>
<tr>
<td>47</td>
<td>Lime, Gypsum and Other Nonmetallic Mineral Product Manufacturing</td>
<td>-15</td>
<td>0</td>
</tr>
</tbody>
</table>
Chapter 10. Beckley, WV

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-15</td>
<td>-1</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Mfg</td>
<td>-20</td>
<td>-2</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-52</td>
<td>-0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-16</td>
<td>-5</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-22</td>
<td>-7</td>
</tr>
<tr>
<td>122</td>
<td>Commercial and Industrial Machinery Rental Mfg</td>
<td>-17</td>
<td>-1</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design</td>
<td>-25</td>
<td>-14</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-15</td>
<td>-4</td>
</tr>
</tbody>
</table>

Table 7. Phase 3 Deficits Adding Anchor Industry 154

Nursing and Residential Care Facilities

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-40</td>
<td>-0</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Mfg</td>
<td>-25</td>
<td>-0</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Mfg</td>
<td>-27</td>
<td>-0</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Mfg</td>
<td>-46</td>
<td>-0</td>
</tr>
<tr>
<td>47</td>
<td>Lime, Gypsum and Other Nonmetallic Mfg</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Mfg</td>
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<td>-0</td>
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<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Mfg</td>
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<td>-1</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-52</td>
<td>-0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-18</td>
<td>-2</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-24</td>
<td>-2</td>
</tr>
<tr>
<td>122</td>
<td>Commercial and Industrial Machinery Rental Mfg</td>
<td>-17</td>
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</tr>
<tr>
<td>128</td>
<td>Computer Systems Design</td>
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<td>-4</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-16</td>
<td>-1</td>
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</table>

Table 8. Phase 4 Deficits Adding Anchor Industry 166

Accommodation

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-40</td>
<td>-0</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Mfg</td>
<td>-25</td>
<td>-0</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Mfg</td>
<td>-27</td>
<td>-0</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Mfg</td>
<td>-46</td>
<td>-0</td>
</tr>
<tr>
<td>47</td>
<td>Lime, Gypsum and Other Nonmetallic Mfg</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Mfg</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Mfg</td>
<td>-22</td>
<td>-1</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-52</td>
<td>-0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-21</td>
<td>-3</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-26</td>
<td>-1</td>
</tr>
<tr>
<td>122</td>
<td>Commercial and Industrial Machinery Rental Mfg</td>
<td>-17</td>
<td>-0</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design</td>
<td>-32</td>
<td>-3</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-19</td>
<td>-3</td>
</tr>
</tbody>
</table>

Table 9. Phase 5 Deficits Adding Anchor Industry 151

Home Health Care Services

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-40</td>
<td>-0</td>
</tr>
<tr>
<td>37</td>
<td>Pesticide, Fertilizer, and Other Agricultural Mfg</td>
<td>-25</td>
<td>-0</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Mfg</td>
<td>-28</td>
<td>-0</td>
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</tbody>
</table>
## Chapter 10. Beckley, WV

<table>
<thead>
<tr>
<th>SIC</th>
<th>Industry Description</th>
<th>Change</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>-47</td>
<td>0</td>
</tr>
<tr>
<td>47</td>
<td>Lime, Gypsum and Other Nonmetallic Mineral Product</td>
<td>-15</td>
<td>0</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-16</td>
<td>0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-22</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-52</td>
<td>0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-22</td>
<td>-1</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-26</td>
<td>0</td>
</tr>
<tr>
<td>122</td>
<td>Commercial and Industrial Machinery and Equipment Rental</td>
<td>-18</td>
<td>0</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design and Related Services</td>
<td>-33</td>
<td>-1</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-20</td>
<td>0</td>
</tr>
</tbody>
</table>
Chapter 11. Binghamton, NY

Study Area Overview

The Binghamton, NY study region occupies 1,225 square-miles and had a 2018 population of 240,219. The employed share of the regional labor force during the 2014-2018 period averaged 94.94%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and Government and Unclassified. These three industries account for a combined 22.82% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 29.08, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Binghamton, NY can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Hospitals, whose employment grew by 1,586 followed by Food Services and Drinking Places and Junior Colleges, Colleges, Universities, and Professional Schools. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 2.02, 1.13, and 3.39.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>1,586</td>
<td>710</td>
<td>2.02</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>1,170</td>
<td>-998</td>
<td>1.13</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>1,142</td>
<td>485</td>
<td>3.39</td>
</tr>
<tr>
<td>177</td>
<td>Grantmaking and Giving Services and Social Advocacy Organizations</td>
<td>827</td>
<td>782</td>
<td>3.77</td>
</tr>
<tr>
<td>166</td>
<td>Accommodation</td>
<td>509</td>
<td>415</td>
<td>1.11</td>
</tr>
<tr>
<td>76</td>
<td>Household Appliance Manufacturing</td>
<td>409</td>
<td>423</td>
<td>11.84</td>
</tr>
<tr>
<td>119</td>
<td>Real Estate and Owner-Occupied Dwellings</td>
<td>370</td>
<td>312</td>
<td>0.68</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>277</td>
<td>-8</td>
<td>0.85</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>213</td>
<td>-47</td>
<td>0.65</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>211</td>
<td>-87</td>
<td>0.83</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Binghamton, NY, the cluster with the largest CLQ in 2018 is Computer, Electronic, and Electrical Products with a CLQ of 6.97, followed by Education and Knowledge Creation and Biomedical/Biotechnical (Life Sciences). The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Binghamton, NY cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.38</td>
<td>1.44</td>
<td>14,906</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>3.93</td>
<td>3.92</td>
<td>12,874</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.70</td>
<td>0.61</td>
<td>11,750</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.90</td>
<td>0.99</td>
<td>11,073</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.52</td>
<td>0.48</td>
<td>6,928</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.90</td>
<td>0.90</td>
<td>6,549</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>8.33</td>
<td>6.97</td>
<td>6,289</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.71</td>
<td>1.08</td>
<td>1,151</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.54</td>
<td>0.40</td>
<td>1,057</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.09</td>
<td>1.31</td>
<td>892</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.55</td>
<td>0.77</td>
<td>743</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.28</td>
<td>0.92</td>
<td>663</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.60</td>
<td>0.63</td>
<td>618</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>1.05</td>
<td>0.75</td>
<td>523</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.63</td>
<td>1.16</td>
<td>505</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.47</td>
<td>0.36</td>
<td>87</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.04</td>
<td>0.01</td>
<td>10</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Binghamton, NY

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (14,906)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (12,874)</td>
</tr>
<tr>
<td>Business and Financial Services (11,750)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (11,073)</td>
</tr>
<tr>
<td>Defense and Security (6,928)</td>
</tr>
<tr>
<td>Transportation and Logistics (6,549)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (6,289)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (1,151)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (1,057)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (892)</td>
</tr>
<tr>
<td>Forest and Wood Products (743)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (663)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (618)</td>
</tr>
<tr>
<td>Machinery (523)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (505)</td>
</tr>
<tr>
<td>Apparel and Textiles (87)</td>
</tr>
<tr>
<td>Transportation Equipment (10)</td>
</tr>
</tbody>
</table>
Chapter 11. Binghamton, NY

2. CADS Analysis
The 2018 CADS analysis of the economy of Binghamton, NY identifies 3 anchor industries in 3 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Hospitals, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>153</td>
<td>Hospitals</td>
<td>4,845</td>
<td>6,431</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>3,155</td>
<td>3,233</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>2,747</td>
<td>3,888</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>2.02</td>
<td>710</td>
<td>18.09</td>
<td>32.74</td>
<td>0.90</td>
<td>0.10</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>14.06</td>
<td>638</td>
<td>-17.77</td>
<td>2.47</td>
<td>0.82</td>
<td>0.07</td>
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<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>3.39</td>
<td>485</td>
<td>23.90</td>
<td>41.56</td>
<td>0.95</td>
<td>0.04</td>
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</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has
been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 153**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>-10</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-51</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-2</td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>Facilities Support Services</td>
<td>-17</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6. Phase 2 Deficits Adding Anchor Industry 72**

Semiconductor and Other Electronic Component Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>-15</td>
<td>-6</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-51</td>
<td>0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-38</td>
<td>-36</td>
</tr>
<tr>
<td>135</td>
<td>Facilities Support Services</td>
<td>-20</td>
<td>-3</td>
</tr>
</tbody>
</table>

**Table 7. Phase 3 Deficits Adding Anchor Industry 144**

Junior Colleges, Colleges, Universities, and Professional Schools

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>-16</td>
<td>-1</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-51</td>
<td>0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-39</td>
<td>0</td>
</tr>
<tr>
<td>135</td>
<td>Facilities Support Services</td>
<td>-21</td>
<td>-1</td>
</tr>
</tbody>
</table>
Chapter 12. Birmingham-Hoover, AL

Study Area Overview

The Birmingham-Hoover, AL study region occupies 5,280 square-miles and had a 2018 population of 1,151,801. The employed share of the regional labor force during the 2014-2018 period averaged 94.8%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Hospitals and All Other Retail. These three industries account for a combined 20.49% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 23.38, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Birmingham-Hoover, AL can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 7,890 followed by Junior Colleges, Colleges, Universities, and Professional Schools and Motor Vehicle Parts Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.13, 2.01, and 2.09.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>7,890</td>
<td>-2,352</td>
<td>1.13</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>5,047</td>
<td>3,513</td>
<td>2.01</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>2,783</td>
<td>2,909</td>
<td>2.09</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>2,218</td>
<td>7</td>
<td>1.38</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>2,190</td>
<td>96</td>
<td>0.54</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>2,010</td>
<td>-1,244</td>
<td>1.92</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>1,838</td>
<td>-3,654</td>
<td>2.03</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>1,761</td>
<td>160</td>
<td>1.05</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>1,595</td>
<td>666</td>
<td>0.75</td>
</tr>
<tr>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>1,491</td>
<td>646</td>
<td>1.33</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Birmingham-Hoover, AL, the cluster with the largest CLQ in 2018 is Energy (Fossil and Renewable) with a CLQ of 2.73, followed by Education and Knowledge Creation and Primary and Fabricated Metal Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Birmingham-Hoover, AL cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>1.06</td>
<td>1.03</td>
<td>98,580</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.42</td>
<td>1.42</td>
<td>73,365</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.92</td>
<td>0.99</td>
<td>55,243</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.23</td>
<td>1.08</td>
<td>39,455</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.50</td>
<td>2.39</td>
<td>39,145</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.38</td>
<td>0.40</td>
<td>28,800</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>2.36</td>
<td>2.10</td>
<td>11,166</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>2.66</td>
<td>2.73</td>
<td>9,771</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.51</td>
<td>0.47</td>
<td>6,158</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.45</td>
<td>1.28</td>
<td>4,729</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.82</td>
<td>0.85</td>
<td>4,068</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.91</td>
<td>1.11</td>
<td>3,768</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.38</td>
<td>1.65</td>
<td>3,593</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.65</td>
<td>0.82</td>
<td>2,836</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.46</td>
<td>0.56</td>
<td>2,730</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.22</td>
<td>0.36</td>
<td>1,603</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.48</td>
<td>0.34</td>
<td>416</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Birmingham-Hoover, AL

Bubble Size as the Employment for Each Cluster
- Business and Financial Services (98,580)
- Biomedical/Biotechnical (Life Sciences) (73,365)
- Arts, Entertainment, Recreation and Visitor Industries (55,243)
- Transportation and Logistics (39,455)
- Education and Knowledge Creation (39,145)
- Defense and Security (28,800)
- Primary and Fabricated Metal Products (11,166)
- Energy (Fossil and Renewable) (9,771)
- Agribusiness, Food Processing and Technology (6,158)
- Transportation Equipment (4,729)
- Forest and Wood Products (4,068)
- Information Technology and Telecommunications (3,768)
- Mining, Glass and Ceramics (3,593)
- Machinery (2,836)
- Chemicals and Chemical-Based Products (2,730)
- Computer, Electronic, and Electrical Products (1,603)
- Apparel and Textiles (416)
Chapter 12. Birmingham-Hoover, AL

2. CADS Analysis

The 2018 CADS analysis of the economy of Birmingham-Hoover, AL identifies 7 anchor industries in 6 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Electric Power Generation, Transmission and Distribution, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>11</td>
<td>Electric Power Generation, Transmission and Distribution</td>
<td>6,119</td>
<td>6,191</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>115</td>
<td>Monetary Authorities, Credit Intermediation, and Related Activities</td>
<td>16,315</td>
<td>17,257</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>146</td>
<td>Offices of Physicians</td>
<td>9,068</td>
<td>11,286</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>99</td>
<td>Truck Transportation</td>
<td>6,469</td>
<td>7,316</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>6,419</td>
<td>11,467</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>3,713</td>
<td>5,204</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>139</td>
<td>Investigation and Security Services</td>
<td>3,954</td>
<td>5,382</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Electric Power Generation, Transmission and Distribution</td>
<td>5.14</td>
<td>223</td>
<td>-2.47</td>
<td>1.17</td>
<td>0.88</td>
<td>0.09</td>
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</table>
Chapter 12. Birmingham-Hoover, AL

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 11

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-3</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-128</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-9</td>
</tr>
<tr>
<td>70</td>
<td>Communications Equipment Manufacturing</td>
<td>-1</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-5</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-139</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-5</td>
</tr>
<tr>
<td>114</td>
<td>Other Information Services</td>
<td>N/A</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>N/A</td>
</tr>
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</table>
Table 6. Phase 2 Deficits Adding Anchor Industry 115
Monetary Authorities, Credit Intermediation, and Related Activities

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-140</td>
<td>-12</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-23</td>
<td>-14</td>
</tr>
<tr>
<td>70</td>
<td>Communications Equipment Manufacturing</td>
<td>-11</td>
<td>-10</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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<tr>
<td>97</td>
<td>Rail Transportation</td>
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<td>-6</td>
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<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-20</td>
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<tr>
<td>114</td>
<td>Other Information Services</td>
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<td>-81</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
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<td>-66</td>
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Table 7. Phase 3 Deficits Adding Anchor Industry 146
Offices of Physicians

<table>
<thead>
<tr>
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<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-7</td>
<td>-2</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-143</td>
<td>-2</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-27</td>
<td>-3</td>
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<tr>
<td>70</td>
<td>Communications Equipment Manufacturing</td>
<td>-18</td>
<td>-7</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-44</td>
<td>-13</td>
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<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-149</td>
<td>-4</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-22</td>
<td>-2</td>
</tr>
<tr>
<td>114</td>
<td>Other Information Services</td>
<td>N/A</td>
<td>-17</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-47</td>
<td>-14</td>
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Table 8. Phase 4 Deficits Adding Anchor Industry 99
Truck Transportation

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-7</td>
<td>-1</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-160</td>
<td>-17</td>
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<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-31</td>
<td>-4</td>
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<tr>
<td>70</td>
<td>Communications Equipment Manufacturing</td>
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<td>-3</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-59</td>
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<td>97</td>
<td>Rail Transportation</td>
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<td>-35</td>
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<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-24</td>
<td>-2</td>
</tr>
<tr>
<td>114</td>
<td>Other Information Services</td>
<td>-1</td>
<td>-10</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-58</td>
<td>-11</td>
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</tbody>
</table>

Table 9. Phase 5 Deficits Adding Anchor Industry 144
Junior Colleges, Colleges, Universities, and Professional Schools

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
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<tbody>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-13</td>
<td>-6</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-162</td>
<td>-2</td>
</tr>
<tr>
<td>70</td>
<td>Communications Equipment Manufacturing</td>
<td>-23</td>
<td>-2</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-66</td>
<td>-7</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-187</td>
<td>-2</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-24</td>
<td>-1</td>
</tr>
</tbody>
</table>
Chapter 12. Birmingham-Hoover, AL

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>114</td>
<td>Other Information Services</td>
<td>-12</td>
<td>-11</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-63</td>
<td>-5</td>
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</tbody>
</table>

**Table 10. Phase 6 Deficits Adding Anchor Industry 118**
Agencies, Brokerages, and Other Insurance Related Activities

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
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<td>4</td>
<td>Fishing, Hunting and Trapping</td>
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<td>6</td>
<td>Oil and Gas Extraction</td>
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<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-33</td>
<td>1</td>
</tr>
<tr>
<td>70</td>
<td>Communications Equipment Manufacturing</td>
<td>-23</td>
<td>1</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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<td>2</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-187</td>
<td>0</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-25</td>
<td>1</td>
</tr>
<tr>
<td>114</td>
<td>Other Information Services</td>
<td>-16</td>
<td>3</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-66</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 11. Phase 7 Deficits Adding Anchor Industry 139**
Investigation and Security Services

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Fishing, Hunting and Trapping</td>
<td>-14</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-163</td>
<td>0</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-34</td>
<td>1</td>
</tr>
<tr>
<td>70</td>
<td>Communications Equipment Manufacturing</td>
<td>-27</td>
<td>-4</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-75</td>
<td>-8</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-188</td>
<td>-1</td>
</tr>
<tr>
<td>109</td>
<td>Cable and Other Subscription Programming</td>
<td>-26</td>
<td>-1</td>
</tr>
<tr>
<td>114</td>
<td>Other Information Services</td>
<td>-23</td>
<td>-7</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-69</td>
<td>-3</td>
</tr>
</tbody>
</table>
Chapter 13. Blacksburg-Christiansburg-Radford, VA

Study Area Overview

The Blacksburg-Christiansburg-Radford, VA study region occupies 1,073 square-miles and had a 2018 population of 168,234. The employed share of the regional labor force during the 2014-2018 period averaged 96.01%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by All Other Retail and Elementary and Secondary Schools. These three industries account for a combined 21.65% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 33.72, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Blacksburg-Christiansburg-Radford, VA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 955 followed by Electrical Equipment Manufacturing and Plastics Product Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.42, 31.05, and 2.67.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>955</td>
<td>-566</td>
<td>1.42</td>
</tr>
<tr>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>680</td>
<td>741</td>
<td>31.05</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>494</td>
<td>499</td>
<td>2.67</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design and Related Services</td>
<td>458</td>
<td>172</td>
<td>1.11</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>402</td>
<td>398</td>
<td>0.74</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>310</td>
<td>236</td>
<td>0.29</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>277</td>
<td>81</td>
<td>1.17</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>246</td>
<td>382</td>
<td>30.40</td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>218</td>
<td>220</td>
<td>3.59</td>
</tr>
<tr>
<td>119</td>
<td>Real Estate and Owner-Occupied Dwellings</td>
<td>213</td>
<td>151</td>
<td>1.03</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Blacksburg-Christiansburg-Radford, VA, the cluster with the largest CLQ in 2018 is Transportation Equipment with a CLQ of 9.33, followed by Chemicals and Chemical-Based Products and Computer, Electronic, and Electrical Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Blacksburg-Christiansburg-Radford, VA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.07</td>
<td>1.25</td>
<td>7,951</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.58</td>
<td>0.68</td>
<td>7,495</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>0.85</td>
<td>0.89</td>
<td>5,227</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>4.70</td>
<td>2.76</td>
<td>5,167</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>7.79</td>
<td>9.33</td>
<td>3,952</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.63</td>
<td>0.58</td>
<td>2,405</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.21</td>
<td>0.28</td>
<td>2,323</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>2.70</td>
<td>4.00</td>
<td>2,227</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>2.43</td>
<td>3.81</td>
<td>1,961</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>3.18</td>
<td>2.30</td>
<td>1,260</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>2.87</td>
<td>3.63</td>
<td>904</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.33</td>
<td>0.36</td>
<td>546</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.60</td>
<td>1.26</td>
<td>502</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.91</td>
<td>0.66</td>
<td>400</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.67</td>
<td>0.45</td>
<td>173</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>1.89</td>
<td>1.24</td>
<td>172</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.84</td>
<td>0.39</td>
<td>160</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Blacksburg-Christiansburg-Radford, VA

Bubble Size as the Employment for Each Cluster
- Arts, Entertainment, Recreation and Visitor Industries (7,951)
- Business and Financial Services (7,495)
- Biomedical/Biotechnical (Life Sciences) (5,227)
- Education and Knowledge Creation (5,167)
- Transportation Equipment (3,952)
- Transportation and Logistics (2,405)
- Defense and Security (2,323)
- Chemicals and Chemical-Based Products (2,227)
- Computer, Electronic, and Electrical Products (1,961)
- Forest and Wood Products (1,260)
- Mining, Glass and Ceramics (904)
- Agribusiness, Food Processing and Technology (546)
- Machinery (502)
- Primary and Fabricated Metal Products (400)
- Information Technology and Telecommunications (173)
- Apparel and Textiles (172)
- Energy (Fossil and Renewable) (160)
Chapter 13. Blacksburg-Christiansburg-Radford, VA

2. CADS Analysis

The 2018 CADS analysis of the economy of Blacksburg-Christiansburg-Radford, VA identifies 4 anchor industries in 4 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Other Chemical Product and Preparation Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>661</td>
<td>907</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>864</td>
<td>1,544</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>46</td>
<td>Cement and Concrete Product Manufacturing</td>
<td>704</td>
<td>709</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>696</td>
<td>774</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>30.40</td>
<td>382</td>
<td>-20.49</td>
<td>37.25</td>
<td>0.81</td>
<td>0.07</td>
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<tr>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>31.05</td>
<td>741</td>
<td>-7.05</td>
<td>78.68</td>
<td>0.70</td>
<td>0.05</td>
</tr>
<tr>
<td>46</td>
<td>Cement and Concrete Product Manufacturing</td>
<td>10.24</td>
<td>135</td>
<td>-18.50</td>
<td>0.67</td>
<td>0.84</td>
<td>0.02</td>
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</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

### Table 5. Phase 1 Deficits for Anchor Industry 41

Other Chemical Product and Preparation Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-7</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-3</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-11</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-15</td>
</tr>
<tr>
<td>45</td>
<td>Glass and Glass Product Manufacturing</td>
<td>-8</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-3</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>N/A</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-4</td>
</tr>
<tr>
<td>56</td>
<td>Boiler, Tank, and Shipping Container Manufacturing</td>
<td>-7</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>N/A</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>N/A</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>-1</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-14</td>
</tr>
</tbody>
</table>

### Table 6. Phase 2 Deficits Adding Anchor Industry 77

Electrical Equipment Manufacturing
### Table 7. Phase 3 Deficits Adding Anchor Industry 46
Cement and Concrete Product Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-9</td>
<td>-2</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
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<td>-8</td>
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<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
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<td>-3</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-19</td>
<td>-4</td>
</tr>
<tr>
<td>45</td>
<td>Glass and Glass Product Manufacturing</td>
<td>-10</td>
<td>-1</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-22</td>
<td>-19</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-11</td>
<td>-14</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-59</td>
<td>-55</td>
</tr>
<tr>
<td>56</td>
<td>Boiler, Tank, and Shipping Container Manufacturing</td>
<td>-10</td>
<td>-3</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
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<td>-80</td>
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<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-14</td>
<td>-20</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>-17</td>
<td>-16</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-18</td>
<td>-4</td>
</tr>
</tbody>
</table>

### Table 8. Phase 4 Deficits Adding Anchor Industry 126
Architectural, Engineering, and Related Services

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-11</td>
<td>-0</td>
</tr>
<tr>
<td>8</td>
<td>Metal Ore Mining</td>
<td>-12</td>
<td>-0</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>39</td>
<td>Paint, Coating, and Adhesive Manufacturing</td>
<td>-22</td>
<td>-0</td>
</tr>
<tr>
<td>45</td>
<td>Glass and Glass Product Manufacturing</td>
<td>-14</td>
<td>-0</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-25</td>
<td>-1</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-62</td>
<td>-1</td>
</tr>
<tr>
<td>Code</td>
<td>Category</td>
<td>Change</td>
<td>2010</td>
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<tr>
<td>------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>56</td>
<td>Boiler, Tank, and Shipping Container Manufacturing</td>
<td>-11</td>
<td>-0</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-43</td>
<td>-1</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-22</td>
<td>-1</td>
</tr>
<tr>
<td>65</td>
<td>Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration</td>
<td>-37</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>Equipment Manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>-17</td>
<td>-0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-27</td>
<td>-0</td>
</tr>
</tbody>
</table>
Chapter 14. Bloomsburg-Berwick, PA

Study Area Overview

The Bloomsburg-Berwick, PA study region occupies 613 square-miles and had a 2018 population of 83,696. The employed share of the regional labor force during the 2014-2018 period averaged 96.38%. The Hospitals industry was the region’s largest employer in 2018, followed by Food Services and Drinking Places and Management of Companies and Enterprises. These three industries account for a combined 29.03% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 44.96, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Bloomsburg-Berwick, PA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Hospitals, whose employment grew by 1,156 followed by Outpatient Care Centers and Insurance Carriers. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 4.86, 8.37, and 3.01.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>1,156</td>
<td>227</td>
<td>4.86</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>1,098</td>
<td>266</td>
<td>8.37</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>915</td>
<td>899</td>
<td>3.01</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>825</td>
<td>183</td>
<td>4.46</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>425</td>
<td>-280</td>
<td>0.92</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>376</td>
<td>266</td>
<td>1.32</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>247</td>
<td>40</td>
<td>2.39</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>196</td>
<td>192</td>
<td>1.19</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>172</td>
<td>685</td>
<td>23.50</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>164</td>
<td>-224</td>
<td>2.11</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Bloomsburg-Berwick, PA, the cluster with the largest CLQ in 2018 is Apparel and Textiles with a CLQ of 14.63, followed by Biomedical/Biotechnical (Life Sciences) and Education and Knowledge Creation. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Bloomsburg-Berwick, PA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>2.34</td>
<td>2.64</td>
<td>11,097</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.70</td>
<td>0.76</td>
<td>5,932</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.84</td>
<td>0.83</td>
<td>3,768</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.82</td>
<td>2.31</td>
<td>3,089</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.59</td>
<td>0.66</td>
<td>1,958</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>2.24</td>
<td>1.36</td>
<td>1,458</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>7.40</td>
<td>14.63</td>
<td>1,450</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.16</td>
<td>0.17</td>
<td>986</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>2.23</td>
<td>2.27</td>
<td>985</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>1.86</td>
<td>2.22</td>
<td>670</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.84</td>
<td>1.34</td>
<td>534</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.82</td>
<td>1.06</td>
<td>299</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.27</td>
<td>0.64</td>
<td>187</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.56</td>
<td>0.91</td>
<td>162</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>1.58</td>
<td>0.28</td>
<td>108</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.07</td>
<td>0.14</td>
<td>52</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.55</td>
<td>0.16</td>
<td>44</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Bloomsburg-Berwick, PA

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (11,097)</td>
</tr>
<tr>
<td>Business and Financial Services (5,932)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (3,768)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (3,089)</td>
</tr>
<tr>
<td>Transportation and Logistics (1,958)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (1,457)</td>
</tr>
<tr>
<td>Apparel and Textiles (1,450)</td>
</tr>
<tr>
<td>Defense and Security (986)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (985)</td>
</tr>
<tr>
<td>Transportation Equipment (670)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (534)</td>
</tr>
<tr>
<td>Machinery (299)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (187)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (162)</td>
</tr>
<tr>
<td>Forest and Wood Products (108)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (52)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (44)</td>
</tr>
</tbody>
</table>
Chapter 14. Bloomsburg-Berwick, PA

2. CADS Analysis

The 2018 CADS analysis of the economy of Bloomsburg-Berwick, PA identifies 5 anchor industries in 5 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Hospitals, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>153</td>
<td>Hospitals</td>
<td>5,132</td>
<td>6,288</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>1,241</td>
<td>1,413</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>80</td>
<td>Motor Vehicle Body and Trailer Manufacturing</td>
<td>408</td>
<td>526</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>867</td>
<td>1,114</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>463</td>
<td>497</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>4.86</td>
<td>227</td>
<td>18.09</td>
<td>22.52</td>
<td>0.73</td>
<td>0.23</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>23.50</td>
<td>685</td>
<td>-41.39</td>
<td>13.85</td>
<td>0.75</td>
<td>0.08</td>
</tr>
<tr>
<td>80</td>
<td>Motor Vehicle Body and Trailer Manufacturing</td>
<td>12.66</td>
<td>132</td>
<td>-3.45</td>
<td>28.93</td>
<td>0.69</td>
<td>0.04</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>2.39</td>
<td>40</td>
<td>23.90</td>
<td>28.52</td>
<td>0.90</td>
<td>0.03</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

### Table 5. Phase 1 Deficits for Anchor Industry 153

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-49</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-75</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-10</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-30</td>
</tr>
<tr>
<td>103</td>
<td>Couriers and Messengers</td>
<td>-36</td>
</tr>
<tr>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>-162</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-63</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-456</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-58</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-29</td>
</tr>
<tr>
<td>174</td>
<td>Drycleaning and Laundry Services</td>
<td>-33</td>
</tr>
</tbody>
</table>

### Table 6. Phase 2 Deficits Adding Anchor Industry 26

Textile Mills and Textile Product Mills
Chapter 14. Bloomsburg-Berwick, PA

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-46</td>
<td>-46</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-50</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-33</td>
<td>-23</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-75</td>
<td>-0</td>
</tr>
<tr>
<td>103</td>
<td>Couriers and Messengers</td>
<td>-38</td>
<td>-8</td>
</tr>
<tr>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>-50</td>
<td>-14</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-177</td>
<td>-15</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-67</td>
<td>-3</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-490</td>
<td>-35</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-66</td>
<td>-9</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-35</td>
<td>-5</td>
</tr>
<tr>
<td>174</td>
<td>Drycleaning and Laundry Services</td>
<td>-35</td>
<td>-2</td>
</tr>
</tbody>
</table>

Table 7. Phase 3 Deficits Adding Anchor Industry 80

Motor Vehicle Body and Trailer Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-48</td>
<td>-3</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-50</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-46</td>
<td>-13</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-75</td>
<td>-0</td>
</tr>
<tr>
<td>103</td>
<td>Couriers and Messengers</td>
<td>-43</td>
<td>-4</td>
</tr>
<tr>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>-57</td>
<td>-7</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-185</td>
<td>-9</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-69</td>
<td>-2</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-509</td>
<td>-19</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-71</td>
<td>-5</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-37</td>
<td>-2</td>
</tr>
<tr>
<td>174</td>
<td>Drycleaning and Laundry Services</td>
<td>-36</td>
<td>-1</td>
</tr>
</tbody>
</table>

Table 8. Phase 4 Deficits Adding Anchor Industry 144

Junior Colleges, Colleges, Universities, and Professional Schools

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-48</td>
<td>-0</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-50</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-47</td>
<td>-1</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-75</td>
<td>-0</td>
</tr>
<tr>
<td>103</td>
<td>Couriers and Messengers</td>
<td>-44</td>
<td>-1</td>
</tr>
<tr>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>-59</td>
<td>-2</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-188</td>
<td>-2</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-70</td>
<td>-1</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-518</td>
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</table>
### Table 9. Phase 5 Deficits Adding Anchor Industry 55

**Architectural and Structural Metals Manufacturing**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-49</td>
<td>-1</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-50</td>
<td>0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-54</td>
<td>-7</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-76</td>
<td>0</td>
</tr>
<tr>
<td>103</td>
<td>Couriers and Messengers</td>
<td>-46</td>
<td>-3</td>
</tr>
<tr>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>-61</td>
<td>-2</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-71</td>
<td>-1</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-540</td>
<td>-22</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-83</td>
<td>-10</td>
</tr>
<tr>
<td>170</td>
<td>Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance</td>
<td>-39</td>
<td>-2</td>
</tr>
<tr>
<td>174</td>
<td>Drycleaning and Laundry Services</td>
<td>-37</td>
<td>0</td>
</tr>
</tbody>
</table>
Chapter 15. Bluefield, WV-VA

Study Area Overview

The Bluefield, WV-VA study region occupies 938 square-miles and had a 2018 population of 99,986. The employed share of the regional labor force during the 2014-2018 period averaged 94.8%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and All Other Retail. These three industries account for a combined 22.62% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 33.45, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Bluefield, WV-VA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Government and Unclassified, whose employment grew by 427 followed by Coal Mining and Outpatient Care Centers. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 0.39, 51.52, and 2.74.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>427</td>
<td>375</td>
<td>0.39</td>
</tr>
<tr>
<td>7</td>
<td>Coal Mining</td>
<td>337</td>
<td>403</td>
<td>51.52</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>307</td>
<td>86</td>
<td>2.74</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>249</td>
<td>-124</td>
<td>1.15</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>178</td>
<td>93</td>
<td>0.85</td>
</tr>
<tr>
<td>157</td>
<td>Child Day Care Services</td>
<td>165</td>
<td>162</td>
<td>0.97</td>
</tr>
<tr>
<td>162</td>
<td>Museums, Historical Sites, and Similar Institutions</td>
<td>161</td>
<td>156</td>
<td>4.75</td>
</tr>
<tr>
<td>62</td>
<td>Agriculture, Construction, and Mining Machinery Manufacturing</td>
<td>144</td>
<td>123</td>
<td>13.16</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>106</td>
<td>-155</td>
<td>1.34</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>106</td>
<td>69</td>
<td>0.44</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Bluefield, WV-VA, the cluster with the largest CLQ in 2018 is Energy (Fossil and Renewable) with a CLQ of 3.86, followed by Education and Knowledge Creation and Machinery. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Bluefield, WV-VA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.76</td>
<td>1.63</td>
<td>5,732</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.04</td>
<td>1.05</td>
<td>3,975</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>3.51</td>
<td>3.47</td>
<td>3,859</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.57</td>
<td>0.54</td>
<td>3,516</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.26</td>
<td>0.38</td>
<td>1,856</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.07</td>
<td>0.69</td>
<td>1,719</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>2.25</td>
<td>3.86</td>
<td>941</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>1.65</td>
<td>2.99</td>
<td>704</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>1.58</td>
<td>1.34</td>
<td>485</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.92</td>
<td>1.08</td>
<td>350</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.89</td>
<td>0.59</td>
<td>179</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.47</td>
<td>1.08</td>
<td>159</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.67</td>
<td>0.66</td>
<td>152</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.65</td>
<td>0.21</td>
<td>70</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.11</td>
<td>0.27</td>
<td>69</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.57</td>
<td>0.08</td>
<td>68</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.70</td>
<td>0.74</td>
<td>61</td>
</tr>
</tbody>
</table>

**Note:** Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Bluefield, WV-VA

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (5,732)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (3,975)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (3,859)</td>
</tr>
<tr>
<td>Business and Financial Services (3,516)</td>
</tr>
<tr>
<td>Defense and Security (1,856)</td>
</tr>
<tr>
<td>Transportation and Logistics (1,719)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (941)</td>
</tr>
<tr>
<td>Machinery (704)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (485)</td>
</tr>
<tr>
<td>Forest and Wood Products (350)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (179)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (159)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (152)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (70)</td>
</tr>
<tr>
<td>Transportation Equipment (69)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (68)</td>
</tr>
<tr>
<td>Apparel and Textiles (61)</td>
</tr>
</tbody>
</table>
Chapter 15. Bluefield, WV-VA

2. CADS Analysis
The 2018 CADS analysis of the economy of Bluefield, WV-VA identifies 3 anchor industries in 3 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Coal Mining, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry's dependence on the region while the AD measures the region's dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>7</td>
<td>Coal Mining</td>
<td>234</td>
<td>571</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>62</td>
<td>Agriculture, Construction, and Mining Machinery Manufacturing</td>
<td>458</td>
<td>602</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>262</td>
<td>569</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Coal Mining</td>
<td>51.52</td>
<td>403</td>
<td>-28.42</td>
<td>143.97</td>
<td>0.81</td>
<td>0.12</td>
</tr>
<tr>
<td>62</td>
<td>Agriculture, Construction, and Mining Machinery Manufacturing</td>
<td>13.16</td>
<td>123</td>
<td>4.70</td>
<td>31.52</td>
<td>0.64</td>
<td>0.09</td>
</tr>
<tr>
<td>149</td>
<td>Outpatient Care Centers</td>
<td>2.74</td>
<td>86</td>
<td>84.40</td>
<td>117.27</td>
<td>0.91</td>
<td>0.02</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column
Chapter 15. Bluefield, WV-VA

reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 7

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>-7</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>-10</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-3</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-2</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>N/A</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-2</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>N/A</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>N/A</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>N/A</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-18</td>
</tr>
</tbody>
</table>

Table 6. Phase 2 Deficits Adding Anchor Industry 62

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>-25</td>
<td>-18</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>-31</td>
<td>-21</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-26</td>
<td>-22</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-15</td>
<td>-13</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-19</td>
<td>-22</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-23</td>
<td>-21</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-15</td>
<td>-28</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>-25</td>
<td>-30</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>-29</td>
<td>-58</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-21</td>
<td>-4</td>
</tr>
</tbody>
</table>
### Table 7. Phase 3 Deficits Adding Anchor Industry 149
Outpatient Care Centers

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>-26</td>
<td>-1</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>-31</td>
<td>-0</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-26</td>
<td>-0</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-16</td>
<td>-0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-19</td>
<td>-0</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-24</td>
<td>-0</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment</td>
<td>-25</td>
<td>-0</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>-30</td>
<td>-0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-22</td>
<td>-0</td>
</tr>
</tbody>
</table>
Chapter 16. Boone, NC

Study Area Overview

The Boone, NC study region occupies 313 square-miles and had a 2018 population of 55,945. The employed share of the regional labor force during the 2014-2018 period averaged 97.4%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by All Other Retail and Junior Colleges, Colleges, Universities, and Professional Schools. These three industries account for a combined 33.87% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 39.02, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Boone, NC can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 885 followed by Junior Colleges, Colleges, Universities, and Professional Schools and Community and Vocational Rehabilitation Services. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 2.19, 7.01, and 12.05.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>885</td>
<td>78</td>
<td>2.19</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>468</td>
<td>159</td>
<td>7.01</td>
</tr>
<tr>
<td>156</td>
<td>Community and Vocational Rehabilitation Services</td>
<td>381</td>
<td>386</td>
<td>12.05</td>
</tr>
<tr>
<td>141</td>
<td>Other Support Services</td>
<td>313</td>
<td>311</td>
<td>6.82</td>
</tr>
<tr>
<td>119</td>
<td>Real Estate and Owner-Occupied Dwellings</td>
<td>287</td>
<td>263</td>
<td>1.76</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>187</td>
<td>152</td>
<td>0.89</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>173</td>
<td>110</td>
<td>1.20</td>
</tr>
<tr>
<td>93</td>
<td>Food and Beverage Stores</td>
<td>157</td>
<td>118</td>
<td>1.71</td>
</tr>
<tr>
<td>95</td>
<td>All Other Retail</td>
<td>112</td>
<td>172</td>
<td>1.84</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>104</td>
<td>55</td>
<td>0.79</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Boone, NC, the cluster with the largest CLQ in 2018 is Education and Knowledge Creation with a CLQ of 3.67, followed by Arts, Entertainment, Recreation and Visitor Industries and Biomedical/Biotechnical (Life Sciences). The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Boone, NC cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.97</td>
<td>2.16</td>
<td>5,287</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.50</td>
<td>0.63</td>
<td>2,661</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>3.90</td>
<td>3.67</td>
<td>2,641</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.22</td>
<td>1.02</td>
<td>2,325</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.26</td>
<td>0.28</td>
<td>885</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.23</td>
<td>0.51</td>
<td>812</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.43</td>
<td>0.48</td>
<td>277</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.80</td>
<td>0.79</td>
<td>166</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.54</td>
<td>0.67</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.03</td>
<td>0.23</td>
<td>49</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.88</td>
<td>0.48</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.90</td>
<td>0.80</td>
<td>43</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.48</td>
<td>0.21</td>
<td>34</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.17</td>
<td>0.09</td>
<td>20</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.00</td>
<td>0.09</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.92</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Boone, NC

Bubble Size as the Employment for Each Cluster
- Arts, Entertainment, Recreation and Visitor Industries (5,287)
- Business and Financial Services (2,661)
- Education and Knowledge Creation (2,641)
- Biomedical/Biotechnical (Life Sciences) (2,325)
- Defense and Security (885)
- Transportation and Logistics (812)
- Agribusiness, Food Processing and Technology (277)
- Forest and Wood Products (166)
- Information Technology and Telecommunications (100)
- Chemicals and Chemical-Based Products (49)
- Mining, Glass and Ceramics (46)
- Apparel and Textiles (43)
- Energy (Fossil and Renewable) (34)
- Primary and Fabricated Metal Products (20)
- Machinery (14)
- Computer, Electronic, and Electrical Products (0)
- Transportation Equipment (0)
2. CADS Analysis
The 2018 CADS analysis of the economy of Boone, NC identifies 1 anchor industry in 1 cluster. Identified anchor and its parent cluster are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industry and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Real Estate and Owner-Occupied Dwellings, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>119</td>
<td>Real Estate and Owner-Occupied Dwellings</td>
<td>222</td>
<td>509</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>119</td>
<td>Real Estate and Owner-Occupied Dwellings</td>
<td>1.76</td>
<td>263</td>
<td>11.04</td>
<td>129.79</td>
<td>0.77</td>
<td>0.29</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The
tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 119
Real Estate and Owner-Occupied Dwellings

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-30</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-17</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-50</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-15</td>
</tr>
</tbody>
</table>
Chapter 17. Bradford, PA

Study Area Overview

The Bradford, PA study region occupies 979 square-miles and had a 2018 population of 40,968. The employed share of the regional labor force during the 2014-2018 period averaged 94.2%. The Elementary and Secondary Schools industry was the region’s largest employer in 2018, followed by Nursing and Residential Care Facilities and Government and Unclassified. These three industries account for a combined 20.31% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 40.41, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Bradford, PA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Electrical Equipment Manufacturing, whose employment grew by 406 followed by Elementary and Secondary Schools and Management of Companies and Enterprises. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 36.1, 11.01, and 1.02.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>406</td>
<td>411</td>
<td>36.10</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>209</td>
<td>-62</td>
<td>11.01</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>196</td>
<td>184</td>
<td>1.02</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>151</td>
<td>66</td>
<td>1.76</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>151</td>
<td>113</td>
<td>1.14</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>74</td>
<td>22</td>
<td>1.68</td>
</tr>
<tr>
<td>20</td>
<td>Animal Slaughtering and Processing</td>
<td>53</td>
<td>52</td>
<td>1.40</td>
</tr>
<tr>
<td>163</td>
<td>Amusement Parks and Arcades</td>
<td>52</td>
<td>52</td>
<td>2.56</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>47</td>
<td>47</td>
<td>5.16</td>
</tr>
<tr>
<td>168</td>
<td>Automotive Repair and Maintenance</td>
<td>45</td>
<td>45</td>
<td>1.02</td>
</tr>
</tbody>
</table>
Chapter 17. Bradford, PA

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Bradford, PA, the cluster with the largest CLQ in 2018 is Energy (Fossil and Renewable) with a CLQ of 9.91, followed by Primary and Fabricated Metal Products and Forest and Wood Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Bradford, PA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.55</td>
<td>1.49</td>
<td>2,354</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.36</td>
<td>2.97</td>
<td>1,490</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.34</td>
<td>0.41</td>
<td>1,215</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.72</td>
<td>0.71</td>
<td>1,213</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>9.26</td>
<td>9.91</td>
<td>1,089</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.35</td>
<td>0.42</td>
<td>929</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>3.95</td>
<td>5.43</td>
<td>887</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.01</td>
<td>0.65</td>
<td>727</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>7.39</td>
<td>3.95</td>
<td>578</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.84</td>
<td>3.49</td>
<td>480</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>5.94</td>
<td>3.67</td>
<td>245</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.38</td>
<td>0.51</td>
<td>205</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.54</td>
<td>1.12</td>
<td>167</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.39</td>
<td>0.35</td>
<td>36</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.19</td>
<td>0.25</td>
<td>27</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.60</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.50</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: Increasing cluster concentrations are highlighted in blue.*
Figure 1: Cluster Bubble Chart of Bradford, PA

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (2,354)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (1,490)</td>
</tr>
<tr>
<td>Business and Financial Services (1,215)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (1,213)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (1,089)</td>
</tr>
<tr>
<td>Defense and Security (929)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (887)</td>
</tr>
<tr>
<td>Transportation and Logistics (727)</td>
</tr>
<tr>
<td>Forest and Wood Products (578)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (480)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (245)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (205)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (167)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (36)</td>
</tr>
<tr>
<td>Machinery (27)</td>
</tr>
<tr>
<td>Apparel and Textiles (0)</td>
</tr>
<tr>
<td>Transportation Equipment (0)</td>
</tr>
</tbody>
</table>
Chapter 17. Bradford, PA

2. CADS Analysis

The 2018 CADS analysis of the economy of Bradford, PA identifies 5 anchor industries in 4 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Electrical Equipment Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>74</td>
<td>480</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>54</td>
<td>Cutlery and Handtool Manufacturing</td>
<td>359</td>
<td>361</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>56</td>
<td>Boiler, Tank, and Shipping Container</td>
<td>153</td>
<td>172</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and</td>
<td>220</td>
<td>294</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Professional Schools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>151</td>
<td>Home Health Care Services</td>
<td>107</td>
<td>258</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>36.10</td>
<td>411</td>
<td>-7.05</td>
<td>546.05</td>
<td>0.58</td>
<td>0.05</td>
</tr>
<tr>
<td>54</td>
<td>Cutlery and Handtool Manufacturing</td>
<td>99.67</td>
<td>125</td>
<td>-34.13</td>
<td>0.61</td>
<td>0.61</td>
<td>0.04</td>
</tr>
<tr>
<td>56</td>
<td>Boiler, Tank, and Shipping Container</td>
<td>19.82</td>
<td>17</td>
<td>0.77</td>
<td>12.03</td>
<td>0.51</td>
<td>0.03</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

### Table 5. Phase 1 Deficits for Anchor Industry 77

**Electrical Equipment Manufacturing**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-6</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-3</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-17</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-3</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-11</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-16</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-24</td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-2</td>
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</tr>
</tbody>
</table>

### Table 6. Phase 2 Deficits Adding Anchor Industry 54

**Cutlery and Handtool Manufacturing**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
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<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-15</td>
<td>-9</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-10</td>
<td>-5</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
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<td>-6</td>
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<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
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</table>
## Table 7. Phase 3 Deficits Adding Anchor Industry 56

<table>
<thead>
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<th>Employment</th>
<th>Added to Deficit</th>
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</thead>
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<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-23</td>
<td>-8</td>
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<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-15</td>
<td>-5</td>
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<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-36</td>
<td>-27</td>
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<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-26</td>
<td>-5</td>
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<td>52</td>
<td>Foundries</td>
<td>-11</td>
<td>-2</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-35</td>
<td>-9</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-28</td>
<td>-7</td>
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<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-71</td>
<td>-17</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-10</td>
<td>-3</td>
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</table>

## Table 8. Phase 4 Deficits Adding Anchor Industry 144

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-23</td>
<td>0</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-15</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-36</td>
<td>0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-26</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-11</td>
<td>0</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-36</td>
<td>0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-29</td>
<td>0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-72</td>
<td>-1</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-10</td>
<td>0</td>
</tr>
</tbody>
</table>

## Table 9. Phase 5 Deficits Adding Anchor Industry 151

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-23</td>
<td>0</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-15</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>Alumina and Aluminum Production and Processing</td>
<td>-36</td>
<td>0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-26</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-11</td>
<td>0</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-36</td>
<td>0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-29</td>
<td>0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-72</td>
<td>0</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-11</td>
<td>-1</td>
</tr>
</tbody>
</table>
Chapter 18. Brevard, NC

Study Area Overview
The Brevard, NC study region occupies 379 square-miles and had a 2018 population of 34,215. The employed share of the regional labor force during the 2014-2018 period averaged 95.3%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Government and Unclassified and Elementary and Secondary Schools. These three industries account for a combined 25.79% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 34.84, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Brevard, NC can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Other Food Manufacturing, whose employment grew by 118 followed by Semiconductor and Other Electronic Component Manufacturing and Elementary and Secondary Schools. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 9.32, 6.05, and 11.58.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>118</td>
<td>118</td>
<td>9.32</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component</td>
<td>112</td>
<td>115</td>
<td>6.05</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>100</td>
<td>-79</td>
<td>11.58</td>
</tr>
<tr>
<td>93</td>
<td>Food and Beverage Stores</td>
<td>89</td>
<td>68</td>
<td>2.25</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>88</td>
<td>22</td>
<td>2.43</td>
</tr>
<tr>
<td>145</td>
<td>Other Educational Services</td>
<td>82</td>
<td>69</td>
<td>1.97</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting</td>
<td>73</td>
<td>70</td>
<td>0.81</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>60</td>
<td>59</td>
<td>6.55</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>59</td>
<td>32</td>
<td>0.61</td>
</tr>
<tr>
<td>24</td>
<td>Beverage Manufacturing</td>
<td>46</td>
<td>46</td>
<td>3.10</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Brevard, NC, the cluster with the largest CLQ in 2018 is Education and Knowledge Creation with a CLQ of 3.84, followed by Computer, Electronic, and Electrical Products and Chemicals and Chemical-Based Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Brevard, NC cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.60</td>
<td>1.44</td>
<td>1,459</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.31</td>
<td>1.24</td>
<td>1,171</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>3.21</td>
<td>3.84</td>
<td>1,144</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.39</td>
<td>0.48</td>
<td>835</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.50</td>
<td>0.58</td>
<td>756</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.59</td>
<td>0.42</td>
<td>280</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.53</td>
<td>1.06</td>
<td>253</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.76</td>
<td>1.52</td>
<td>135</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.54</td>
<td>1.54</td>
<td>127</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.50</td>
<td>1.21</td>
<td>106</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.93</td>
<td>1.32</td>
<td>82</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>1.68</td>
<td>0.37</td>
<td>36</td>
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<td>13</td>
<td>Machinery</td>
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<td>0.51</td>
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<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
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<td>0.80</td>
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<td>17</td>
<td>Transportation Equipment</td>
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<tr>
<td>2</td>
<td>Apparel and Textiles</td>
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<td>0.52</td>
<td>11</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.29</td>
<td>0.16</td>
<td>10</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Brevard, NC

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (1,459)</td>
</tr>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (1,171)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (1,144)</td>
</tr>
<tr>
<td>Business and Financial Services (835)</td>
</tr>
<tr>
<td>Defense and Security (756)</td>
</tr>
<tr>
<td>Transportation and Logistics (280)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (253)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (135)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (127)</td>
</tr>
<tr>
<td>Forest and Wood Products (106)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (82)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (36)</td>
</tr>
<tr>
<td>Machinery (32)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (32)</td>
</tr>
<tr>
<td>Transportation Equipment (12)</td>
</tr>
<tr>
<td>Apparel and Textiles (11)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (10)</td>
</tr>
</tbody>
</table>
2. CADS Analysis
The 2018 CADS analysis of the economy of Brevard, NC identifies 2 anchor industries in 2 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Pharmaceutical and Medicine Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>50</td>
<td>110</td>
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<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>145</td>
<td>Other Educational Services</td>
<td>29</td>
<td>111</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>6.55</td>
<td>59</td>
<td>2.37</td>
<td>120.94</td>
<td>0.62</td>
<td>0.07</td>
</tr>
<tr>
<td>145</td>
<td>Other Educational Services</td>
<td>1.97</td>
<td>69</td>
<td>44.75</td>
<td>286.13</td>
<td>0.80</td>
<td>0.01</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were
reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 38
Pharmaceutical and Medicine Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-19</td>
</tr>
</tbody>
</table>

Table 6. Phase 2 Deficits Adding Anchor Industry 145
Other Educational Services

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-20</td>
<td>-1</td>
</tr>
</tbody>
</table>
Chapter 19. Calhoun, GA

Study Area Overview
The Calhoun, GA study region occupies 356 square-miles and had a 2018 population of 57,685. The employed share of the regional labor force during the 2014-2018 period averaged 96.5%. The Textile Mills and Textile Product Mills industry was the region’s largest employer in 2018, followed by Employment Services and Food Services and Drinking Places. These three industries account for a combined 39.61% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 48.38, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Calhoun, GA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Hospitals, whose employment grew by 423 followed by Wholesale Trade and Government and Unclassified. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.23, 1.57, and 0.28.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>423</td>
<td>338</td>
<td>1.23</td>
</tr>
<tr>
<td>91</td>
<td>Wholesale Trade</td>
<td>323</td>
<td>318</td>
<td>1.57</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>232</td>
<td>208</td>
<td>0.28</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>150</td>
<td>193</td>
<td>9.51</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>114</td>
<td>-26</td>
<td>1.71</td>
</tr>
<tr>
<td>118</td>
<td>Agencies, Brokerages, and Other Insurance Related Activities</td>
<td>112</td>
<td>94</td>
<td>1.07</td>
</tr>
<tr>
<td>22</td>
<td>Bakeries and Tortilla Manufacturing</td>
<td>107</td>
<td>105</td>
<td>2.53</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>103</td>
<td>91</td>
<td>3.06</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>102</td>
<td>56</td>
<td>0.76</td>
</tr>
<tr>
<td>44</td>
<td>Clay Product and Refractory Manufacturing</td>
<td>101</td>
<td>119</td>
<td>24.60</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Calhoun, GA, the cluster with the largest CLQ in 2018 is Apparel and Textiles with a CLQ of 109.31, followed by Chemicals and Chemical-Based Products and Education and Knowledge Creation. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Calhoun, GA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>59.59</td>
<td>109.31</td>
<td>6,059</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.65</td>
<td>0.63</td>
<td>2,740</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.06</td>
<td>1.18</td>
<td>1,961</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>0.61</td>
<td>0.77</td>
<td>1,803</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.59</td>
<td>2.28</td>
<td>1,699</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.63</td>
<td>0.62</td>
<td>1,573</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>4.19</td>
<td>6.38</td>
<td>1,419</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.18</td>
<td>0.26</td>
<td>867</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.24</td>
<td>0.74</td>
<td>445</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.41</td>
<td>1.24</td>
<td>270</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.24</td>
<td>1.78</td>
<td>177</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.10</td>
<td>0.26</td>
<td>63</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.23</td>
<td>0.35</td>
<td>55</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>1.16</td>
<td>0.20</td>
<td>31</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.10</td>
<td>0.01</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.30</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Calhoun, GA

Bubble Size as the Employment for Each Cluster
- Apparel and Textiles (6,059)
- Business and Financial Services (2,740)
- Transportation and Logistics (1,961)
- Biomedical/Biotechnical (Life Sciences) (1,803)
- Education and Knowledge Creation (1,699)
- Arts, Entertainment, Recreation and Visitor Industries (1,573)
- Chemicals and Chemical-Based Products (1,419)
- Defense and Security (867)
- Agribusiness, Food Processing and Technology (445)
- Forest and Wood Products (270)
- Mining, Glass and Ceramics (177)
- Primary and Fabricated Metal Products (63)
- Information Technology and Telecommunications (55)
- Machinery (31)
- Energy (Fossil and Renewable) (1)
- Computer, Electronic, and Electrical Products (0)
- Transportation Equipment (0)
2. CADS Analysis

The 2018 CADS analysis of the economy of Calhoun, GA identifies 1 anchor industry in 1 cluster. Identified anchor and its parent cluster are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industry and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Textile Mills and Textile Product Mills, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>6,887</td>
<td>6,059</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>180.20</td>
<td>2,023</td>
<td>-41.39</td>
<td>-12.02</td>
<td>0.54</td>
<td>0.50</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The
Chapter 19. Calhoun, GA

tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 26
Textile Mills and Textile Product Mills

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-241</td>
</tr>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>-67</td>
</tr>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-143</td>
</tr>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>-51</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-120</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-101</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-67</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-54</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-53</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-218</td>
</tr>
</tbody>
</table>
Chapter 20. Cambridge, OH

Study Area Overview

The Cambridge, OH study region occupies 522 square-miles and had a 2018 population of 39,022. The employed share of the regional labor force during the 2014-2018 period averaged 95.2%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Nursing and Residential Care Facilities and Hospitals. These three industries account for a combined 19.16% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 40.67, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Cambridge, OH can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Support Activities for Mining, whose employment grew by 444 followed by Individual and Family Services and Motor Vehicle Parts Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 15.17, 2.36, and 5.35.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Support Activities for Mining</td>
<td>444</td>
<td>410</td>
<td>15.17</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>357</td>
<td>134</td>
<td>2.36</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>306</td>
<td>306</td>
<td>5.35</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>247</td>
<td>282</td>
<td>33.97</td>
</tr>
<tr>
<td>14</td>
<td>Construction</td>
<td>237</td>
<td>250</td>
<td>0.88</td>
</tr>
<tr>
<td>145</td>
<td>Other Educational Services</td>
<td>218</td>
<td>200</td>
<td>2.70</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>166</td>
<td>-166</td>
<td>1.11</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>153</td>
<td>31</td>
<td>2.63</td>
</tr>
<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>142</td>
<td>142</td>
<td>10.10</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>135</td>
<td>132</td>
<td>2.46</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Cambridge, OH, the cluster with the largest CLQ in 2018 is Chemicals and Chemical-Based Products with a CLQ of 7.03, followed by Energy (Fossil and Renewable) and Machinery. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Cambridge, OH cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.98</td>
<td>1.63</td>
<td>2,595</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.06</td>
<td>1.03</td>
<td>1,775</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.53</td>
<td>0.36</td>
<td>1,063</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>5.99</td>
<td>7.03</td>
<td>1,060</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.63</td>
<td>2.08</td>
<td>1,053</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.02</td>
<td>0.93</td>
<td>1,045</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.29</td>
<td>0.32</td>
<td>720</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.26</td>
<td>5.25</td>
<td>583</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>2.46</td>
<td>3.04</td>
<td>501</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.00</td>
<td>2.67</td>
<td>306</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.41</td>
<td>0.45</td>
<td>184</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.20</td>
<td>1.08</td>
<td>150</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.20</td>
<td>0.71</td>
<td>106</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>4.19</td>
<td>1.41</td>
<td>95</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.28</td>
<td>0.25</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Cambridge, OH

Bubble Size as the Employment for Each Cluster

- Biomedical/Biotechnical (Life Sciences) (2,595)
- Arts, Entertainment, Recreation and Visitor Industries (1,775)
- Business and Financial Services (1,063)
- Chemicals and Chemical-Based Products (1,060)
- Education and Knowledge Creation (1,053)
- Transportation and Logistics (1,045)
- Defense and Security (720)
- Energy (Fossil and Renewable) (583)
- Primary and Fabricated Metal Products (501)
- Machinery (450)
- Transportation Equipment (306)
- Agribusiness, Food Processing and Technology (184)
- Computer, Electronic, and Electrical Products (150)
- Forest and Wood Products (106)
- Mining, Glass and Ceramics (95)
- Information Technology and Telecommunications (26)
- Apparel and Textiles (0)
2. CADS Analysis

The 2018 CADS analysis of the economy of Cambridge, OH identifies 5 anchor industries in 5 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Rubber Product Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

**Table 3. Anchors, Clusters, and Employment**

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>204</td>
<td>451</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>0</td>
<td>306</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>10</td>
<td>Support Activities for Mining</td>
<td>65</td>
<td>509</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>99</td>
<td>Truck Transportation</td>
<td>264</td>
<td>399</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>162</td>
<td>208</td>
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</tbody>
</table>

**Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates**

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional Rate (%)</th>
<th>AS</th>
<th>AD</th>
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<tbody>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>33.97</td>
<td>282</td>
<td>-17.19</td>
<td>121.20</td>
<td>0.75</td>
<td>0.08</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>5.35</td>
<td>306</td>
<td>-11.56</td>
<td>N/A</td>
<td>0.65</td>
<td>0.08</td>
</tr>
<tr>
<td>10</td>
<td>Support Activities for Mining</td>
<td>15.17</td>
<td>410</td>
<td>52.54</td>
<td>683.08</td>
<td>0.79</td>
<td>0.08</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>2.46</td>
<td>132</td>
<td>1.19</td>
<td>51.14</td>
<td>0.83</td>
<td>0.04</td>
</tr>
<tr>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>5.51</td>
<td>48</td>
<td>-1.47</td>
<td>28.40</td>
<td>0.77</td>
<td>0.03</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 43**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-15</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-18</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-36</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-5</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-7</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-11</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-13</td>
<td></td>
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**Table 6. Phase 2 Deficits Adding Anchor Industry 81**

<table>
<thead>
<tr>
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<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-18</td>
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</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-19</td>
<td>-1</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-41</td>
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<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-12</td>
<td>-11</td>
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<td>52</td>
<td>Foundries</td>
<td>-31</td>
<td>-30</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-18</td>
<td>-14</td>
</tr>
<tr>
<td>Industry #</td>
<td>Industry Name</td>
<td>Employment</td>
<td>Added to Deficit</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------</td>
<td>------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-47</td>
<td>-42</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
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</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-37</td>
<td>-26</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-10</td>
<td>-25</td>
</tr>
<tr>
<td>129</td>
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<td>133</td>
<td>Management of Companies and Enterprises</td>
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<td>-29</td>
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Table 7. Phase 3 Deficits Adding Anchor Industry 10

Support Activities for Mining

<table>
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<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-20</td>
<td>-2</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-20</td>
<td>0</td>
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<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
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<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-12</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-32</td>
<td>-1</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-19</td>
<td>-1</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-51</td>
<td>-4</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
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<td>-2</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-40</td>
<td>-3</td>
</tr>
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<td>104</td>
<td>Warehousing and Storage</td>
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<td>-6</td>
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<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
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<td>Management of Companies and Enterprises</td>
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<td>-19</td>
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Table 8. Phase 4 Deficits Adding Anchor Industry 99

Truck Transportation

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<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
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<td>Crop Production</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-42</td>
<td>0</td>
</tr>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-13</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-32</td>
<td>0</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-19</td>
<td>0</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
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<td>-1</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
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<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-40</td>
<td>0</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-33</td>
<td>-17</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
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<td>-4</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-70</td>
<td>-8</td>
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</table>

Table 9. Phase 5 Deficits Adding Anchor Industry 55

Architectural and Structural Metals Manufacturing

<table>
<thead>
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<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-42</td>
<td>0</td>
</tr>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-13</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-33</td>
<td>-1</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-20</td>
<td>-1</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-60</td>
<td>-8</td>
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### Chapter 20. Cambridge, OH

<table>
<thead>
<tr>
<th>Code</th>
<th>Industry</th>
<th>Change 1</th>
<th>Change 2</th>
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<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
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<td>-2</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-43</td>
<td>-3</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-42</td>
<td>-9</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-25</td>
<td>-2</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-75</td>
<td>-5</td>
</tr>
</tbody>
</table>
Chapter 21. Cedartown, GA

Study Area Overview

The Cedartown, GA study region occupies 310 square-miles and had a 2018 population of 42,470. The employed share of the regional labor force during the 2014-2018 period averaged 94.7%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Rubber Product Manufacturing and Elementary and Secondary Schools. These three industries account for a combined 27.48% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 50.82, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Cedartown, GA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Rubber Product Manufacturing, whose employment grew by 427 followed by Food Services and Drinking Places and Nursing and Residential Care Facilities. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 107.66, 1.3, and 2.39.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>427</td>
<td>533</td>
<td>107.66</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>304</td>
<td>67</td>
<td>1.30</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>242</td>
<td>186</td>
<td>2.39</td>
</tr>
<tr>
<td>94</td>
<td>General Merchandise Stores</td>
<td>213</td>
<td>199</td>
<td>2.28</td>
</tr>
<tr>
<td>87</td>
<td>Office Furniture (Including Fixtures) Manufacturing</td>
<td>183</td>
<td>286</td>
<td>101.09</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>155</td>
<td>133</td>
<td>0.78</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>146</td>
<td>146</td>
<td>8.78</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>146</td>
<td>146</td>
<td>3.50</td>
</tr>
<tr>
<td>142</td>
<td>Waste Management and Remediation Services</td>
<td>137</td>
<td>129</td>
<td>5.33</td>
</tr>
<tr>
<td>65</td>
<td>Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing</td>
<td>68</td>
<td>68</td>
<td>7.28</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Cedartown, GA, the cluster with the largest CLQ in 2018 is Chemicals and Chemical-Based Products with a CLQ of 11.46, followed by Forest and Wood Products and Apparel and Textiles. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Cedartown, GA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
## Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>5.91</td>
<td>11.46</td>
<td>1,263</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.72</td>
<td>0.93</td>
<td>1,173</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>0.58</td>
<td>0.90</td>
<td>1,054</td>
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<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.93</td>
<td>2.64</td>
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</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>4.72</td>
<td>8.42</td>
<td>912</td>
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<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.49</td>
<td>0.45</td>
<td>739</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.45</td>
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<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
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<td>16</td>
<td>Transportation and Logistics</td>
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<td>Machinery</td>
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<tr>
<td>2</td>
<td>Apparel and Textiles</td>
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<td>5.32</td>
<td>146</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>3.41</td>
<td>1.75</td>
<td>146</td>
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<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.44</td>
<td>1.02</td>
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</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.42</td>
<td>1.09</td>
<td>53</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>2.42</td>
<td>0.60</td>
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<td>Information Technology and Telecommunications</td>
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<td>Computer, Electronic, and Electrical Products</td>
<td>0.40</td>
<td>0.00</td>
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</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Cedartown, GA

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
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<tbody>
<tr>
<td>Chemicals and Chemical-Based Products (1,263)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (1,173)</td>
</tr>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (1,054)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (977)</td>
</tr>
<tr>
<td>Forest and Wood Products (912)</td>
</tr>
<tr>
<td>Defense and Security (739)</td>
</tr>
<tr>
<td>Business and Financial Services (658)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (654)</td>
</tr>
<tr>
<td>Transportation and Logistics (576)</td>
</tr>
<tr>
<td>Machinery (148)</td>
</tr>
<tr>
<td>Apparel and Textiles (146)</td>
</tr>
<tr>
<td>Transportation Equipment (146)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (123)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (53)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (49)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (40)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (0)</td>
</tr>
</tbody>
</table>
Chapter 21. Cedartown, GA

2. CADS Analysis
The 2018 CADS analysis of the economy of Cedartown, GA identifies 3 anchor industries in 3 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Rubber Product Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>618</td>
<td>1,045</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>0</td>
<td>146</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>0</td>
<td>146</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>107.66</td>
<td>533</td>
<td>-17.19</td>
<td>69.08</td>
<td>0.61</td>
<td>0.26</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>3.50</td>
<td>146</td>
<td>-11.56</td>
<td>N/A</td>
<td>0.50</td>
<td>0.05</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>8.78</td>
<td>146</td>
<td>-41.39</td>
<td>N/A</td>
<td>0.62</td>
<td>0.02</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has
been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 43**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-23</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-54</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-33</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-10</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-20</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-17</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-25</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-17</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-16</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-45</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-10</td>
</tr>
</tbody>
</table>

**Table 6. Phase 2 Deficits Adding Anchor Industry 81**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-24</td>
<td>-1</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-54</td>
<td>-1</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-35</td>
<td>-2</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-16</td>
<td>-6</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-39</td>
<td>-19</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-21</td>
<td>-4</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-36</td>
<td>-12</td>
</tr>
</tbody>
</table>
Chapter 21. Cedartown, GA

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-20</td>
<td>-4</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-20</td>
<td>-5</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-58</td>
<td>-13</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-13</td>
<td>-3</td>
</tr>
</tbody>
</table>

Table 7. Phase 3 Deficits Adding Anchor Industry 26

Textile Mills and Textile Product Mills

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-23</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Forestry and Logging</td>
<td>-54</td>
<td>0</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments</td>
<td>-34</td>
<td>1</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-16</td>
<td>0</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-39</td>
<td>0</td>
</tr>
<tr>
<td>60</td>
<td>Coating, Engraving, Heat Treating, and Allied Activities</td>
<td>-21</td>
<td>0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-36</td>
<td>0</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-57</td>
<td>1</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-12</td>
<td>0</td>
</tr>
</tbody>
</table>
Chapter 22. Charleston, WV

Study Area Overview

The Charleston, WV study region occupies 2,529 square-miles and had a 2018 population of 288,318. The employed share of the regional labor force during the 2014-2018 period averaged 95.01%. The Government and Unclassified industry was the region’s largest employer in 2018, followed by Food Services and Drinking Places and Hospitals. These three industries account for a combined 24.34% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 21.52, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Charleston, WV can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Motor Vehicle Parts Manufacturing, whose employment grew by 1,466 followed by Employment Services and Hospitals. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 5.21, 1.03, and 2.2.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>1,466</td>
<td>1,582</td>
<td>5.21</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>1,372</td>
<td>1,359</td>
<td>1.03</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>1,023</td>
<td>-412</td>
<td>2.20</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>1,003</td>
<td>737</td>
<td>0.94</td>
</tr>
<tr>
<td>148</td>
<td>Offices of Other Health Practitioners</td>
<td>531</td>
<td>142</td>
<td>1.38</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design and Related Services</td>
<td>515</td>
<td>331</td>
<td>0.44</td>
</tr>
<tr>
<td>166</td>
<td>Accommodation</td>
<td>342</td>
<td>216</td>
<td>0.96</td>
</tr>
<tr>
<td>152</td>
<td>Other Ambulatory Health Care Services</td>
<td>340</td>
<td>242</td>
<td>2.03</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>315</td>
<td>-6</td>
<td>1.13</td>
</tr>
<tr>
<td>122</td>
<td>Commercial and Industrial Machinery and Equipment Rental and Leasing</td>
<td>268</td>
<td>180</td>
<td>3.46</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Charleston, WV, the cluster with the largest CLQ in 2018 is Energy (Fossil and Renewable) with a CLQ of 4.12, followed by Transportation Equipment and Education and Knowledge Creation. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Charleston, WV cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.75</td>
<td>0.86</td>
<td>21,029</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.37</td>
<td>1.49</td>
<td>19,730</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.67</td>
<td>0.77</td>
<td>14,109</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.95</td>
<td>0.94</td>
<td>13,464</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.36</td>
<td>2.32</td>
<td>9,721</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.32</td>
<td>0.90</td>
<td>8,422</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>8.31</td>
<td>4.12</td>
<td>3,788</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.84</td>
<td>2.62</td>
<td>2,490</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>1.65</td>
<td>1.24</td>
<td>1,543</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.47</td>
<td>1.26</td>
<td>1,094</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.30</td>
<td>0.52</td>
<td>708</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.17</td>
<td>0.13</td>
<td>420</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.21</td>
<td>0.22</td>
<td>265</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.81</td>
<td>0.35</td>
<td>192</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.13</td>
<td>0.16</td>
<td>180</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.16</td>
<td>0.13</td>
<td>114</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.18</td>
<td>0.14</td>
<td>43</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Charleston, WV

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and Financial Services (21,029)</td>
</tr>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (19,730)</td>
</tr>
<tr>
<td>Defense and Security (14,109)</td>
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<td>Arts, Entertainment, Recreation and Visitor Industries (13,464)</td>
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<td>Energy (Fossil and Renewable) (3,788)</td>
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<tr>
<td>Transportation Equipment (2,490)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (1,543)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (1,094)</td>
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<td>Machinery (114)</td>
</tr>
<tr>
<td>Apparel and Textiles (43)</td>
</tr>
</tbody>
</table>

2018 CLQ vs % Change in CLQ, 2005 - 2018
2. CADS Analysis

The 2018 CADS analysis of the economy of Charleston, WV identifies 1 anchor industry in 1 cluster. Identified anchor and its parent cluster are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industry and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Motor Vehicle Parts Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>1,000</td>
<td>2,466</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>5.21</td>
<td>1,582</td>
<td>-11.56</td>
<td>146.57</td>
<td>0.62</td>
<td>0.08</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The
The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 81
Motor Vehicle Parts Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>-85</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>-126</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-108</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-65</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-73</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-245</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-111</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-61</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-64</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-217</td>
</tr>
</tbody>
</table>
Chapter 23. Chattanooga, TN-GA

Study Area Overview

The Chattanooga, TN-GA study region occupies 2,088 square-miles and had a 2018 population of 560,793. The employed share of the regional labor force during the 2014-2018 period averaged 95.37%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and All Other Retail. These three industries account for a combined 20.19% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 25.86, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Chattanooga, TN-GA can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 5,380 followed by Elementary and Secondary Schools and Motor Vehicle Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.26, 8.21, and 4.96.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>5,380</td>
<td>-26</td>
<td>1.26</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>3,050</td>
<td>-11</td>
<td>8.21</td>
</tr>
<tr>
<td>79</td>
<td>Motor Vehicle Manufacturing</td>
<td>1,829</td>
<td>1,829</td>
<td>4.96</td>
</tr>
<tr>
<td>93</td>
<td>Food and Beverage Stores</td>
<td>1,645</td>
<td>1,471</td>
<td>0.86</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>1,601</td>
<td>811</td>
<td>1.11</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>1,526</td>
<td>164</td>
<td>0.73</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>1,328</td>
<td>1,433</td>
<td>2.42</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>1,135</td>
<td>-103</td>
<td>1.51</td>
</tr>
<tr>
<td>154</td>
<td>Nursing and Residential Care Facilities</td>
<td>1,124</td>
<td>379</td>
<td>1.03</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>1,115</td>
<td>780</td>
<td>0.29</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Chattanooga, TN-GA, the cluster with the largest CLQ in 2018 is Apparel and Textiles with a CLQ of 5.54, followed by Transportation Equipment and Education and Knowledge Creation. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Chattanooga, TN-GA cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.93</td>
<td>0.92</td>
<td>44,309</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.97</td>
<td>1.09</td>
<td>30,301</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.05</td>
<td>1.11</td>
<td>28,726</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>2.37</td>
<td>1.30</td>
<td>23,667</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>1.99</td>
<td>2.33</td>
<td>19,100</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.27</td>
<td>0.31</td>
<td>11,193</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>1.13</td>
<td>0.90</td>
<td>5,913</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.60</td>
<td>2.75</td>
<td>5,107</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>1.68</td>
<td>1.77</td>
<td>4,716</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>1.30</td>
<td>1.51</td>
<td>3,682</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>2.08</td>
<td>1.97</td>
<td>3,533</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>4.43</td>
<td>5.54</td>
<td>3,368</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.77</td>
<td>1.24</td>
<td>2,973</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>1.82</td>
<td>1.55</td>
<td>2,701</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.91</td>
<td>1.01</td>
<td>2,275</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.26</td>
<td>1.81</td>
<td>1,975</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.34</td>
<td>1.01</td>
<td>1,709</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Chapter 23. Chattanooga, TN-GA

Figure 1: Cluster Bubble Chart of Chattanooga, TN-GA
Chapter 23. Chattanooga, TN-GA

2. CADS Analysis
The 2018 CADS analysis of the economy of Chattanooga, TN-GA identifies 1 anchor industry in 1 cluster. Identified anchor and its parent cluster are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industry and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Junior Colleges, Colleges, Universities, and Professional Schools, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>2,614</td>
<td>3,695</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>1.29</td>
<td>456</td>
<td>23.90</td>
<td>41.34</td>
<td>0.98</td>
<td>0.01</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The
tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 144**

*Junior Colleges, Colleges, Universities, and Professional Schools*

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
</table>

Note: If no industries with deficits greater than 10 employees are identified for a given analysis phase, deficit tables will include only column headings.
Chapter 24. Chillicothe, OH

Study Area Overview

The Chillicothe, OH study region occupies 689 square-miles and had a 2018 population of 76,931. The employed share of the regional labor force during the 2014-2018 period averaged 94%. The Hospitals industry was the region’s largest employer in 2018, followed by Food Services and Drinking Places and Government and Unclassified. These three industries account for a combined 31.12% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 40.45, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Chillicothe, OH can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Hospitals, whose employment grew by 1,407 followed by Motor Vehicle Parts Manufacturing and Food Services and Drinking Places. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 4.13, 8.08, and 1.41.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>1,407</td>
<td>967</td>
<td>4.13</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>603</td>
<td>635</td>
<td>8.08</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>555</td>
<td>-199</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Motor Vehicle Manufacturing</td>
<td>364</td>
<td>426</td>
<td>44.59</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>325</td>
<td>101</td>
<td>1.18</td>
</tr>
<tr>
<td>95</td>
<td>All Other Retail</td>
<td>293</td>
<td>347</td>
<td>1.37</td>
</tr>
<tr>
<td>80</td>
<td>Motor Vehicle Body and Trailer Manufacturing</td>
<td>185</td>
<td>185</td>
<td>6.19</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>172</td>
<td>167</td>
<td>1.20</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>163</td>
<td>160</td>
<td>1.48</td>
</tr>
<tr>
<td>145</td>
<td>Other Educational Services</td>
<td>162</td>
<td>120</td>
<td>1.42</td>
</tr>
</tbody>
</table>
Chapter 24. Chillicothe, OH

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Chillicothe, OH, the cluster with the largest CLQ in 2018 is Transportation Equipment with a CLQ of 13.75, followed by Forest and Wood Products and Education and Knowledge Creation. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Chillicothe, OH cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.89</td>
<td>2.03</td>
<td>6,153</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.15</td>
<td>1.08</td>
<td>3,533</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>7.49</td>
<td>13.75</td>
<td>2,985</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.88</td>
<td>2.41</td>
<td>2,311</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.45</td>
<td>0.39</td>
<td>2,166</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.55</td>
<td>0.51</td>
<td>2,134</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.79</td>
<td>0.68</td>
<td>1,460</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>4.75</td>
<td>3.61</td>
<td>1,014</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.23</td>
<td>0.94</td>
<td>187</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.83</td>
<td>0.82</td>
<td>172</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.22</td>
<td>0.21</td>
<td>159</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.39</td>
<td>0.41</td>
<td>128</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.82</td>
<td>0.57</td>
<td>73</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.10</td>
<td>0.31</td>
<td>64</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.69</td>
<td>0.14</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.01</td>
<td>0.13</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.03</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Chillicothe, OH

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (6,153)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (3,533)</td>
</tr>
<tr>
<td>Transportation Equipment (2,985)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (2,311)</td>
</tr>
<tr>
<td>Business and Financial Services (2,166)</td>
</tr>
<tr>
<td>Defense and Security (2,134)</td>
</tr>
<tr>
<td>Transportation and Logistics (1,460)</td>
</tr>
<tr>
<td>Forest and Wood Products (1,014)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (187)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (172)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (159)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (128)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (73)</td>
</tr>
<tr>
<td>Machinery (64)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (36)</td>
</tr>
<tr>
<td>Apparel and Textiles (9)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (0)</td>
</tr>
</tbody>
</table>
Chapter 24. Chillicothe, OH

2. CADS Analysis

The 2018 CADS analysis of the economy of Chillicothe, OH identifies 1 anchor industry in 1 cluster. Identified anchor and its parent cluster are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industry and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Motor Vehicle Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>79</td>
<td>Motor Vehicle Manufacturing</td>
<td>1,560</td>
<td>1,924</td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>79</td>
<td>Motor Vehicle Manufacturing</td>
<td>44.59</td>
<td>426</td>
<td>-3.98</td>
<td>23.34</td>
<td>0.28</td>
<td>0.57</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The
Chapter 24. Chillicothe, OH

tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 79
Motor Vehicle Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>-432</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-360</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-583</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>-307</td>
</tr>
<tr>
<td>71</td>
<td>Audio and Video Equipment Manufacturing</td>
<td>-383</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-459</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>-2,412</td>
</tr>
<tr>
<td>91</td>
<td>Wholesale Trade</td>
<td>-1,142</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>-384</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>-401</td>
</tr>
</tbody>
</table>
Chapter 25. Clarksburg, WV

Study Area Overview
The Clarksburg, WV study region occupies 909 square-miles and had a 2018 population of 92,822. The employed share of the regional labor force during the 2014-2018 period averaged 94.14%. The Government and Unclassified industry was the region’s largest employer in 2018, followed by Hospitals and Construction. These three industries account for a combined 27.74% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 28.81, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Clarksburg, WV can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Construction, whose employment grew by 1,442 followed by Hospitals and Architectural, Engineering, and Related Services. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.4, 2.52, and 2.14.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Construction</td>
<td>1,442</td>
<td>1,489</td>
<td>1.40</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>844</td>
<td>384</td>
<td>2.52</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>538</td>
<td>507</td>
<td>2.14</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>520</td>
<td>517</td>
<td>1.79</td>
</tr>
<tr>
<td>10</td>
<td>Support Activities for Mining</td>
<td>485</td>
<td>300</td>
<td>9.11</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>442</td>
<td>265</td>
<td>0.88</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>416</td>
<td>395</td>
<td>16.45</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>364</td>
<td>349</td>
<td>0.66</td>
</tr>
<tr>
<td>102</td>
<td>Scenic and Sightseeing Transportation and Support Activities for Transportation</td>
<td>352</td>
<td>309</td>
<td>2.42</td>
</tr>
<tr>
<td>151</td>
<td>Home Health Care Services</td>
<td>288</td>
<td>73</td>
<td>1.38</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Clarksburg, WV, the cluster with the largest CLQ in 2018 is Energy (Fossil and Renewable) with a CLQ of 7.19, followed by Education and Knowledge Creation and Biomedical/Biotechnical (Life Sciences). The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Clarksburg, WV cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.58</td>
<td>1.59</td>
<td>6,930</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>1.00</td>
<td>0.93</td>
<td>5,661</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.55</td>
<td>0.60</td>
<td>4,877</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.97</td>
<td>0.83</td>
<td>3,927</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.95</td>
<td>1.09</td>
<td>3,363</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.81</td>
<td>1.78</td>
<td>2,466</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>4.48</td>
<td>7.19</td>
<td>2,183</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.60</td>
<td>0.69</td>
<td>284</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.17</td>
<td>0.79</td>
<td>227</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.49</td>
<td>0.47</td>
<td>213</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.20</td>
<td>0.17</td>
<td>191</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>2.41</td>
<td>0.74</td>
<td>136</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.34</td>
<td>0.33</td>
<td>125</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>0.61</td>
<td>0.12</td>
<td>49</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.16</td>
<td>0.10</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.03</td>
<td>0.14</td>
<td>15</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note:** Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Clarksburg, WV

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical/Biotechnical (Life Sciences) (6,930)</td>
</tr>
<tr>
<td>Defense and Security (5,661)</td>
</tr>
<tr>
<td>Business and Financial Services (4,877)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (3,927)</td>
</tr>
<tr>
<td>Transportation and Logistics (3,363)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (2,466)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (2,183)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (284)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (227)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (213)</td>
</tr>
<tr>
<td>Agribusiness, Food Processing and Technology (191)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (136)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (125)</td>
</tr>
<tr>
<td>Forest and Wood Products (49)</td>
</tr>
<tr>
<td>Machinery (30)</td>
</tr>
<tr>
<td>Apparel and Textiles (15)</td>
</tr>
<tr>
<td>Transportation Equipment (0)</td>
</tr>
</tbody>
</table>
2. CADS Analysis

The 2018 CADS analysis of the economy of Clarksburg, WV identifies 3 anchor industries in 3 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Oil and Gas Extraction, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

### Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>196</td>
<td>612</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>153</td>
<td>Hospitals</td>
<td>2,539</td>
<td>3,383</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>99</td>
<td>Truck Transportation</td>
<td>275</td>
<td>796</td>
</tr>
</tbody>
</table>

### Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>16.45</td>
<td>395</td>
<td>10.72</td>
<td>212.81</td>
<td>0.70</td>
<td>0.25</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>2.52</td>
<td>384</td>
<td>18.09</td>
<td>33.22</td>
<td>0.74</td>
<td>0.10</td>
</tr>
<tr>
<td>99</td>
<td>Truck Transportation</td>
<td>1.79</td>
<td>517</td>
<td>1.19</td>
<td>189.05</td>
<td>0.86</td>
<td>0.03</td>
</tr>
</tbody>
</table>

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were
reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 6**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>-22</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-0</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-25</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-21</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-29</td>
</tr>
<tr>
<td>58</td>
<td>Spring and Wire Product Manufacturing</td>
<td>-17</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-60</td>
</tr>
<tr>
<td>62</td>
<td>Agriculture, Construction, and Mining Machinery Manufacturing</td>
<td>-34</td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>-57</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>-18</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>N/A</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-74</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>N/A</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>N/A</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Table 6. Phase 2 Deficits Adding Anchor Industry 153**

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>-27</td>
<td>-5</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-27</td>
<td>-27</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-27</td>
<td>-2</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-21</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-29</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Spring and Wire Product Manufacturing</td>
<td>-18</td>
<td>-0</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-63</td>
<td>-2</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Agriculture, Construction, and Mining Machinery Manufacturing</td>
<td>-34</td>
<td>-0</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>-57</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>-22</td>
<td>-4</td>
<td></td>
</tr>
</tbody>
</table>
### Chapter 25. Clarksburg, WV

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-30</td>
<td>-40</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-180</td>
<td>-105</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-21</td>
<td>-107</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-113</td>
<td>-255</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-29</td>
<td>-35</td>
</tr>
</tbody>
</table>

#### Table 7. Phase 3 Deficits Adding Anchor Industry 99

**Truck Transportation**

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Basic Chemical Manufacturing</td>
<td>-28</td>
<td>-0</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-27</td>
<td>-0</td>
</tr>
<tr>
<td>41</td>
<td>Other Chemical Product and Preparation Manufacturing</td>
<td>-27</td>
<td>-0</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-22</td>
<td>-0</td>
</tr>
<tr>
<td>49</td>
<td>Steel Product Manufacturing From Purchased Steel</td>
<td>-30</td>
<td>-0</td>
</tr>
<tr>
<td>58</td>
<td>Spring and Wire Product Manufacturing</td>
<td>-18</td>
<td>-0</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-63</td>
<td>-1</td>
</tr>
<tr>
<td>62</td>
<td>Agriculture, Construction, and Mining Machinery Manufacturing</td>
<td>-34</td>
<td>-0</td>
</tr>
<tr>
<td>66</td>
<td>Metalworking Machinery Manufacturing</td>
<td>-58</td>
<td>-0</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>-28</td>
<td>-5</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-30</td>
<td>-0</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-190</td>
<td>-10</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-29</td>
<td>-8</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>-178</td>
<td>-65</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-36</td>
<td>-7</td>
</tr>
</tbody>
</table>
Chapter 26. Cleveland, TN

Study Area Overview
The Cleveland, TN study region occupies 764 square-miles and had a 2018 population of 123,625. The employed share of the regional labor force during the 2014-2018 period averaged 94.51%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and Warehousing and Storage. These three industries account for a combined 21.4% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 38.38, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Cleveland, TN can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Warehousing and Storage, whose employment grew by 2,477 followed by Food Services and Drinking Places and Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 8.33, 1.26, and 26.36.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>2,477</td>
<td>2,342</td>
<td>8.33</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>1,406</td>
<td>570</td>
<td>1.26</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>653</td>
<td>658</td>
<td>26.36</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>637</td>
<td>621</td>
<td>2.96</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>537</td>
<td>432</td>
<td>1.28</td>
</tr>
<tr>
<td>14</td>
<td>Construction</td>
<td>404</td>
<td>442</td>
<td>0.76</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>372</td>
<td>-303</td>
<td>8.87</td>
</tr>
<tr>
<td>47</td>
<td>Lime, Gypsum and Other Nonmetallic Mineral Product Manufacturing</td>
<td>339</td>
<td>339</td>
<td>12.53</td>
</tr>
<tr>
<td>93</td>
<td>Food and Beverage Stores</td>
<td>326</td>
<td>293</td>
<td>0.93</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>314</td>
<td>148</td>
<td>1.35</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Cleveland, TN, the cluster with the largest CLQ in 2018 is Apparel and Textiles with a CLQ of 7.45, followed by Computer, Electronic, and Electrical Products and Mining, Glass and Ceramics. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Cleveland, TN cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.82</td>
<td>0.74</td>
<td>6,325</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.90</td>
<td>1.04</td>
<td>5,207</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.99</td>
<td>1.57</td>
<td>5,125</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.66</td>
<td>2.68</td>
<td>3,931</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.27</td>
<td>0.71</td>
<td>3,292</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>6.33</td>
<td>6.19</td>
<td>2,493</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>1.54</td>
<td>1.61</td>
<td>1,888</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>2.23</td>
<td>3.37</td>
<td>1,471</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>3.59</td>
<td>3.39</td>
<td>1,453</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.20</td>
<td>0.22</td>
<td>1,401</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>6.82</td>
<td>7.45</td>
<td>812</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.80</td>
<td>3.77</td>
<td>735</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.71</td>
<td>0.56</td>
<td>266</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>0.88</td>
<td>0.64</td>
<td>205</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.23</td>
<td>0.48</td>
<td>149</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.31</td>
<td>0.47</td>
<td>142</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.61</td>
<td>0.23</td>
<td>76</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Cleveland, TN
Chapter 26. Cleveland, TN

2. CADS Analysis
The 2018 CADS analysis of the economy of Cleveland, TN identifies 7 anchor industries in 6 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

### Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>44</td>
<td>696</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>17</td>
<td>Sugar and Confectionery Product Manufacturing</td>
<td>588</td>
<td>703</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>104</td>
<td>Warehousing and Storage</td>
<td>153</td>
<td>2,630</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>2,802</td>
<td>4,207</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>146</td>
<td>Offices of Physicians</td>
<td>682</td>
<td>996</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>99</td>
<td>Truck Transportation</td>
<td>601</td>
<td>753</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>838</td>
<td>1,116</td>
</tr>
</tbody>
</table>

### Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
</table>

179
Chapter 26. Cleveland, TN

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 36
Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-20</td>
</tr>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-9</td>
</tr>
<tr>
<td>12</td>
<td>Natural Gas Distribution</td>
<td>-8</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-6</td>
</tr>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>-0</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-7</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-15</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-15</td>
</tr>
<tr>
<td>63</td>
<td>Industrial Machinery Manufacturing</td>
<td>-9</td>
</tr>
</tbody>
</table>
### Chapter 26. Cleveland, TN

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>73</td>
<td>Navigational, Measuring, Electromedical, and Control Instruments Manufacturing</td>
<td>-14</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-25</td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-6</td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-11</td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-16</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6. Phase 2 Deficits Adding Anchor Industry 17**

Sugar and Confectionery Product Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-66</td>
<td>-163</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-22</td>
<td>-3</td>
</tr>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-10</td>
<td>-1</td>
</tr>
<tr>
<td>12</td>
<td>Natural Gas Distribution</td>
<td>-10</td>
<td>-3</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-17</td>
<td>-11</td>
</tr>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>-18</td>
<td>-17</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-17</td>
<td>-9</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-17</td>
<td>-2</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-25</td>
<td>-10</td>
</tr>
<tr>
<td>63</td>
<td>Industrial Machinery Manufacturing</td>
<td>-10</td>
<td>-1</td>
</tr>
<tr>
<td>73</td>
<td>Navigational, Measuring, Electromedical, and Control Instruments Manufacturing</td>
<td>-15</td>
<td>-1</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-34</td>
<td>-9</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-14</td>
<td>-7</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>N/A</td>
<td>-31</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-24</td>
<td>-14</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-23</td>
<td>-7</td>
</tr>
</tbody>
</table>

**Table 7. Phase 3 Deficits Adding Anchor Industry 104**

Warehousing and Storage

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-67</td>
<td>-2</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-23</td>
<td>-1</td>
</tr>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-10</td>
<td>-0</td>
</tr>
<tr>
<td>12</td>
<td>Natural Gas Distribution</td>
<td>-11</td>
<td>-1</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-17</td>
<td>-0</td>
</tr>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>-18</td>
<td>-0</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-18</td>
<td>-1</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-18</td>
<td>-1</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-31</td>
<td>-7</td>
</tr>
<tr>
<td>63</td>
<td>Industrial Machinery Manufacturing</td>
<td>-10</td>
<td>-0</td>
</tr>
<tr>
<td>73</td>
<td>Navigational, Measuring, Electromedical, and Control Instruments Manufacturing</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-35</td>
<td>-1</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-23</td>
<td>-9</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>N/A</td>
<td>-17</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-28</td>
<td>-4</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-35</td>
<td>-12</td>
</tr>
</tbody>
</table>
**Table 8. Phase 4 Deficits Adding Anchor Industry 167**

Food Services and Drinking Places

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-83</td>
<td>-16</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-24</td>
<td>-1</td>
</tr>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-11</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Natural Gas Distribution</td>
<td>-12</td>
<td>-1</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-18</td>
<td>-1</td>
</tr>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>-25</td>
<td>-7</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-19</td>
<td>-1</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-19</td>
<td>-1</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-34</td>
<td>-2</td>
</tr>
<tr>
<td>63</td>
<td>Industrial Machinery Manufacturing</td>
<td>-10</td>
<td>-0</td>
</tr>
<tr>
<td>73</td>
<td>Navigational, Measuring, Electromedical, and Control Instruments Manufacturing</td>
<td>-15</td>
<td>-0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-36</td>
<td>-1</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-29</td>
<td>-6</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
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<td>-16</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-41</td>
<td>-12</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-43</td>
<td>-8</td>
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</table>

**Table 9. Phase 5 Deficits Adding Anchor Industry 146**

Offices of Physicians

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-84</td>
<td>-1</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-24</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-11</td>
<td>-1</td>
</tr>
<tr>
<td>12</td>
<td>Natural Gas Distribution</td>
<td>-12</td>
<td>-1</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-18</td>
<td>-0</td>
</tr>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>-25</td>
<td>-0</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-19</td>
<td>-0</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-19</td>
<td>-0</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-34</td>
<td>-1</td>
</tr>
<tr>
<td>63</td>
<td>Industrial Machinery Manufacturing</td>
<td>-10</td>
<td>-0</td>
</tr>
<tr>
<td>73</td>
<td>Navigational, Measuring, Electromedical, and Control Instruments Manufacturing</td>
<td>-20</td>
<td>-4</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-37</td>
<td>-0</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-34</td>
<td>-5</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-14</td>
<td>-25</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-43</td>
<td>-3</td>
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<td>139</td>
<td>Investigation and Security Services</td>
<td>-51</td>
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</table>

**Table 10. Phase 6 Deficits Adding Anchor Industry 99**

Truck Transportation

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-84</td>
<td>0</td>
</tr>
</tbody>
</table>
### Table 11. Phase 7 Deficits Adding Anchor Industry 144
Junior Colleges, Colleges, Universities, and Professional Schools

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-87</td>
<td>-3</td>
</tr>
<tr>
<td>6</td>
<td>Oil and Gas Extraction</td>
<td>-26</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Nonmetallic Mineral Mining and Quarrying</td>
<td>-11</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Natural Gas Distribution</td>
<td>-13</td>
<td>-1</td>
</tr>
<tr>
<td>16</td>
<td>Grain and Oilseed Milling</td>
<td>-18</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>Other Food Manufacturing</td>
<td>-26</td>
<td>-1</td>
</tr>
<tr>
<td>31</td>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>-19</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>Petroleum and Coal Products Manufacturing</td>
<td>-20</td>
<td>-1</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>-36</td>
<td>0</td>
</tr>
<tr>
<td>63</td>
<td>Industrial Machinery Manufacturing</td>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td>73</td>
<td>Navigational, Measuring, Electromedical, and Control Instruments Manufacturing</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>Rail Transportation</td>
<td>-39</td>
<td>2</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-41</td>
<td>7</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-19</td>
<td>5</td>
</tr>
<tr>
<td>131</td>
<td>Advertising and Related Services</td>
<td>-45</td>
<td>2</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-56</td>
<td>5</td>
</tr>
</tbody>
</table>

Chapter 26. Cleveland, TN
Chapter 27. Columbus, MS

Study Area Overview

The Columbus, MS study region occupies 506 square-miles and had a 2018 population of 58,930. The employed share of the regional labor force during the 2014-2018 period averaged 91.8%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by All Other Retail and Government and Unclassified. These three industries account for a combined 22.77% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 34.01, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Columbus, MS can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 984 followed by Iron and Steel Mills and Ferroalloy Manufacturing and Motor Vehicle Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.42, 44.94, and 11.05.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>984</td>
<td>481</td>
<td>1.42</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>594</td>
<td>594</td>
<td>44.94</td>
</tr>
<tr>
<td>79</td>
<td>Motor Vehicle Manufacturing</td>
<td>411</td>
<td>411</td>
<td>11.05</td>
</tr>
<tr>
<td>82</td>
<td>Aerospace Product and Parts Manufacturing</td>
<td>348</td>
<td>348</td>
<td>4.36</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>318</td>
<td>221</td>
<td>1.72</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>216</td>
<td>216</td>
<td>2.31</td>
</tr>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>211</td>
<td>-28</td>
<td>4.18</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>198</td>
<td>136</td>
<td>0.65</td>
</tr>
<tr>
<td>100</td>
<td>Transit and Ground Passenger Transportation</td>
<td>165</td>
<td>125</td>
<td>2.53</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>158</td>
<td>166</td>
<td>9.95</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Columbus, MS, the cluster with the largest CLQ in 2018 is Primary and Fabricated Metal Products with a CLQ of 4.32, followed by Transportation Equipment and Apparel and Textiles. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Columbus, MS cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.22</td>
<td>1.25</td>
<td>3,272</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.92</td>
<td>1.16</td>
<td>3,256</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>3.62</td>
<td>2.98</td>
<td>2,461</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.53</td>
<td>0.50</td>
<td>2,439</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.23</td>
<td>1.13</td>
<td>2,078</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.43</td>
<td>0.50</td>
<td>1,830</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>1.01</td>
<td>4.32</td>
<td>1,164</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.00</td>
<td>3.68</td>
<td>689</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>5.28</td>
<td>1.57</td>
<td>380</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.26</td>
<td>0.41</td>
<td>271</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>1.49</td>
<td>1.16</td>
<td>263</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.30</td>
<td>1.30</td>
<td>236</td>
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<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>3.54</td>
<td>3.22</td>
<td>198</td>
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<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>2.46</td>
<td>1.56</td>
<td>172</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.37</td>
<td>0.78</td>
<td>133</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>0.72</td>
<td>0.54</td>
<td>132</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.15</td>
<td>0.53</td>
<td>93</td>
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</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Columbus, MS

**Bubble Size as the Employment for Each Cluster**
- Biomedical/Biotechnical (Life Sciences) (3,272)
- Arts, Entertainment, Recreation and Visitor Industries (3,256)
- Education and Knowledge Creation (2,461)
- Business and Financial Services (2,439)
- Transportation and Logistics (2,078)
- Defense and Security (1,830)
- Primary and Fabricated Metal Products (1,164)
- Transportation Equipment (689)
- Forest and Wood Products (380)
- Agribusiness, Food Processing and Technology (271)
- Computer, Electronic, and Electrical Products (263)
- Energy (Fossil and Renewable) (236)
- Apparel and Textiles (198)
- Mining, Glass and Ceramics (172)
- Information Technology and Telecommunications (133)
- Chemicals and Chemical-Based Products (132)
- Machinery (93)
Chapter 27. Columbus, MS

2. CADS Analysis

The 2018 CADS analysis of the economy of Columbus, MS identifies 5 anchor industries in 5 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Motor Vehicle Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>79</td>
<td>Motor Vehicle Manufacturing</td>
<td>0</td>
<td>411</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>2</td>
<td>595</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>1,687</td>
<td>2,671</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>82</td>
<td>Aerospace Product and Parts Manufacturing</td>
<td>0</td>
<td>348</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>100</td>
<td>Transit and Ground Passenger Transportation</td>
<td>95</td>
<td>260</td>
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</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>79</td>
<td>Motor Vehicle Manufacturing</td>
<td>11.05</td>
<td>411</td>
<td>-3.98</td>
<td>N/A</td>
<td>0.56</td>
<td>0.21</td>
</tr>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>44.94</td>
<td>594</td>
<td>-14.74</td>
<td>37,740.89</td>
<td>0.68</td>
<td>0.21</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>1.42</td>
<td>481</td>
<td>29.84</td>
<td>58.33</td>
<td>0.85</td>
<td>0.05</td>
</tr>
<tr>
<td>82</td>
<td>Aerospace Product and Parts Manufacturing</td>
<td>4.36</td>
<td>348</td>
<td>11.31</td>
<td>N/A</td>
<td>0.75</td>
<td>0.04</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

### Table 5. Phase 1 Deficits for Anchor Industry 79

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
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<tbody>
<tr>
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<td>42</td>
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<td>51</td>
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<td>53</td>
<td>Forging and Stamping</td>
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<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
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<td>71</td>
<td>Audio and Video Equipment Manufacturing</td>
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<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
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<td>104</td>
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<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
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<tr>
<td>137</td>
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### Table 6. Phase 2 Deficits Adding Anchor Industry 48

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Chapter 27. Columbus, MS

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<th>Added to Deficit</th>
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<td>Textile Mills and Textile Product Mills</td>
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<td>71</td>
<td>Audio and Video Equipment Manufacturing</td>
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<td>-32</td>
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<td>133</td>
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Table 7. Phase 3 Deficits Adding Anchor Industry 167
Food Services and Drinking Places

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</thead>
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<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
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<td>42</td>
<td>Plastics Product Manufacturing</td>
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<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
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<td>53</td>
<td>Forging and Stamping</td>
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<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
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</tr>
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<td>71</td>
<td>Audio and Video Equipment Manufacturing</td>
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<td>-2</td>
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<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
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<td>-10</td>
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Table 8. Phase 4 Deficits Adding Anchor Industry 82
Aerospace Product and Parts Manufacturing

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</thead>
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<td>Metal Ore Mining</td>
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</tr>
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<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
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<td>Plastics Product Manufacturing</td>
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<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
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<td>Forging and Stamping</td>
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<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
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<td>0</td>
</tr>
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<td>71</td>
<td>Audio and Video Equipment Manufacturing</td>
<td>-82</td>
<td>0</td>
</tr>
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<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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<td>-19</td>
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<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
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<td>-2</td>
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<td>104</td>
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<td>129</td>
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<td>133</td>
<td>Management of Companies and Enterprises</td>
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Table 9. Phase 5 Deficits Adding Anchor Industry 100
Transit and Ground Passenger Transportation
## Chapter 27. Columbus, MS

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
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<tbody>
<tr>
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<td>-0</td>
</tr>
<tr>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>-35</td>
<td>-0</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
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<td>-0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
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<td>-0</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-50</td>
<td>-0</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>-69</td>
<td>-0</td>
</tr>
<tr>
<td>71</td>
<td>Audio and Video Equipment Manufacturing</td>
<td>-82</td>
<td>-0</td>
</tr>
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<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-146</td>
<td>-0</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>-511</td>
<td>-0</td>
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<tr>
<td>104</td>
<td>Warehousing and Storage</td>
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<td>-1</td>
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<td>133</td>
<td>Management of Companies and Enterprises</td>
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<td>137</td>
<td>Business Support Services</td>
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</table>
Chapter 28. Cookeville, TN

Study Area Overview

The Cookeville, TN study region occupies 1,142 square-miles and had a 2018 population of 112,669. The employed share of the regional labor force during the 2014-2018 period averaged 96.24%. The Food Services and Drinking Places industry was the region’s largest employer in 2018, followed by Elementary and Secondary Schools and All Other Retail. These three industries account for a combined 22.49% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 32.92, which indicates that it is less specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Cookeville, TN can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Food Services and Drinking Places, whose employment grew by 1,614 followed by Elementary and Secondary Schools and Government and Unclassified. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 1.35, 9.2, and 0.44.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>1,614</td>
<td>792</td>
<td>1.35</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>1,437</td>
<td>1,068</td>
<td>9.20</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>847</td>
<td>780</td>
<td>0.44</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>746</td>
<td>738</td>
<td>1.77</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>495</td>
<td>133</td>
<td>1.81</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>419</td>
<td>-24</td>
<td>1.25</td>
</tr>
<tr>
<td>14</td>
<td>Construction</td>
<td>312</td>
<td>357</td>
<td>0.86</td>
</tr>
<tr>
<td>95</td>
<td>All Other Retail</td>
<td>309</td>
<td>382</td>
<td>1.20</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>271</td>
<td>89</td>
<td>1.42</td>
</tr>
<tr>
<td>92</td>
<td>Motor Vehicle and Parts Dealers</td>
<td>263</td>
<td>237</td>
<td>1.53</td>
</tr>
</tbody>
</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Cookeville, TN, the cluster with the largest CLQ in 2018 is Transportation Equipment with a CLQ of 5.76, followed by Education and Knowledge Creation and Machinery. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Cookeville, TN cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
## Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.32</td>
<td>1.20</td>
<td>5,407</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.54</td>
<td>0.63</td>
<td>5,252</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.88</td>
<td>1.05</td>
<td>5,104</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>2.47</td>
<td>3.28</td>
<td>4,663</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>1.26</td>
<td>0.88</td>
<td>2,790</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.29</td>
<td>0.42</td>
<td>2,603</td>
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<td>17</td>
<td>Transportation Equipment</td>
<td>7.47</td>
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<td>1,856</td>
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<tr>
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<td>Agribusiness, Food Processing and Technology</td>
<td>3.03</td>
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<tr>
<td>13</td>
<td>Machinery</td>
<td>1.01</td>
<td>2.14</td>
<td>647</td>
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<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>2.35</td>
<td>1.53</td>
<td>638</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
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<td>1.35</td>
<td>626</td>
</tr>
<tr>
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<tr>
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<td>Chemicals and Chemical-Based Products</td>
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<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.93</td>
<td>0.79</td>
<td>233</td>
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<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.27</td>
<td>1.16</td>
<td>219</td>
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<tr>
<td>10</td>
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</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>0.30</td>
<td>0.48</td>
<td>51</td>
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Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Cookeville, TN

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
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<tr>
<td>Biomedical/Biotechnical (Life Sciences) (5,407)</td>
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<tr>
<td>Business and Financial Services (5,252)</td>
</tr>
<tr>
<td>Arts, Entertainment, Recreation and Visitor Industries (5,104)</td>
</tr>
<tr>
<td>Education and Knowledge Creation (4,663)</td>
</tr>
<tr>
<td>Transportation and Logistics (2,790)</td>
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<td>Defense and Security (2,603)</td>
</tr>
<tr>
<td>Transportation Equipment (1,856)</td>
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<tr>
<td>Agribusiness, Food Processing and Technology (1,283)</td>
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<tr>
<td>Machinery (647)</td>
</tr>
<tr>
<td>Forest and Wood Products (638)</td>
</tr>
<tr>
<td>Primary and Fabricated Metal Products (626)</td>
</tr>
<tr>
<td>Computer, Electronic, and Electrical Products (570)</td>
</tr>
<tr>
<td>Chemicals and Chemical-Based Products (438)</td>
</tr>
<tr>
<td>Information Technology and Telecommunications (233)</td>
</tr>
<tr>
<td>Mining, Glass and Ceramics (219)</td>
</tr>
<tr>
<td>Energy (Fossil and Renewable) (55)</td>
</tr>
<tr>
<td>Apparel and Textiles (51)</td>
</tr>
</tbody>
</table>
2. CADS Analysis

The 2018 CADS analysis of the economy of Cookeville, TN identifies 4 anchor industries in 3 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Hospitals, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>153</td>
<td>Hospitals</td>
<td>1,998</td>
<td>2,492</td>
</tr>
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<td>5</td>
<td>Business and Financial Services</td>
<td>115</td>
<td>Monetary Authorities, Credit Intermediation, and Related Activities</td>
<td>807</td>
<td>1,049</td>
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<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>2,755</td>
<td>4,369</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>146</td>
<td>Offices of Physicians</td>
<td>745</td>
<td>1,016</td>
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Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
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<tr>
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<th>Anchor Industry Name</th>
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<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
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<tr>
<td>153</td>
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<td>1.81</td>
<td>133</td>
<td>18.09</td>
<td>24.76</td>
<td>0.73</td>
<td>0.09</td>
</tr>
<tr>
<td>115</td>
<td>Monetary Authorities, Credit Intermediation, and Related Activities</td>
<td>1.45</td>
<td>310</td>
<td>-8.42</td>
<td>29.94</td>
<td>0.90</td>
<td>0.06</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>1.35</td>
<td>792</td>
<td>29.84</td>
<td>58.58</td>
<td>0.82</td>
<td>0.06</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>1.42</td>
<td>89</td>
<td>24.38</td>
<td>36.37</td>
<td>0.84</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Chapter 28. Cookeville, TN

The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 153

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>N/A</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-20</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-25</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-75</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>N/A</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>N/A</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-9</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>N/A</td>
</tr>
<tr>
<td>152</td>
<td>Other Ambulatory Health Care Services</td>
<td>-18</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-4</td>
</tr>
</tbody>
</table>

Table 6. Phase 2 Deficits Adding Anchor Industry 115

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Animal Production</td>
<td>N/A</td>
<td>-1</td>
</tr>
<tr>
<td>38</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
<td>-20</td>
<td>-0</td>
</tr>
<tr>
<td>89</td>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>-25</td>
<td>-0</td>
</tr>
<tr>
<td>117</td>
<td>Insurance Carriers</td>
<td>-78</td>
<td>-3</td>
</tr>
<tr>
<td>129</td>
<td>Management, Scientific, and Technical Consulting Services</td>
<td>-25</td>
<td>-61</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>N/A</td>
<td>-17</td>
</tr>
<tr>
<td>134</td>
<td>Office Administrative Services</td>
<td>-15</td>
<td>-6</td>
</tr>
<tr>
<td>139</td>
<td>Investigation and Security Services</td>
<td>-13</td>
<td>-22</td>
</tr>
</tbody>
</table>
### Table 7. Phase 3 Deficits Adding Anchor Industry 167

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>152</td>
<td>Other Ambulatory Health Care Services</td>
<td>-18</td>
<td>-0</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-8</td>
<td>-4</td>
</tr>
</tbody>
</table>

### Table 8. Phase 4 Deficits Adding Anchor Industry 146

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>152</td>
<td>Other Ambulatory Health Care Services</td>
<td>-18</td>
<td>-0</td>
</tr>
<tr>
<td>161</td>
<td>Independent Artists, Writers, and Performers</td>
<td>-12</td>
<td>-1</td>
</tr>
</tbody>
</table>
Chapter 29. Corbin, KY

Study Area Overview
The Corbin, KY study region occupies 438 square-miles and had a 2018 population of 36,242. The employed share of the regional labor force during the 2014-2018 period averaged 92.4%. The Elementary and Secondary Schools industry was the region’s largest employer in 2018, followed by Food Services and Drinking Places and Junior Colleges, Colleges, Universities, and Professional Schools. These three industries account for a combined 30.71% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 42.51, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Corbin, KY can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Junior Colleges, Colleges, Universities, and Professional Schools, whose employment grew by 462 followed by Services to Buildings and Dwellings and Rubber Product Manufacturing. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends. Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 7.32, 1.36, and 22.29.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>462</td>
<td>335</td>
<td>7.32</td>
</tr>
<tr>
<td>140</td>
<td>Services to Buildings and Dwellings</td>
<td>195</td>
<td>174</td>
<td>1.36</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>163</td>
<td>174</td>
<td>22.29</td>
</tr>
<tr>
<td>155</td>
<td>Individual and Family Services</td>
<td>156</td>
<td>122</td>
<td>1.01</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>145</td>
<td>-172</td>
<td>1.36</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>124</td>
<td>-33</td>
<td>2.63</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>99</td>
<td>-286</td>
<td>17.68</td>
</tr>
<tr>
<td>10</td>
<td>Support Activities for Mining</td>
<td>98</td>
<td>93</td>
<td>4.17</td>
</tr>
<tr>
<td>59</td>
<td>Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing</td>
<td>93</td>
<td>91</td>
<td>6.96</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>91</td>
<td>2</td>
<td>2.34</td>
</tr>
</tbody>
</table>
Chapter 29. Corbin, KY

Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018

Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Corbin, KY, the cluster with the largest CLQ in 2018 is Education and Knowledge Creation with a CLQ of 6.56, followed by Chemicals and Chemical-Based Products and Energy (Fossil and Renewable). The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Corbin, KY cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>5.27</td>
<td>6.56</td>
<td>2,554</td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.94</td>
<td>1.71</td>
<td>2,093</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>1.06</td>
<td>1.14</td>
<td>1,510</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.53</td>
<td>0.42</td>
<td>965</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.33</td>
<td>0.32</td>
<td>551</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.61</td>
<td>0.56</td>
<td>488</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>1.55</td>
<td>4.04</td>
<td>469</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.37</td>
<td>2.82</td>
<td>241</td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.61</td>
<td>1.88</td>
<td>238</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>1.33</td>
<td>1.27</td>
<td>112</td>
</tr>
<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.69</td>
<td>0.36</td>
<td>111</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>0.35</td>
<td>0.57</td>
<td>47</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>1.13</td>
<td>0.57</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>2.02</td>
<td>0.86</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>1.99</td>
<td>0.26</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>0.99</td>
<td>0.07</td>
<td>7</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>1.55</td>
<td>0.03</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Corbin, KY

<table>
<thead>
<tr>
<th>Bubble Size as the Employment for Each Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Education and Knowledge Creation (2,554)</td>
</tr>
<tr>
<td>- Biomedical/Biotechnical (Life Sciences) (2,093)</td>
</tr>
<tr>
<td>- Arts, Entertainment, Recreation and Visitor Industries (1,510)</td>
</tr>
<tr>
<td>- Business and Financial Services (965)</td>
</tr>
<tr>
<td>- Defense and Security (551)</td>
</tr>
<tr>
<td>- Transportation and Logistics (488)</td>
</tr>
<tr>
<td>- Chemicals and Chemical-Based Products (469)</td>
</tr>
<tr>
<td>- Energy (Fossil and Renewable) (241)</td>
</tr>
<tr>
<td>- Primary and Fabricated Metal Products (238)</td>
</tr>
<tr>
<td>- Transportation Equipment (112)</td>
</tr>
<tr>
<td>- Agribusiness, Food Processing and Technology (111)</td>
</tr>
<tr>
<td>- Machinery (47)</td>
</tr>
<tr>
<td>- Information Technology and Telecommunications (46)</td>
</tr>
<tr>
<td>- Apparel and Textiles (25)</td>
</tr>
<tr>
<td>- Mining, Glass and Ceramics (14)</td>
</tr>
<tr>
<td>- Computer, Electronic, and Electrical Products (7)</td>
</tr>
<tr>
<td>- Forest and Wood Products (3)</td>
</tr>
</tbody>
</table>
Chapter 29. Corbin, KY

2. CADS Analysis
The 2018 CADS analysis of the economy of Corbin, KY identifies 5 anchor industries in 4 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Junior Colleges, Colleges, Universities, and Professional Schools, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Education and Knowledge</td>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>533</td>
<td>995</td>
</tr>
<tr>
<td></td>
<td>Creation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based</td>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>64</td>
<td>227</td>
</tr>
<tr>
<td></td>
<td>Products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life</td>
<td>146</td>
<td>Offices of Physicians</td>
<td>365</td>
<td>456</td>
</tr>
<tr>
<td></td>
<td>Sciences)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based</td>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>157</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>Products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Primary and Fabricated Metal</td>
<td>59</td>
<td>Machine Shops; Turned Product, and Screw, Nut, and Bolt Manufacturing</td>
<td>96</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>Products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

<table>
<thead>
<tr>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
<th>National</th>
<th>Regional</th>
<th>AS</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>144</td>
<td>Junior Colleges, Colleges, Universities, and Professional Schools</td>
<td>7.32</td>
<td>335</td>
<td>23.90</td>
<td>86.83</td>
<td>0.82</td>
<td>0.08</td>
</tr>
<tr>
<td>43</td>
<td>Rubber Product Manufacturing</td>
<td>22.29</td>
<td>174</td>
<td>-17.19</td>
<td>254.20</td>
<td>0.69</td>
<td>0.07</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>2.34</td>
<td>2</td>
<td>24.38</td>
<td>24.93</td>
<td>0.80</td>
<td>0.06</td>
</tr>
<tr>
<td>42</td>
<td>Plastics Product Manufacturing</td>
<td>4.50</td>
<td>50</td>
<td>-6.65</td>
<td>25.05</td>
<td>0.61</td>
<td>0.05</td>
</tr>
</tbody>
</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

**Table 5. Phase 1 Deficits for Anchor Industry 144**

Junior Colleges, Colleges, Universities, and Professional Schools

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-3</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-1</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>N/A</td>
</tr>
<tr>
<td>126</td>
<td>Architectural, Engineering, and Related Services</td>
<td>-0</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
<td>N/A</td>
</tr>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>N/A</td>
</tr>
<tr>
<td>137</td>
<td>Business Support Services</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Table 6. Phase 2 Deficits Adding Anchor Industry 43**

Rubber Product Manufacturing

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop Production</td>
<td>-10</td>
<td>-8</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing</td>
<td>-7</td>
<td>-7</td>
</tr>
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<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
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## Table 7. Phase 3 Deficits Adding Anchor Industry 146

<table>
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<td>Management of Companies and Enterprises</td>
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## Table 8. Phase 4 Deficits Adding Anchor Industry 42

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</thead>
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<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments</td>
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<td>-11</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-10</td>
<td>-3</td>
</tr>
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<td>Warehousing and Storage</td>
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<td>Management of Companies and Enterprises</td>
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## Table 9. Phase 5 Deficits Adding Anchor Industry 59

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</thead>
<tbody>
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<td>Crop Production</td>
<td>-15</td>
<td>0</td>
</tr>
<tr>
<td>36</td>
<td>Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments</td>
<td>-19</td>
<td>0</td>
</tr>
<tr>
<td>72</td>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>-12</td>
<td>-3</td>
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<td>104</td>
<td>Warehousing and Storage</td>
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<td>Management of Companies and Enterprises</td>
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<tr>
<td>137</td>
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</table>
Chapter 30. Corinth, MS

Study Area Overview

The Corinth, MS study region occupies 400 square-miles and had a 2018 population of 36,925. The employed share of the regional labor force during the 2014-2018 period averaged 91.8%. The Employment Services industry was the region’s largest employer in 2018, followed by Hospitals and Food Services and Drinking Places. These three industries account for a combined 28.85% of the region’s economy. The region’s 2018 coefficient of specialization (COS) is 43.14, which indicates that it is more specialized than the average micropolitan and metropolitan region fully within the Appalachian Region. The average COS for all of these regions is 37.73.

Employment changes in Corinth, MS can reveal important recent trends in underlying economic structure. Table 1 shows the top ten employment growth industries from 2005 to 2018. We rank employment growth rather than employment growth rate because some industries with high growth rates might be quite small and insignificant relative to regional totals. The highest growth industry was Employment Services, whose employment grew by 1,074 followed by Food Services and Drinking Places and Warehousing and Storage. The regional shift (RS) values in Table 1 measure industry employment growth attributable to regional factors unrelated to overall national or industry-specific growth trends.

Table 1 also shows location quotients (LQ) for these industries. Industry LQs reflect their relative concentrations within the region. Values exceeding 1.0 indicate regional concentration and imply potential advantage relative to national averages. The three fastest growing regional industries have LQ values of 4.32, 1.24, and 2.76.

Table 1. Top Ten Growth Industries

<table>
<thead>
<tr>
<th>Industry #</th>
<th>Industry Name</th>
<th>Employment Change</th>
<th>RS</th>
<th>LQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>136</td>
<td>Employment Services</td>
<td>1,074</td>
<td>1,071</td>
<td>4.32</td>
</tr>
<tr>
<td>167</td>
<td>Food Services and Drinking Places</td>
<td>329</td>
<td>29</td>
<td>1.24</td>
</tr>
<tr>
<td>104</td>
<td>Warehousing and Storage</td>
<td>239</td>
<td>204</td>
<td>2.76</td>
</tr>
<tr>
<td>153</td>
<td>Hospitals</td>
<td>190</td>
<td>-26</td>
<td>3.02</td>
</tr>
<tr>
<td>143</td>
<td>Elementary and Secondary Schools</td>
<td>175</td>
<td>41</td>
<td>6.51</td>
</tr>
<tr>
<td>181</td>
<td>Government and Unclassified</td>
<td>146</td>
<td>126</td>
<td>0.34</td>
</tr>
<tr>
<td>146</td>
<td>Offices of Physicians</td>
<td>121</td>
<td>67</td>
<td>1.46</td>
</tr>
<tr>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>106</td>
<td>114</td>
<td>3.30</td>
</tr>
<tr>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>102</td>
<td>97</td>
<td>78.31</td>
</tr>
<tr>
<td>27</td>
<td>Apparel, Leather and Allied Product Manufacturing</td>
<td>96</td>
<td>113</td>
<td>9.49</td>
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</table>
Cluster Analysis Results

1. Regional Cluster Concentrations, 2005 and 2018
Table 2 presents a high-level view of the existing distribution of industry employment relative to the 17 clusters. Just as an industry whose location quotient value exceeds 1.0 implies relative regional concentration, cluster location quotient (CLQ) values exceeding 1.0 also imply relative concentration of the set of industries in the cluster. Likewise, clusters whose CLQ are less than 1.0 are relatively less concentrated in the region than they are in the national economy. In Corinth, MS, the cluster with the largest CLQ in 2018 is Apparel and Textiles with a CLQ of 12.41, followed by Machinery and Forest and Wood Products. The CLQs for 2005 and 2018 are presented to further illuminate the trends in cluster specialization and regional structural change.

Figure 1 illustrates the Corinth, MS cluster characteristics graphically. The size of each cluster bubble is proportional to its 2018 employment level and the legend is presented in order of decreasing cluster size. Cluster employment appears in parentheses in each legend entry. So, in addition to identifying the clusters by color code and by reference to the values in Table 2, the largest bubble in the chart corresponds to the first cluster listed in the legend, the second largest bubble corresponds to the second largest cluster, and so on. The vertical axis marks the 2018 value of the CLQ, and the horizontal axis marks the change in CLQ from 2005 to 2018. CLQ changes can be positive or negative and CLQ values can be greater than or less than 1.0, which allows us to define four chart quadrants numbered I – IV beginning at the top right and moving counter-clockwise. Clusters centered in quadrants I and II have CLQ values greater than 1.0 indicating relative concentration, implying some degree of specialization relative to national averages. Clusters centered in quadrants I and IV have become more specialized within the region during the period of analysis, while those in II and III have become relatively less concentrated within the region.

As a result of this categorization, the Star clusters that display in quadrant I are specialized and becoming more so. The Mature clusters that display in quadrant II are specialized but have become less so. Emerging clusters, those in quadrant IV, are not specialized in the region, but have gained in share of regional employment relative to the national industry’s share of national employment, both of which can have changed over time due to industry specific and total employment changes within the region, in the entire nation, or both. Clusters in quadrant III are relatively less concentrated in the region than in the nation and have become even less so between 2005 and 2018.
### Table 2. Cluster Concentrations, 2005 and 2018

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>2005 CLQ</th>
<th>2018 CLQ</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Biomedical/Biotechnical (Life Sciences)</td>
<td>1.73</td>
<td>1.70</td>
<td>2,522</td>
</tr>
<tr>
<td>5</td>
<td>Business and Financial Services</td>
<td>0.71</td>
<td>0.85</td>
<td>2,336</td>
</tr>
<tr>
<td>3</td>
<td>Arts, Entertainment, Recreation and Visitor Industries</td>
<td>0.82</td>
<td>0.95</td>
<td>1,523</td>
</tr>
<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>0.82</td>
<td>0.87</td>
<td>913</td>
</tr>
<tr>
<td>8</td>
<td>Defense and Security</td>
<td>0.27</td>
<td>0.34</td>
<td>709</td>
</tr>
<tr>
<td>13</td>
<td>Machinery</td>
<td>5.77</td>
<td>6.97</td>
<td>696</td>
</tr>
<tr>
<td>9</td>
<td>Education and Knowledge Creation</td>
<td>1.26</td>
<td>1.46</td>
<td>689</td>
</tr>
<tr>
<td>11</td>
<td>Forest and Wood Products</td>
<td>4.59</td>
<td>3.28</td>
<td>452</td>
</tr>
<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>5.44</td>
<td>12.41</td>
<td>434</td>
</tr>
<tr>
<td>7</td>
<td>Computer, Electronic, and Electrical Products</td>
<td>3.09</td>
<td>2.46</td>
<td>318</td>
</tr>
<tr>
<td>6</td>
<td>Chemicals and Chemical-Based Products</td>
<td>2.46</td>
<td>2.00</td>
<td>281</td>
</tr>
<tr>
<td>10</td>
<td>Energy (Fossil and Renewable)</td>
<td>1.17</td>
<td>1.80</td>
<td>186</td>
</tr>
<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>0.54</td>
<td>1.65</td>
<td>176</td>
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<td>15</td>
<td>Primary and Fabricated Metal Products</td>
<td>0.55</td>
<td>0.92</td>
<td>141</td>
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<tr>
<td>1</td>
<td>Agribusiness, Food Processing and Technology</td>
<td>0.21</td>
<td>0.13</td>
<td>51</td>
</tr>
<tr>
<td>12</td>
<td>Information Technology and Telecommunications</td>
<td>0.36</td>
<td>0.36</td>
<td>35</td>
</tr>
<tr>
<td>14</td>
<td>Mining, Glass and Ceramics</td>
<td>0.59</td>
<td>0.19</td>
<td>12</td>
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</tbody>
</table>

**Note:** Increasing cluster concentrations are highlighted in blue.
Figure 1: Cluster Bubble Chart of Corinth, MS

Bubble Size as the Employment for Each Cluster
- Biomedical/Biotechnical (Life Sciences) (2,522)
- Business and Financial Services (2,336)
- Arts, Entertainment, Recreation and Visitor Industries (1,523)
- Transportation and Logistics (913)
- Defense and Security (709)
- Machinery (696)
- Education and Knowledge Creation (689)
- Forest and Wood Products (452)
- Apparel and Textiles (434)
- Computer, Electronic, and Electrical Products (318)
- Chemicals and Chemical-Based Products (281)
- Energy (Fossil and Renewable) (186)
- Transportation Equipment (176)
- Primary and Fabricated Metal Products (141)
- Agribusiness, Food Processing and Technology (51)
- Information Technology and Telecommunications (35)
- Mining, Glass and Ceramics (12)
Chapter 30. Corinth, MS

2. CADS Analysis
The 2018 CADS analysis of the economy of Corinth, MS identifies 4 anchor industries in 4 different clusters. Identified anchors and their parent clusters are presented in Table 3 along with 2005 and 2018 employment. Table 4 provides additional industry-specific information for the identified anchors. Both tables list anchor industries and related information in the order in which industries were added to the set of anchors, which also corresponds, according to the CADS algorithm, to their importance to the regional economy. The leading anchor industry is Engine, Turbine, and Power Transmission Equipment Manufacturing, which is the most dominant regional industry that also meets the CADS analysis criteria.

To further understand the potential influence of an anchor industry on the existing local economy, anchor strength (AS) and anchor dominance (AD) indicators are provided in Table 4. As described in the Section 3 of the accompanying overview and technical document, both AS and AD range from zero to one. The AS value shown in Table 4 measures the extent to which regional industry output can satisfy the input requirements for the anchor industry. A low AS value implies that the industry must rely heavily on other regions to satisfy its direct and indirect input demands, whereas higher AS values identify industries whose direct and indirect input demands can be satisfied more fully by local industries. The AD value measures the extent to which the industry dominates the local economy, directly and indirectly. Regions are more heavily dependent, again directly and indirectly, on industries with larger AD values on industries with smaller AD values. The AS measures the industry’s dependence on the region while the AD measures the region’s dependence on the industry. The fortunes of the regional economy are clearly more strongly tied to industries with larger AS and AD values than to those with lower AS and AD values.

Table 3. Anchors, Clusters, and Employment

<table>
<thead>
<tr>
<th>Cluster #</th>
<th>Cluster Name</th>
<th>Anchor #</th>
<th>Anchor Industry Name</th>
<th>Anchor Emp. 2005</th>
<th>Anchor Emp. 2018</th>
</tr>
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<tbody>
<tr>
<td>13</td>
<td>Machinery</td>
<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>581</td>
<td>683</td>
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<tr>
<td>17</td>
<td>Transportation Equipment</td>
<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>70</td>
<td>176</td>
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<tr>
<td>2</td>
<td>Apparel and Textiles</td>
<td>26</td>
<td>Textile Mills and Textile Product Mills</td>
<td>346</td>
<td>303</td>
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<tr>
<td>16</td>
<td>Transportation and Logistics</td>
<td>104</td>
<td>Warehousing and Storage</td>
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Table 4. Anchors, Location Quotients, Regional Shift, and Growth Rates

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<th>Anchor Industry Name</th>
<th>LQ</th>
<th>RS</th>
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<th>Regional</th>
<th>AS</th>
<th>AD</th>
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<td>67</td>
<td>Engine, Turbine, and Power Transmission Equipment Manufacturing</td>
<td>78.31</td>
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<td>81</td>
<td>Motor Vehicle Parts Manufacturing</td>
<td>3.30</td>
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<td>152.66</td>
<td>0.61</td>
<td>0.05</td>
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<td>88.22</td>
<td>589.75</td>
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</table>
The remaining tables report the results for each phase of the CADS analysis. The reported values for Phase 1 in Table 5 refer to the CADS analysis of the first identified anchor. Then, if a second anchor has been identified, Table 6 reports the Phase 2 analysis results and reported values in the Employment column refer to the results for the first two identified anchors combined. The Added to Deficit column reports the contributions to deficits from the newly added anchor industry. These negative values can be larger than their corresponding Employment column values when no deficits for this industry were reported in the prior phase. If a third anchor has been identified, Phase 3 results will be reported in Table 7 and refer to values for the first three anchors combined and third anchor added, and so on. The tables report estimated employment deficits for all industries whose employment deficits exceed 10 at any phase of the CADS analysis. Because the top ten deficit industries for each phase can change, there can be more than ten reported industries in these tables. There can also be CADS results tables with fewer than ten entries, which happens when there are fewer than ten support industries with identified supply deficits.

The results reported for each CADS analysis phase identify the industries whose further development could most substantially strengthen the cluster support infrastructure at that phase of the analysis. The values estimate the additional employment required to satisfy supporting industry output deficits at each phase of the analysis. Because these estimates are based on average nationwide inter-industry sales, purchases, and productivity data, they are not precise but should provide useful guidance for further analysis by region planners and other decision-makers who have a greater depth of knowledge of their local economies.

Table 5. Phase 1 Deficits for Anchor Industry 67

<table>
<thead>
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<th>Industry Name</th>
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<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-16</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-16</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-65</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-21</td>
</tr>
<tr>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>-18</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
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<td>77</td>
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<td>Other Electrical Equipment and Component Manufacturing</td>
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<td>128</td>
<td>Computer Systems Design and Related Services</td>
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<td>Management of Companies and Enterprises</td>
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Table 6. Phase 2 Deficits Adding Anchor Industry 81

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</thead>
<tbody>
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<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-19</td>
<td>-4</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-19</td>
<td>-2</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-73</td>
<td>-8</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-24</td>
<td>-4</td>
</tr>
<tr>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>-20</td>
<td>-3</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
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<td>-3</td>
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<td>77</td>
<td>Electrical Equipment Manufacturing</td>
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<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
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<td>-1</td>
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</table>
Table 7. Phase 3 Deficits Adding Anchor Industry 26
Textile Mills and Textile Product Mills

<table>
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<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
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<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>51</td>
<td>Nonferrous Metal (except Aluminum) Production and Processing</td>
<td>-19</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>Foundries</td>
<td>-73</td>
<td>0</td>
</tr>
<tr>
<td>53</td>
<td>Forging and Stamping</td>
<td>-24</td>
<td>0</td>
</tr>
<tr>
<td>55</td>
<td>Architectural and Structural Metals Manufacturing</td>
<td>-21</td>
<td>0</td>
</tr>
<tr>
<td>61</td>
<td>Other Fabricated Metal Product Manufacturing</td>
<td>-28</td>
<td>-1</td>
</tr>
<tr>
<td>77</td>
<td>Electrical Equipment Manufacturing</td>
<td>-31</td>
<td>-1</td>
</tr>
<tr>
<td>78</td>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>128</td>
<td>Computer Systems Design and Related Services</td>
<td>-19</td>
<td>-2</td>
</tr>
<tr>
<td>133</td>
<td>Management of Companies and Enterprises</td>
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<td>-11</td>
</tr>
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</table>

Table 8. Phase 4 Deficits Adding Anchor Industry 104
Warehousing and Storage

<table>
<thead>
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<th>Industry #</th>
<th>Industry Name</th>
<th>Employment</th>
<th>Added to Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Iron and Steel Mills and Ferroalloy Manufacturing</td>
<td>-20</td>
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