

Industry Cluster Analysis for the Southeast Missouri Region

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Executive Summary

Industry clusters are a framework for economic development that views the regional economy as a collection of clusters, rather than many individual firms influenced by specific events. This study analyzes twenty-two industry clusters in the Southeast Missouri region (comprised of Bollinger, Cape Girardeau, Iron, Madison, Perry, Ste. Genevieve, and St. Francois counties) in two ways: using location quotients and using shift-share analysis.

Location quotients and their changes help identify strengths and weaknesses in the region's economy. Industry clusters that represent strengths in the region are those in which the region specializes and its concentration in the region is increasing. These clusters include: Chemicals and Chemical Based Products; Forest and Wood Products; Transportation and Logistics; Fabricated Metal Product Manufacturing; Electrical Equipment, Appliance and Component Manufacturing; and Mining. There are also two "emerging" industry clusters which hold the potential for strength in the future: Transportation Equipment Manufacturing; and Energy. However, the analysis also signals some possible needed attention for Agribusiness, Food Processing and Technology; Glass and Ceramics; and Biomedical/Biotechnical (or Life Sciences).

Shift-share analysis helps to identify the impact of region-specific factors on regional economic growth. For the clusters in which the region has a positive impact, the region has a competitive advantage. The Southeast region has a competitive advantage in Chemicals and Chemical Based Products; Forest and Wood Products; Transportation and Logistics; Fabricated Metal Product Manufacturing; Electrical Equipment, Appliance and Component Manufacturing; Mining; Transportation Equipment Manufacturing; and Energy.

We note, however, that not all counties in the region have these same strengths. Some counties specialize in more industry clusters than do others. Some counties specialize in industry clusters in which the region as a whole does not. Nevertheless, all counties specialize in several clusters that represent strengths in the region. Therefore, regional cooperation in economic development activities will benefit all counties in the region.

The industry cluster analyses in this study provide useful information about the regional economy's strengths and weaknesses. They serve as foundation information, along with local knowledge, for devising a cluster strategy for regional economic growth.

Introduction to Industry Clusters

Economic development strategies prior to the 1990s followed a “one-size-fits-all” approach. Regional economic growth was thought to depend on “external factors” – forces outside the region itself. That is, regional growth depended on exogenous demand for a region’s exports. Exports (goods and services sold outside the region) were viewed as the engine of growth. In order to grow, a region needed to increase the amount of export goods produced in the region. The goal of economic development was to attract and retain large firms by offering cheap labor and land and providing a package of financial incentives to reduce costs even further.¹ Any firms producing exports would do.

This strategy unraveled in the early 1990s as regions discovered that their cost advantages could quickly evaporate due to global competition. As other countries and regions captured the cost advantages, firms found it profitable to move. Examples include the migration of automobile production from Detroit to the southeast, steel production from Pittsburgh to the Great Lakes and overseas, etc.

The emergence of global competition has forced a reexamination of this approach. Practitioners and policymakers need to understand the competitive strengths and challenges of the region’s economy, to build on its strengths and address the weaknesses.² Industry clusters provide a framework for understanding a region’s economy. Clusters are viewed as the drivers of competitive advantage, and, hence, of regional economic growth.

What is an Industry Cluster?

Actually, the concept of an industry cluster is not new. It can be traced back over 100 years to economist Alfred Marshall’s studies of industrial districts in 19th century England published in 1890.³

Michael Porter, a Professor at the Harvard Business School, who is credited with inventing the term *cluster*,⁴ defines industry clusters as “geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition.”⁵ They include both upstream industries (suppliers) and downstream industries (customers). For example, in his definition of the California wine cluster, Porter begins with the core or driver industries: growers and vineyards, and wineries and processing facilities. The upstream industries include the portion of the California agricultural sector involved in supplying growers (grape stock; fertilizers, pesticides, herbicides; grape harvesting equipment; irrigation technology), wine-making equipment, barrels, bottles, caps and corks, labels, public relations and advertising, and specialized publications. Downstream industries include tourism, and food and restaurants. Other important entities include state government agencies, and educational, research, and trade organizations.⁶

As the above example illustrates, an industry cluster does not correspond to an industry sector, such as those given by the Standardized Industrial Classification (SIC) or North American Industrial Classification System (NAICS). Furthermore, a particular industry may belong to more than one cluster.⁷ The industries in a cluster are not mutually exclusive.

Industry clusters follow a life cycle. For example, emerging clusters tend to have new firms and grow rapidly. Mature clusters have larger, established firms and slower growth. This life cycle view is consistent with Schumpeter's notion of "creative destruction," that in a vibrant economy as some firms and jobs die, entrepreneurs create new businesses, products, and jobs.⁸ From a practitioners' or policymakers' viewpoint, what *could* become a cluster (with appropriate policy actions) may be as important as knowing what currently *is* a cluster.

Why do industry clusters create a competitive advantage?

Marshall argued that similar firms locate together to capture the benefits of what economists refer to as *external economies*, productive benefits that accrue to firms other than the individual firm that creates them. These external economies arise from three sources. First, a concentration of similar firms attracts a pool of workers with a certain set of skills. These workers would be willing to locate near this concentration of firms to minimize their chances of being unemployed. At the same time, firms have access to an appropriately skilled labor force which reduces their employee search and training costs. Second, a concentration of similar firms creates a relatively large market for their input suppliers. Use of local suppliers reduces transportation costs and allows just-in-time delivery of inputs. Interaction between the firms and local suppliers builds supplier expertise, allowing them to refine their products for the firms. This lowers production costs for the firms further. Third, a concentration of similar firms encourages interaction among the participants, who share problem-solving ideas and know-how (economists refer to this as *knowledge spillovers*), leading to innovation.⁹

Porter presents a complementary view of how a cluster of firms and industries creates a competitive advantage. This view is summarized in Porter's "diamond."¹⁰ According to Porter, the clustering of firms and industries creates a competitive advantage. This competitive advantage derives from four factors.

- Factor conditions. These include the region's stock of resources, for example, skilled labor, mineral deposits, educational institutions, and infrastructure (transportations systems, communications systems, etc.). As these inputs increase in quality and efficiency, so does a firm's productivity.
- Demand conditions. A strong core of local customers can "pressure" firms to innovate faster to meet customer needs. This, in turn, can make products more competitive in other markets.
- Related and supporting industries. Competitive local suppliers and related industries create a competitive advantage in the cluster's core industries. Firms and their suppliers develop close working relationships and the sharing of information between them leads to innovations.
- Firm strategy, structure, and rivalry. The laws, rules, and incentives in a region affect competition. For example, policies that encourage investment, e.g., in research, new facilities, etc., lead to innovation and make the region more competitive. Further, if firms compete with others in the industry cluster, they pressure each other to improve quality and services and to innovate – create new products and processes.

The four factors are viewed as reinforcing each other. For example, the co-location of similar firms in a region stimulates the formation of a specialized labor pool and attracts suppliers. Local competition among similar firms creates more "demanding" local customers. Government policy can influence all of the factors.

Methodology for Defining Industry Clusters

There is no single, universally accepted method for identifying industry clusters, nor is there a single “set” of industry cluster definitions.¹¹ Most industry cluster analyses begin with a set of “benchmark” industry cluster definitions, that is, “pre-determined sets of related sectors that have been identified based on an analysis of interindustry relationships at a geographic scale other than the region under study, usually the nation as a whole.”¹² Typically, only the industry clusters that are traded (export-oriented) are included in the analysis. Most goods-producing industries are traded, but so are some service industries. Thus, clusters contain both goods and service industries. Examples of industries excluded from the analysis would be child day care services, video and disc rental, and personal care services. These services are purchased by local customers (not export-oriented). Examples of “benchmark” industry cluster definitions include those derived by Porter¹³ and Bergman and Feser.¹⁴ Peters¹⁵ derives a set of 9 benchmark cluster definitions in Missouri; however this set of clusters includes export industries and their upstream suppliers only, referred to as supplier-based clusters. The Missouri Economic Research and Information Center (MERIC) identifies eight target clusters in a study of industry clusters in Missouri.¹⁶

In this study, we adopt the set of 22 benchmark industry cluster definitions developed by the Indiana Business Research Center (IBRC) with the Center for Regional Development at Purdue University and Strategic Development Group (a private consulting firm), under a grant from the U.S. Economic Development Administration to provide, in part, a set of industry clusters that could be used by rural communities across America. To derive the cluster definitions, the IBRC was fortunate to have unsuppressed *Covered Wages and Employment* (CEW) data from the Bureau of Labor Statistics at the state and county-level for Indiana at the six-digit NAICS level. This is quite unusual because at the county level, employment and wage figures are suppressed to protect confidentiality when only one or a few employers are represented in the NAICS code.

Because other researchers do not have access to unsuppressed CEW data, IBRC redefined its cluster definitions by aggregating cluster components up to the three-digit NAICS level where necessary to produce 22 benchmark “aggregated industry cluster definitions.”¹⁷

Primont¹⁸ used CEW data and the 22 benchmark aggregated industry cluster definitions to investigate industry clusters in Missouri. However, our perusal of the county-level CEW data suggested that data suppression was a problem. For example, one of the important industries in southeast Missouri is mining. The CEW data indicated mining establishments present in several southeast Missouri counties, but their employment figures were suppressed (set equal to zero).

To overcome these data suppression problems, we use IMPLAN data from the Minnesota IMPLAN Group for the years 2001 and 2006. Although the IMPLAN data are based on the CEW, suppressed values in the CEW are imputed by the Minnesota IMPLAN Group. The advantage of the IMPLAN data is that there are no missing values. However, IMPLAN data are available only for IMPLAN sectors, which consist of one or more 6-digit, 5-digit, 4-digit, 3-digit, or 2-digit NAICS industries. We, therefore, mapped the IMPLAN sectors to the IBRC NAICS-based aggregate industry clusters.

The resulting set of 22 benchmark industry clusters are listed in Table 1. The clusters are named for their core or driver industries. A detailed set of our benchmark industry cluster definitions is given in Appendix 1.

Table 1
Industry Clusters

1. **Advanced Materials**
 2. **Agribusiness, Food Processing & Technology**
 3. **Apparel & Textiles**
 4. **Arts, Entertainment, Recreation & Visitor Industries**
 5. **Biomedical/Biotechnical (Life Sciences)**
 6. **Business & Financial Services**
 7. **Chemicals & Chemical Based Products**
 8. **Defense & Security**
 9. **Education & Knowledge Creation**
 10. **Energy (Fossil & Renewable)**
 11. **Forest & Wood Products**
 12. **Glass & Ceramics**
 13. **Information Technology & Telecommunications**
 14. **Transportation & Logistics**
 15. **Primary Metal Mfg**
 16. **Fabricated Metal Product Mfg**
 17. **Machinery Mfg**
 18. **Computer & Electronic Product Mfg**
 19. **Electrical Equipment, Appliance & Component Mfg**
 20. **Transportation Equipment Mfg**
 21. **Mining**
 22. **Printing & Publishing**
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Our industry cluster definitions differ from those used by the IBRC in three ways. First, on a few occasions, the IMPLAN sector data are at a slightly higher level of aggregation than that specified in the IBRC NAICS-based aggregate clusters. Therefore, the IMPLAN data may slightly overstate employment in a few clusters. Second, IMPLAN data for the wholesale industry are reported only at the two-digit NAICS level, while some IBRC cluster definitions included wholesale industries at the 4- or 5-digit NAICS levels. Rather than including the entire wholesale industry in several clusters, we decided to exclude wholesale industries from the analysis. So, wholesale industries are not included in our industry cluster definitions. Third, according to the IBRC definition of cluster 5, Biomedical/Biotechnical, the core or driver industries are: Pharmaceuticals and Medicines, Diagnostic Substances, Biological Products, Medical Instruments, Medical Equipment and Supplies, Industrial Chemicals, Medical Chemicals, and Botanicals. The downstream (buyers) include: Doctors and Dentists, Hospitals and other Medical Facilities, Wholesales/Exporters, and certain retailers. The IRBC NAICS-based definition for the cluster, however, did not include doctors, dentists, etc., nor hospitals.¹⁹ Perhaps this is because medical services are often one of the largest employers in rural communities and their services are usually purchased by local customers. However, this is not the case for the Southeast Region. For example, the doctors and hospitals in Cape Girardeau attract many people from outside the region, both from Missouri and Illinois. Thus, we include the services of physicians, dentists, and other health providers, as well as hospital services, in our definition of this cluster.

Introduction to the Region

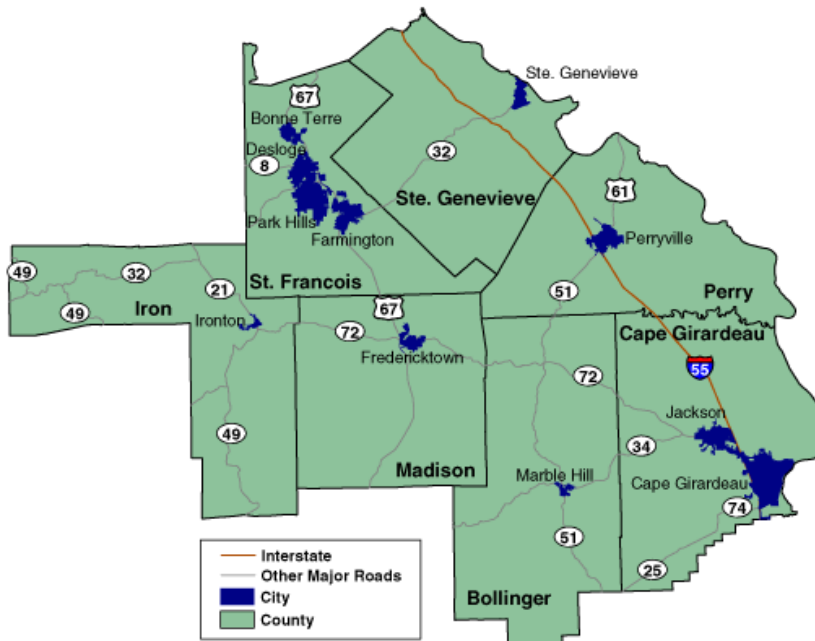
The Southeast Region is comprised of the seven counties in southeast Missouri served by the Southeast Missouri Regional Planning and Economic Development Commission: Bollinger, Cape Girardeau, Iron, Madison, Perry, Ste. Genevieve, and St. Francois counties. Figure 1 shows the location of the Southeast region within Missouri and Figure 2 presents a detailed map.

The Southeast region is located south of the St. Louis metropolitan area, along the Mississippi River. I-55 traverses the eastern portion of the region from north to south. In addition, the region is interconnected by two U.S. highways and eleven major county roads. All of the counties in the region are rural counties; however, Ste. Genevieve and St. Francois counties are adjacent to the St. Louis metropolitan area.

Figure 1
Missouri Regional Planning Commissions



Figure 2
The Southeast Region



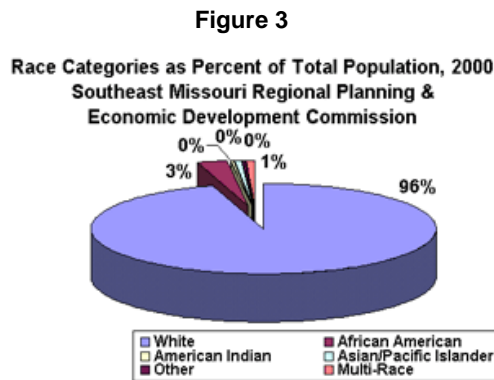
Source: OSEDA, Missouri Department of Transportation.

Population in the Southeast region increased 10.9 percent from 1990-2000 and 6.0 percent from 2000-2007, greater than the increases of 9.3 and 5.1 percent, respectively, for the state of Missouri. From 2007 to 2015, the Southeast region's population is projected to increase 4.6 percent, less than the projected 5.2 percent increase for Missouri. As shown in Table 2, St. Francois and Cape Girardeau counties experienced the fastest growth in population, while Iron county lost population and is expected to continue to do so.

	2015 proj.	2007 est.	2000	1990	% chg 1990- 2000	% chg 2000- 2007	% chg 2007- 2015
Bollinger County	12,403	12,118	12,029	10,619	13.3	0.7	2.4
Cape Girardeau County	76,997	72,740	68,693	61,633	11.5	5.9	5.9
Iron County	9,158	10,013	10,697	10,726	-0.3	-6.4	-8.5
Madison County	12,650	12,180	11,800	11,127	6.0	3.2	3.9
Perry County	19,529	18,794	18,132	16,648	8.9	3.7	3.9
Ste. Genevieve County	18,003	17,841	17,842	16,037	11.3	0.0	0.9
St. Francois County	67,349	62,810	55,641	48,904	13.8	12.9	7.2
Southeast Region	216,089	206,496	194,834	175,694	10.9	6.0	4.6

Source: OSEDA and authors' calculations.

The racial composition of the residents of the Southeast region is fairly homogenous, as shown in Figure 3. Over 95 percent of the population is Caucasian, while 3 percent is African American.



SOURCE: USDC, Bureau of Census, Census of Population and Housing, Summary File 1 (2000).
 Produced by: The Office of Social and Economic Data Analysis, UCE (T. Dranginis, November 2002).

Table 3 shows the percentage of persons aged 25 years old or older who were high school graduates or beyond in 1990 and 2000. In other words, the percentage includes those with a high

school diploma or GED, some college (but no college degree), college graduates, and those with professional degrees. In 2000, 74.6 percent of those aged 25 years or older in the Southeast Region had at least a high school diploma, somewhat below the 81.3 percent for the state of Missouri. Cape Girardeau county had the largest percentage who were high school graduates or beyond, while Iron County had the smallest.

Table 3
Educational Attainment
(Persons aged 25 years or over)

	2000 (pct.)	1990 (pct.)	percentage change 1990-2000
HS Grad or more education			
Bollinger County	70.7	52.7	54.1
Cape Girardeau County	81.1	74.5	25.2
Iron County	65.2	56.3	18.6
Madison County	68.6	54.4	36.2
Perry County	71.2	56.3	41.3
Ste. Genevieve County	73.8	62.9	34.6
St. Francois County	72.3	62.4	35.2
Southeast Region	74.6	64.4	31.8

Source: OSEDA and authors' calculations.

Between 1990 and 2000, Bollinger County experienced a 54.1 percent increase in those over 25 years with a high school diploma or beyond, the largest increase in the region over the period.

Industry Clusters in Southeast Missouri

We perform two types of analyses on the industry clusters: Location Quotients and Shift-Share Analysis. Appendix 2 presents the cluster analyses for each county in the region.

Location Quotients

Using the 22 benchmark industry cluster definitions described earlier, we evaluate each cluster by means of a location quotient (LQ)²⁰. An LQ compares the fraction of the region's employment in a particular industry cluster to the fraction of the nation's employment in the same industry cluster. The location quotient for industry cluster i in region r is calculated as

$$LQ_{ri} = \{ [E_{ri} / E_r] / [E_{ni} / E_n] \},$$

where E_{ri} is the region's employment in industry cluster i , E_r is total regional employment, E_{ni} is the nation's employment in industry cluster i , and E_n is total national employment.

An LQ equal to one indicates that the region employs the same fraction of its workforce in the industry cluster as does the nation as a whole. An LQ greater than one indicates that the region employs a larger fraction of its workforce in the industry cluster (less than one a smaller fraction) than does the nation. When the LQ exceeds 1.0, the region "specializes" in the industry cluster. The region has a concentration in the industry cluster.

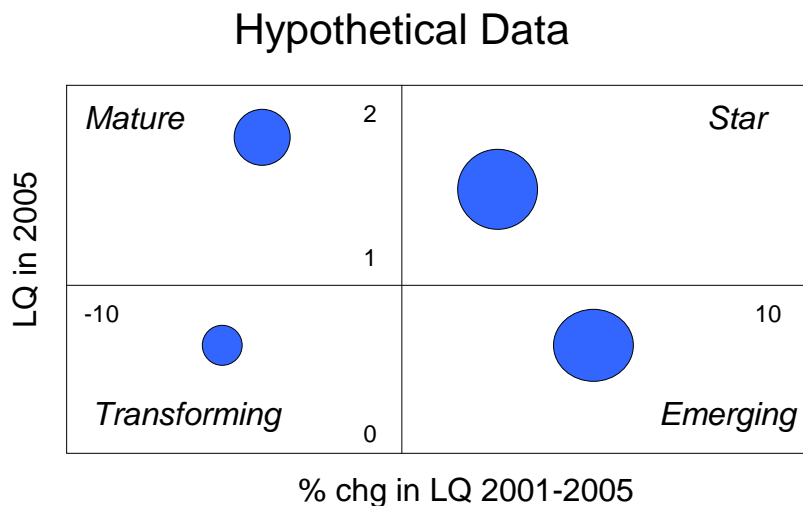
Industry clusters are often displayed in a three-dimensional (LQ, percentage change in LQ, and cluster employment) bubble chart. A hypothetical bubble chart is shown in Figure 4. The vertical axis contains the value of LQ in 2006. The horizontal axis crosses the LQ axis at a

value of LQ equal to one. Bubbles above the horizontal axis represent clusters that employ a larger fraction of its workforce in the industry cluster than does the nation, while the bubbles below the horizontal axis represent clusters that employ a smaller fraction of its workforce than does the nation. The horizontal axis shows the percentage change in the value of the LQ from 2001 to 2006. Bubbles lying to the right of the vertical axis represent industry clusters that have increased their fraction of employment relative to the nation, while those to the left of the vertical axis have decreased their fraction of employment. The size of the bubble represents regional employment in the cluster. The larger the bubble, the larger is the industry cluster's employment.

Bubbles in the chart fall in one of four regions: stars, mature, emerging, and transforming.

Figure 4

Industry Cluster Bubble Chart

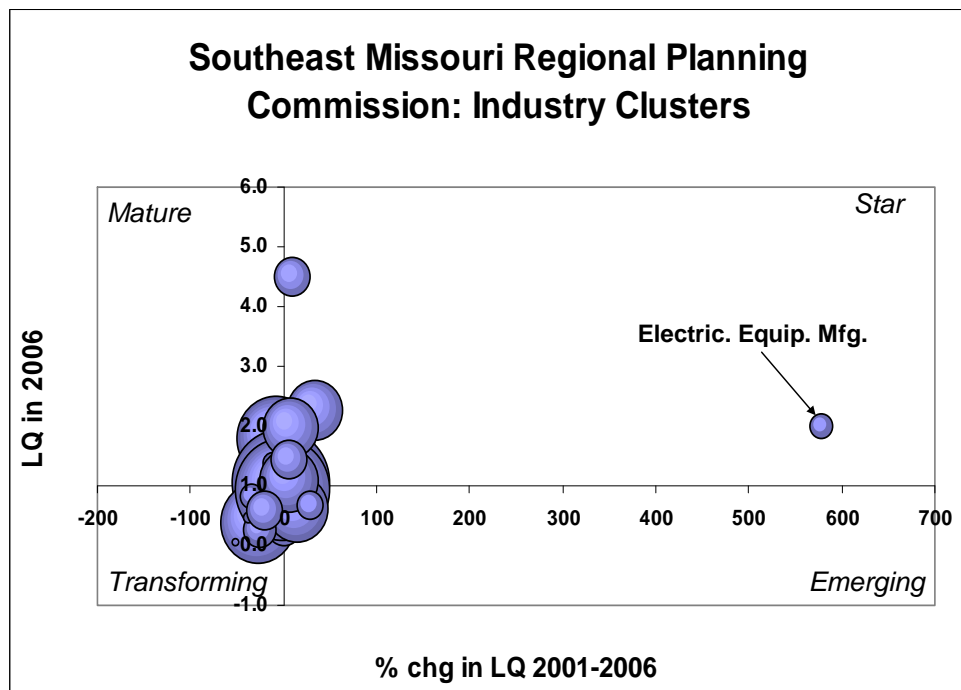


- Industry clusters in the upper right quadrant are “stars.” The star clusters are those whose fraction of employment in the region is larger than that in the nation and whose fraction of employment has increased over the five year period relative to the nation. Star clusters are specialized as compared to the nation and are becoming more specialized.
- Industry clusters in the upper left quadrant are “mature.” The mature clusters are those whose fraction of employment in the region is larger than that in the nation and whose fraction of employment has decreased over the five year period relative to the nation. Mature clusters are specialized as compared to the nation and becoming less specialized.
- Industry clusters in the lower right quadrant are “emerging.” The emerging clusters are those whose fraction of employment in the region is currently less than that in the nation and whose fraction of employment has increased over the five year period relative to the nation. These clusters are less specialized in the region as compared to the nation. Some of the emerging clusters may become specialized clusters in the future.

- Industry clusters in the lower left quadrant are “transforming.” The transforming clusters are those whose fraction of employment in the region is less than that in the nation and whose fraction of employment has decreased over the five year period relative to the nation. These clusters are less specialized in the region. The transforming clusters are unlikely to become specialized.

Figure 5 shows the bubble chart for the industry clusters in the Southeast region. As can be readily seen, the Electrical Equipment, Appliance and Component Manufacturing cluster had an LQ of about 2 and experienced more than a 500 percent increase in the value of its LQ since 2001. This is a star cluster. Since LQ exceeds 2, the Southeast region has a concentration in the Electrical Equipment, Appliance and Component Manufacturing cluster. The Southeast region’s fraction of employment in this cluster increased substantially more than in the nation, although it is still small (576 jobs in 2006 or about 0.5% of regional employment) compared with many of the other industry clusters in the region. The cluster is becoming even more specialized.

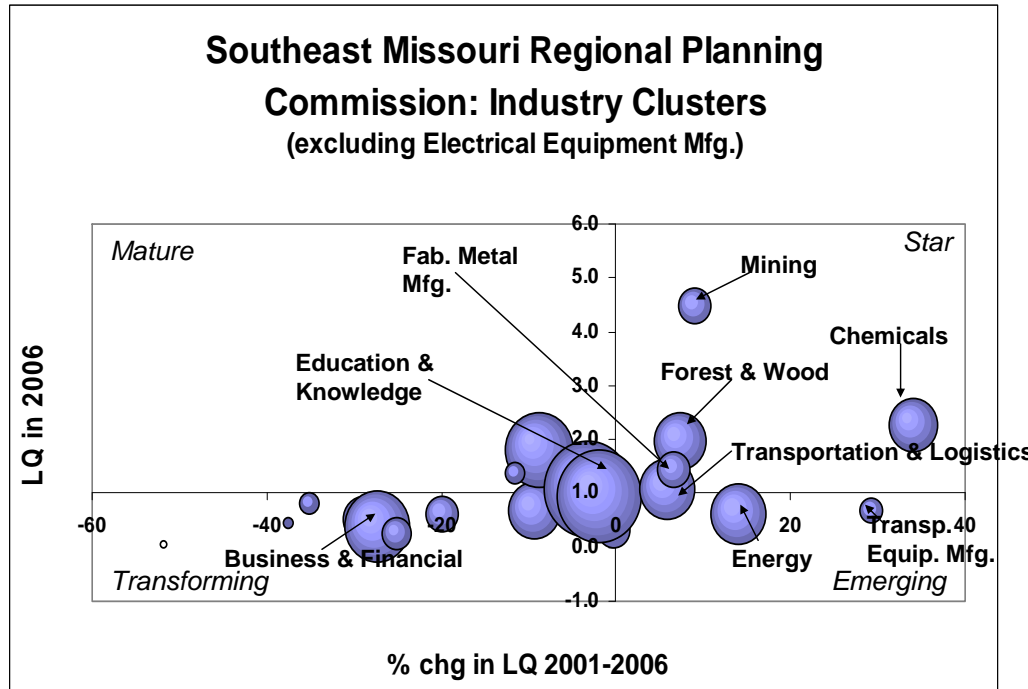
Figure 5



Because of the large increase in the LQ of the Electrical Equipment, Appliance and Component Manufacturing cluster, however, Figure 5 does not clearly reveal the other industry clusters in the region. In Figure 6, the Southeast region’s bubble chart is shown with the Electrical Equipment, Appliance and Component Manufacturing cluster excluded.

Star clusters in the Southeast region include Mining; Chemicals and Chemical Based Products; Electrical Equipment, Appliance and Component Manufacturing (from Fig. 5); Forest and Wood Products; Fabricated Metal Product Manufacturing; and Transportation and Logistics. These clusters employed a total of 14,227 workers, or approximately 12.4% of the region’s work force.

Figure 6



- Mining had the highest location quotient in the Southeast region in 2006 (4.49), and its degree of concentration increased from 2001-2006. Employment in this cluster increased by 6.8% over the period, much faster than the cluster's employment growth at the national level (where cluster employment fell by 1.4%).
- The largest industry clusters in this category are Transportation and Logistics (3928 jobs in 2006), Forest and Wood Products (3513 jobs), and Chemical and Chemical Based Products (3263 jobs). Employment in these clusters increased by 9.2%, 2.7%, and 23.2%, respectively, from 2001-2006, and each of these clusters increased in concentration. Employment growth in these clusters at the national level over the same period was 3.8 %, -3.8%, and -7.5%, respectively.

Mature clusters include Agribusiness, Food Processing and Technology; Glass and Ceramics; Biomedical/Biotechnical (or Life Sciences). These are important industry clusters that may require some attention, since they are becoming less specialized.

- Biomedical/Biotechnical (or Life Sciences) has the highest employment level among the mature clusters, 9889 jobs in 2006. Although employment in this cluster grew 7.7% from 2001-2006, the industry cluster became less concentrated, because employment growth in this industry cluster at the national level was 11.8%.
- Agribusiness, Food Processing and Technology has the highest LQ (1.79) and employment among the mature clusters. However, this cluster experienced a decline in employment from 2001-2006 of 12.7%, compared to an employment decline of 3.6% at the national level.

The Southeast region has a number of emerging industry clusters, including Transportation Equipment Manufacturing and Energy (fossil and renewable). These hold some potential for the future.

- Transportation Equipment Manufacturing and Energy (fossil and renewable) experienced double-digit increases in their employment from 2001-2006 – 18.2% and 14.2%, respectively, as compared to a decline of 8.1% and an increase of 0.8% at the national level. The degree of concentration increased by double digits in the region as well.

Transforming clusters include Education and Knowledge Creation; Apparel and Textiles; Machinery Manufacturing; Advanced Materials; Printing and Publishing; Arts, Entertainment, Recreation, and Visitor Industries; Primary Metal Manufacturing; Business and Financial Services; Defense and Security; Information Technology and Telecommunications; and Computer and Electronic Product Manufacturing.

- Of the transforming clusters, only Education and Knowledge Creation experienced an increase in employment from 2001-2006 – an increase of 17.8%. However, its degree of concentration in the region fell, since employment growth in this cluster at the national level was 20.7%.
- Business and Financial Services experienced a decline of 1569 jobs between 2001 and 2006, the greatest decrease among clusters in the region (in terms of the absolute number of jobs). At the national level, this industry cluster experienced employment growth of 9.2%.

While transforming clusters hold less potential for the Southeast region as a whole, some of these clusters are very important for individual counties within the region. Table 3 shows the industry clusters in which the Southeast region and its counties are specialized, that is, where the LQ exceeds one. In the last column of the table, the Southeast region is specialized in nine industry clusters: Agribusiness, Food Processing and Technology; Biomedical/Biotechnical (Life Sciences); Chemicals and Chemical Based Products; Forest and Wood Products; Glass and Ceramics; Transportation and Logistics; Fabricated Metal Product Manufacturing; Electrical Equipment, Appliance and Component Manufacturing; and Mining. Note that not all the counties in the region specialize in these industry clusters.

Each of the counties in the Southeast region specializes in at least four industry clusters, but some counties specialize in more clusters than others. For example, Bollinger county specializes in four industry clusters, while Cape Girardeau county specializes in nine clusters. These specialized industry clusters also differ markedly from one county to another. For example, only Cape Girardeau and St. Francois counties specialize in the Biomedical/Biotechnical (Life Sciences) cluster. Only Iron and Ste. Genevieve counties specialize in mining. Only Perry county specializes in Advanced Materials.

Furthermore, some counties specialize in industry clusters in which the region as a whole does not. One example is Transportation Equipment Manufacturing. Perry and Ste. Genevieve counties are specialized in this cluster. The Southeast region is not specialized in this cluster. Similarly, Madison county specializes in Energy (fossil and renewable), but the Southeast region does not. Nevertheless, all counties specialize in several clusters that represent strengths in the region. Therefore, regional cooperation in economic development activities will benefit all counties in the region.

Table 3
Specialized Clusters in the Southeast Missouri Region and Counties
(LQ greater than 1 in 2006)

	Bollinger	Cape Girardeau	Iron	Madison	Perry	Ste. Genevieve	St. Francois	Southeast Region
Industry Cluster								
Advanced Materials					2.38			
Agribusiness, Food Processing & Technology	6.50		1.03	3.13	5.53	3.52		1.79
Apparel & Textiles	1.96	1.15		3.15				
Arts, Entertainment, Recreation & Visitor Industries								
Biomedical/Biotechnical (Life Sciences)		1.42					1.30	1.07
Business & Financial Services								
Chemicals & Chemical Based Products		1.23			8.76	8.04		2.27
Defense & Security								
Education & Knowledge Creation		1.45		1.14		1.16		
Energy (Fossil & Renewable)				1.76				
Forest & Wood Products	1.64	2.50		2.57	1.71	4.15		1.96
Glass & Ceramics		1.59	2.79			1.13	1.75	1.38
Information Technology & Telecommunications								
Transportation & Logistics	1.06	1.15		1.56	1.35			1.08
Primary Metal Mfg			7.94					
Fabricated Metal Product Mfg		1.63	2.27				1.80	1.43
Machinery Mfg							2.01	
Computer & Electronic Product Mfg								
Electrical Equipment, Appliance & Component Mfg		4.10						2.01
Transportation Equipment Mfg					1.70	1.13		
Mining			74.17			7.45		4.49
Printing & Publishing						1.40		

The LQs can identify the strengths and weaknesses in a region's economy, and the changes in LQs can tell us whether a cluster has become more or less concentrated over time. However, LQs alone can't explain how performance of the region's economy and its industry clusters differ from that of the nation. To answer these questions, we use shift-share analysis.

Shift-Share Analysis

Shift-share analysis explains the changes in a region's economy (here, employment) by decomposing the actual changes into its three sources: a national share effect, an industry cluster share effect, and a regional share effect.

The national share effect is the change in employment attributed to national economic factors. This effect is calculated by taking the percentage change in national employment from 2001 to 2006 times the region's 2001 employment in the industry cluster. The result is the number of jobs the region's industry cluster gained (or lost, if negative) due to national employment trends. In other words, this is the expected gain (or loss) in jobs due to trends in the national economy.

The industry cluster share effect is the change in employment attributed to industry cluster factors at the national level that caused the industry cluster to expand or contract relative

to the national economy. The effect is calculated as the percentage change in industry cluster employment at the national level minus the percentage change in national employment over the period 2001 to 2006 times the region's 2001 employment in the industry cluster. The result is the expected gain or loss of jobs due to industry cluster trends. In other words, a positive value indicates the industry cluster at the national level grew more quickly than the national economy (an expansion of the cluster), while a negative value indicates the industry cluster grew more slowly (a contraction of the cluster).

The regional share effect is calculated as the residual, i.e., the actual change in employment in the region's cluster minus both the national share and the industry cluster share effects. In other words, the regional share effect is the actual change in employment minus the expected change in employment if the regional cluster exactly followed national trends. It represents the change in the region's cluster employment attributed to region-specific factors affecting competitiveness, such as labor force skills, infrastructure, etc. The regional share is an indicator of the region's competitiveness in the industry cluster. A positive value indicates that the region has a competitive advantage in the industry cluster, while a negative value indicates a competitive disadvantage.

Shift-share analysis for the Southeast region is presented in Table 4. The industry clusters in the table are organized by their location in the Southeast region's bubble charts in Figs. 5 and 6. Consider the "star" cluster Chemicals and Chemical Based Products (Fig. 6), which had a regional employment of 2672 in 2001. Employment in this cluster increased 615 from 2001 to 2006. As shown in Table 4, this change in employment can be decomposed as follows.

- National employment increased by 3.5% over the period. If the region's cluster performed like the nation as a whole, 94 jobs would have been added – this is the *national share*.
- Employment in this industry cluster fell by about 7.5% from 2001 to 2006, so the industry cluster contracted by about 11% relative to the national economy over the period. If the region's cluster performed like the industry cluster at the national level, 294 jobs would have been lost -- this is the *industry cluster share*.
- The *regional share* is 815 jobs. The region's cluster performed much better than the industry cluster at the national level. The positive regional share indicates the Southeast regional economy enjoys a competitive advantage in Chemicals and Chemical Based Products.

The regional share effect is positive – the region has a competitive advantage – in all of the star and emerging clusters. Surprisingly, among these clusters, only Transportation and Logistics expanded at the national level between 2001 and 2006 (industry cluster share is positive). One star cluster (Fabricated Metal Product Manufacturing) actually lost employment at the regional level (3 jobs), but this amount was substantially smaller than the expected job loss due to industry cluster contraction. The positive regional share for this cluster indicates that the region "saved" 81 jobs that would have been lost if the region followed national trends.

Biomedical/Biotechnical (Life Sciences) and Education and Knowledge Creation are the two largest clusters in terms of employment (about 9800 jobs in each cluster) and regional employment increased in both of these clusters between 2001 and 2006. In both clusters, however, expected job gains (national plus industry cluster shares) exceeded actual job gains. Cluster employment at the national level increased at a faster pace than in the region, so the regional effect is negative. The negative regional effect indicates that some region-specific factors are putting the region at a competitive disadvantage in these clusters.

Table 4
Southeast Region Industry Clusters
Shift Share Analysis

Southeast Region	LQ2006	% chg in LQ 2001- 2006	Employment 2006	Change in Employment 2001-2006	National share	Industry Cluster share	Regional share
Total All Industries			114570	3287			
Stars: Specialized, Increasing Concentration							
Mining	4.49	8.9	1506	95	50	-70	116
Chemicals & Chemical Based Products	2.27	34.0	3263	615	94	-294	815
Electrical Equipment, Appliance & Component Mfg	2.01	577.4	576	469	4	-25	491
Forest & Wood Products	1.96	7.4	3513	94	121	-250	223
Fabricated Metal Product Mfg	1.43	6.6	1441	-3	51	-135	81
Transportation & Logistics	1.08	5.8	3928	331	127	9	194
Mature: Specialized, Decreasing Concentration							
Agribusiness, Food Processing & Technology	1.79	-8.9	6461	-937	262	-530	-669
Glass & Ceramics	1.38	-11.5	535	-115	23	-65	-73
Biomedical/Biotechnical (Life Sciences)	1.07	-3.2	9889	703	326	760	-383
Emerging: Not Specialized, Increasing Concentration							
Transportation Equipment Mfg	0.68	29.3	772	119	23	-76	171
Energy (Fossil & Renewable)	0.61	14.0	4136	515	128	-100	487
Transforming: Not Specialized, Decreasing Concentration							
Education & Knowledge Creation	0.94	-1.8	9798	1483	295	1429	-241
Apparel & Textiles	0.85	-0.7	1339	-247	56	-286	-17
Machinery Mfg	0.82	-35.1	648	-483	40	-167	-356
Advanced Materials	0.69	-9.3	3876	-579	158	-316	-421
Printing & Publishing	0.60	-20.0	1429	-392	64	-89	-367
Arts, Entertainment, Recreation & Visitor Industries	0.52	-28.9	2487	-632	111	289	-1031
Primary Metal Mfg	0.47	-37.6	142	-136	10	-59	-87
Business & Financial Services	0.37	-27.3	5869	-1569	264	419	-2251
Defense & Security	0.31	-0.3	1460	-172	58	-218	-12
Information Technology & Telecommunications	0.26	-25.1	1258	-695	69	-334	-431
Computer & Electronic Product Mfg	0.07	-51.9	60	-106	6	-46	-66

While shift-share analysis identifies the industry clusters in which a region has a competitive advantage (disadvantage), it cannot reveal which of the region-specific factors account for the advantage (disadvantage).²¹

Where from Here?

Cluster analysis using location quotients and shift-share analysis provide useful information about the regional economy's strengths and weaknesses. However, these are just the first steps.

These analyses, which are based on secondary data, need to be supplemented with primary data – local knowledge -- in devising a cluster strategy for regional economic growth. The local knowledge could be obtained, for example, by individual interviews, focus groups, business executives, surveys, or public meetings. Since the benchmark cluster definitions used in this study are based on national data, the trading relationships assumed in these definitions need to be verified based on how industries in the region actually interact and trade with each other.

An initial set of clusters to target needs to be identified based on both the cluster analyses and the primary data. This report provides information on only two of many possible criteria for choosing target industry clusters: industry cluster specialization (location quotients greater than one) and competitive advantage (large, positive regional share effects). Regions may choose to target industry clusters with lower location quotients or negative regional share effects. For example, MERIC's list of targeted industry clusters for Missouri includes three clusters with a negative regional share at the state level: Energy; Finance; and Transportation and Logistics.²² Other criteria might include potential for generating high tax revenues, export products, and import substitution possibilities (local firms providing goods that are currently purchased from outside the region).²³

Industry clusters are a framework for economic development that changes the focus from viewing the regional economy as many individual firms influenced by specific events to viewing the regional economy as a collection of clusters. One implication of industry clusters is that developers should work with groups of firms in clusters, rather than just with individual firms. Working with groups of firms can help identify common, shared competitive problems. For example, needed labor skills could be identified cluster-wide and addressed in a comprehensive manner, rather than just addressing the skill needs of a particular firm.

Porter argues that, in the short term, existing clusters hold the best promise for regional economic growth.²⁴ Strengthening and extending existing clusters will be a priority. Rosenfeld²⁵ provides suggestions for accomplishing this task.

End Notes

¹ See Drabenstott (2005).

² See Cortright (2006).

³ See Cortright (2006).

⁴ See Cortright (2006), p. 3.

⁵ Porter (1998), p. 78.

⁶ See Porter (1998).

⁷ In his study of 41 traded industry clusters in the U.S., Porter (2003) reported that each industry cluster contained about 29 industries, and, on average, each industry belonged to two clusters.

⁸ See Schumpeter (1942).

⁹ See Cortright (2006).

¹⁰ See Porter (1990), pp. 71-130.

¹¹ Bergman and Feser (1999) identify six analytical approaches that have been used. From most commonly to least commonly used, the approaches are: expert opinion, location quotients, trade-based input-output analysis, innovation-based input-output analysis (based on innovation survey data), network analysis, and surveys.

¹² Feser (2005), p. 2.

¹³ Porter (2003) uses state level *County Business Patterns* data for 1996 to identify industry clusters based on industry co-location. He identifies a set of 41 benchmark traded clusters. Traded industries account for only about one third of employment across the U.S., but wages and rates of innovation tend to be higher for these industries.

¹⁴ Bergman and Feser (1999) describe their trade-based input-output analysis. Using the 1987 *Benchmark Input-Output Accounts of the United States*, they employ principal components analysis to identify a set of 24 benchmark clusters within manufacturing. Feser (2005) uses the 1997 *Benchmark Input-Output Accounts of the United States* and an improved methodology to identify a set of 45 benchmark clusters covering all sectors in the U.S., except government enterprises and a small number of local service industries.

¹⁵ Peters (2004) uses county-level data for Missouri from the 2000 IMPLAN database (developed by the Minnesota IMPLAN Group) to derive his benchmark supplier-based industry clusters.

¹⁶ See Missouri Economic Research and Information Center (2007). The targeted clusters are: Agribusiness, Automotive, Defense-Homeland Security, Energy, Finance, Information Technology, Life Sciences, and Transportation-Logistics. Because the benchmark industry cluster definitions in the study are based on 6-digit NAICS industries, we were unable to replicate these clusters. As discussed later, data suppression problems in the CEW data and the structure of the IMPLAN database prevent use of 6-digit NAICS definitions at the county and regional level.

¹⁷ In Appendix 1, Indiana Business Research Center (2007) provides a complete list of the aggregated cluster definitions and the NAICS codes for the industries in each of the clusters.

¹⁸ See Primont (2008).

¹⁹ Indiana Business Research Center (2007), p. 18 and Appendix.

²⁰ A location quotient may be measured in terms of employment, wages, or other relevant economic variable. In our work, we focus on employment.

²¹ See Shields (2003).

²² See Missouri Economic Research and Information Center (2007).

²³ Indiana Business Research Center (2007)

²⁴ Porter (2001).

²⁵ See Rosenfeld (2002).

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