TARGET MISSOURI 3 - TM3
INDUSTRY DRIVERS OF THE ECONOMY

April 2004

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KEY FINDINGS

- A common practice in economic development is to craft public policies to support an economy's "target industries". It is assumed by policy makers that public investments in these target industries will create economic growth and wealth for the region. Although this development approach is supported by a segment of economic theory, oftentimes the methods used to identify target industries are simplistic and politically driven. When targeted industries are identified using political rather than empirical justifications, development agencies run the risk of investing scare resources into groups of industries that will produce little to no economic benefits.

- Target Missouri 3 - TM3 - was developed to assist economic development officials in targeting industries based on sound economic theory and methods. TM3 provides a well conceptualized and empirically based definition of which industries are drivers of a region's economy, so that economic development policies and resources can be directed to the most viable parts of the economy.

- Missouri's 82 driver industries have a sizable impact on the state's economy, accounting for 42.8% of total foreign exports, 17.7% of total output, 10.0% of total compensation and 8.3% of total employment. In addition, these driver industries paid an average annual wage per job of $34,653, which was moderately more that the state average wage per job.

- In manufacturing, Missouri had a competitive advantage in greeting card publishing, automatic merchandising machines, lumber and wood products (i.e. sawmill products, hardwood floors, wood containers/pallets, and furniture), ammunition, paper products (i.e. paper bags, paper sanitary products, envelopes, and paper), and lastly in motor vehicles, which was substantially represented (i.e. motor vehicles, boats, motorcycles, aircraft, internal combustion engines, motors and generators, fans, and heating and cooling equipment).

- In the extractive industries, Missouri had a competitive advantage in lead mining, clay cricks, lime and stone quarrying, paving and asphalt products, and cement.

- In agriculture and food products, Missouri had a competitive advantage in agricultural production products (i.e. agricultural chemicals, grass seeds, prepared feeds, feed grains, hay, cattle, hogs, and oil crops) and in manufactured food products (i.e. pet foods, malt beverages, pasta products, poultry processing, pickles and sauces, roasted coffee, cheese and condensed milk, and cereals).

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OVERVIEW

A common practice in economic development is to craft public policies to support an economy's "target industries". It is assumed by policy makers that public investments in these target industries will create economic growth and wealth for the region. Although this development approach is supported by a segment of economic theory, oftentimes the methods used to identify target industries are simplistic and politically driven. Therefore, it is critical that economic development officials base target industry policies on sound economic theory and rigorous methods.

Target Missouri 3 - TM3 - was developed to assist economic development officials in targeting industries based on sound economic theory and methods. TM3 is a methodology for identifying the industrial drivers of an economy, grounded in economic base theory. TM3 can affect economic development policy by providing a well conceptualized and empirically based definition of which industries are drivers of a region's economy. When targeted industries are identified using political rather than empirical justifications, development agencies run the risk of investing scare resources into groups of industries that will produce little to no economic benefits. When targeted industries are identified empirically, economic development policies and resources can be directed to the most viable parts of the economy. TM3 is an extension of previous Target Missouri initiatives, the first of which began in the mid-1990s. TM3 substantially improves upon previous initiatives by: (1) offering greater geographic detail and flexibility using county-based data; (2) offering greater industry detail for over 500 specific economic sectors; (3) offering more diverse and appropriate economic base indicators, such as exports, output and productivity; and (4) offering a statistically sound method for classifying industries.

Target industry development policies are grounded in economic base theory. The essential idea is that some activities in a region are peculiarly basic in the sense that their growth leads and determines the region's overall development; while other non-basic activities are simply consequences of the region's overall development. Economic base theory identifies basic activities as those that bring in money from the outside world, generally by producing goods or services for export. The argument advanced for this approach is that a region, like a household or a business firm, must earn its livelihood by producing something that others will pay for. Activities that simply serve the regional market are there as a result of whatever level of income and demand the region may have achieved - they are passive participants in growth but not prime movers. A household, a neighborhood, a firm, or a region cannot get richer by

simply "taking in its own washing"; it must sell something to others in order to get more income. Consequently, exports are viewed as providing the economic base of a region's growth.

DATA AND METHODS

To identify Missouri's driver industries, a mathematical cluster analysis was used to group industries based on how economically competitive they are relative to the national average. Once grouped, multivariate analysis of variance and discriminant function analysis were used to identify unique characteristics of the clusters and to assess the internal validity of the groupings.

Data in this analysis was taken from the Minnesota IMPLAN Group who compile cross-sectional data at the national, state and county level to construct a comprehensive and accurate database at the county-level that has a consistent structure (MIG, 1999). IMPLAN is used widely by researchers in industry, government and academia. Since the data is disaggregated by county, the analysis can be replicated for any combination of counties in Missouri to approximate economic regions. Nine variables comparing the Missouri industry average to the national industry average in terms of output, employment, compensation and foreign exports were used to measure the economic competitiveness of a given industry between 1997 and 2000. Refer to Table 1.

Industry output represents the value of an industry's total production and was derived from U.S. Bureau of Census (Economic Census), U.S. Bureau of Economic Analysis (output estimates) and U.S. Bureau of Labor Statistics (projections) data. Industry employment includes both full-time and part-time workers and is reported as full-time equivalent jobs. Industry compensation represents total payroll costs, which include wages, salaries, benefits and non-cash compensation. Industry employment and compensation was derived from U.S. Bureau of Economic Analysis (REIS) and U.S. Bureau of Labor Statistics (ES-202) data. Industry foreign exports are demands made for goods and services by consumers and industries outside the U.S. and was derived from U.S. Bureau of Census (Economic Census) and U.S. Bureau of Economic Analysis (export estimates) data.

To measure the economic competitiveness of a given industry in Missouri the data was benchmarked to the national average for that industry. To measure Missouri's economic competitiveness in a given industry relative to the national industry average in 2000, specialization in output, employment, compensation and exports were measured using location quotients. Scores greater than 1.0 indicate that Missouri is relatively more specialized in that industry relative to the national average, which indicates a comparative advantage or potential

for growth. Scores less than 1.0 indicate that Missouri is relatively less specialized in that industry relative to the national average, which indicates a comparative disadvantage. The formula for a location quotient is given in equation (1), where X is the economic variable of interest, i is the industry, r the region and n the nation.

(1) $$LQX_{ir} = (X_{ir}/X_r)/(X_{in}/X_n)$$

To measure Missouri's growth in a given industry relative to the national industry average between 1997 and 2000, the difference in growth rates between Missouri and the United States was calculated for output, employment, compensation and exports. Positive scores indicate the percentage of regional industry growth above the national average, meaning that the industry in Missouri is growing faster than the national industry average. Negative scores indicate the percentage of regional industry growth below the national average, meaning that the industry in Missouri is growing slower than the national industry average. The formula used to calculate the difference in growth rates is given in equation (2), where X is the economic variable of interest, i is the industry, r the region, n the nation and t is time period.

(2) $$\Delta X_{ir} = \left(\left(\left(X_{ir}^{t} - X_{ir}^{t-1}\right)/X_{ir}^{t-1}\right)*100\right) - \left(\left(\left(X_{in}^{t} - X_{in}^{t-1}\right)/X_{in}^{t-1}\right)*100\right)$$

To measure Missouri's productivity in a given industry relative to the national industry average in 2000, the ratio of output per worker between Missouri and the United States was calculated. Scores greater than 1.0 indicate that the industry in Missouri is more productive than the national average, which indicates a comparative advantage. Scores less than 1.0 indicate that the industry in Missouri is less productive than the national average, which may indicate a comparative disadvantage. The formula used to calculate the productivity measure is given in equation (3), where O is output, E is employment, i is the industry, r the region and n the nation.

(3) $$PROD_{ir} = (O_{ir}/E_{ir})/(O_{in}/E_{in})$$

TABLE 1
Economic Competitiveness Variables for Missouri.

Variable	***Description***
Output Specialization	Output location quotient, 2000.
Output Growth	Difference in output growth rates relative to the national average, 1997-2000.
Productivity	Productivity per worker relative to the national average, 2000.
Employment Specialization	Employment location quotient, 2000.
Employment Growth	Difference in employment growth rates relative to the national average, 1997-2000.
Compensation Specialization	Compensation location quotient, 2000.
Compensation Growth	Difference in compensation growth rates relative to the national average, 1997-2000.
Export Specialization	Foreign exports location quotient, 2000.
Export Growth	Difference in foreign exports growth rates relative to the national average, 1997-2000.

NOTES: Data taken from IMPLAN.

MISSOURI'S TARGET INDUSTRIES

Results of the cluster and discriminant function analyses grouped 509 industries into 13 clusters based on how economically competitive they were relative to the national average. Of these 13 clusters, six were identified as drivers of Missouri's economy based on economic specialization relative to the national average. Refer to Table 2. This resulted in 82 driver industries where Missouri had a locational competitive advantage relative to other states. These Refer to Tables 3 and 4. This group represents Missouri's target industries.

The competitive core of Missouri's economy consisted of 13 industries where the state had the best competitive advantage in the nation. Specialization in output, employment, compensation and foreign exports were all extremely high. The *competitive fast growth cluster* included four industries that were growing faster than the national industry average, especially in compensation and employment. Also, productivity per worker was above the national average for these industries. The *competitive slow growth cluster* included nine industries that were growing close to the national industry average. Growth in compensation and foreign exports slightly exceeded the national average. Also, productivity per worker was at the national average for these industries.

The emerging core of Missouri's economy consisted of 69 industries where the state had an above average competitive advantage in the nation. These industries are well positioned to become part of Missouri's competitive core. The *emerging hyper growth cluster* included one industry where specialization in output, employment, compensation and foreign exports were slightly above the national industry average. However, growth across the board far outpaced the national industry average, especially in foreign exports. Also, productivity per worker was below the national average for this industry.

The *emerging fast growth cluster* included four industries where specialization in output, employment, compensation and foreign exports were above the national industry average, especially in compensation. These industries were growing faster than the national industry average, especially in compensation, output and employment. Also, productivity per worker was above the national average for these industries.

The *emerging moderate growth cluster* included 45 industries where specialization in output, employment, compensation and foreign exports were above the national industry

average. These industries were growing above the national industry average, especially in compensation. Also, productivity per worker was at the national average for these industries.

Lastly, the *emerging slow growth cluster* included 19 industries where specialization in output, employment, compensation and foreign exports were well above the national industry average. These industries were growing at or slightly above the national industry average. However, productivity per worker was below the national average for these industries.

The 82 driver industries had a sizable impact on Missouri's economy, accounting for 42.8% of total foreign exports, 17.7% of total output, 10.0% of total compensation and 8.3% of total employment. In addition, these driver industries paid an average annual wage per job of $34,653, which was moderately more that the state average wage per job. In terms of output per worker, productivity was highest in the *emerging hyper growth cluster* ($37,402 per worker) and lowest in the *emerging fast growth cluster* ($14,349 per worker). In terms of wages per job, the highest paying jobs were in the *competitive fast growth cluster* ($72,795 per job) and lowest paying were in the *emerging slow growth cluster* ($30,086 per job). In terms of foreign exports per worker, the *hyper growth cluster* was the most export intensive ($76,085 per worker) and the *emerging fast growth cluster* was the least intensive ($6,486 per worker).

TABLE 2
Cluster Means by Economic Competitiveness Variables.

	Economic Competitiveness Variables								
Industry Clusters	**Output Specialization**	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Competitive Fast Growth	15.36	37.39	1.08	13.18	59.23	17.29	76.90	15.69	27.99
Competitive Slow Growth	8.70	-0.99	0.99	8.41	-0.21	9.15	4.62	8.89	2.79
Emerging Hyper Growth	1.62	385.95	0.86	1.73	381.79	1.48	378.84	1.65	11600.97
Emerging Fast Growth	2.81	170.17	1.12	2.32	163.00	3.24	196.18	1.99	90.46
Emerging Moderate Growth	2.25	10.31	0.97	2.15	11.22	2.30	14.72	2.30	8.03
Emerging Slow Growth	3.93	2.87	0.89	4.10	5.37	3.88	6.34	4.01	8.67
US Average Competitiveness	1.12	-0.85	0.93	1.11	0.64	1.12	-0.06	0.79	-0.93
Uncompetitive Hyper Growth	0.60	603.04	0.87	0.63	465.58	0.41	454.68	0.30	214.86
Uncompetitive Fast Growth	0.35	110.73	0.93	0.34	87.02	0.38	107.83	0.34	91.37
Uncompetitive Slow Growth	0.30	3.65	0.92	0.31	5.62	0.28	7.10	0.28	1.30
Uncompetitive Declining	0.23	-58.38	0.77	0.24	-59.69	0.22	-61.71	0.22	-85.15
Non-Competitive High Productivity	0.39	13.74	5.03	0.07	-20.60	0.05	29.04	0.00	0.00
Non-Competitive Low Productivity	0.04	-0.46	0.04	0.06	3.80	0.03	3.13	0.02	-0.57

SOURCE: IMPLAN.
ANALYSIS: Missouri Economic Research and Information Center (MERIC).

TABLE 3
Economic Impacts of Missouri's Target Industries 2000.

	Economic Variables				
Target Industry Clusters	**Output (Pct of MO Total)**	**Employment (Pct of MO Total)**	**Compensation (Pct of MO Total)**	**Exports (Pct of MO Total)**	**Wage Per Job (Pct of MO Avg)**
Competitive Fast Growth	$5,043,085,000 (1.62%)	16,760 (0.48%)	$1,220,046,000 (1.23%)	$840,150,000 (4.46%)	$72,795 (254.58%)
Competitive Slow Growth	$5,469,782,000 (1.75%)	27,784 (0.80%)	$853,019,000 (0.86%)	$336,170,000 (1.79%)	$30,702 (107.37%)
Emerging Hyper Growth	$1,230,524,000 (0.39%)	3,290 (0.09%)	$201,968,000 (0.20%)	$250,320,000 (1.33%)	$61,388 (214.69%)
Emerging Fast Growth	$132,301,000 (0.04%)	922 (0.03%)	$34,815,000 (0.03%)	$5,980,000 (0.03%)	$37,760 (132.06%)
Emerging Moderate Growth	$29,593,546,000 (9.49%)	151,102 (4.34%)	$5,015,052,000 (5.04%)	$3,331,990,000 (17.69%)	$33,190 (116.07%)
Emerging Slow Growth	$13,874,813,000 (4.45%)	87,425 (2.51%)	$2,630,292,000 (2.64%)	$3,290,120,000 (17.47%)	$30,086 (105.22%)
TOTAL	**$55,344,051,000 (17.74%)**	**287,283 (8.25%)**	**$9,955,192,000 (10.00%)**	**$8,054,730,000 (42.77%)**	**$34,653 (121.19%)**

SOURCE: IMPLAN.
ANALYSIS: Missouri Economic Research and Information Center (MERIC).

TABLE 4
Missouri's Target Industries

Industry and Standard Industrial Classification		*Economic Competitiveness Variables*								
		Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Competitive Fast Growth Cluster		**++**	**+**	**+**	**++**	**++**	**++**	**++**	**++**	**+**
Lead and Zinc Ores	1030									
Greeting Card Publishing	2770									
Agricultural Chemicals, N.E.C	2879									
Small Arms Ammunition	3482									
Lead and Zinc Ores	1030									
Competitive Slow Growth Cluster		**++**	**=**	**=**	**++**	**=**	**++**	**=**	**++**	**=**
Grass Seeds	0139									
Dog, Cat, and Other Pet Food	2047									
Malt Beverages	2082									
Macaroni and Spaghetti	2098									
Special Product Sawmills, N.E.C	2429									
Footwear Cut Stock	3130									
Clay Refractories	3255									
Lime	3274									
Automatic Merchandising Machine	3581									

Industry and Standard Industrial Classification			***Economic Competitiveness Variables***								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Emerging Hyper Growth Cluster			**+**	**++**	**-**	**+**	**++**	**+**	**++**	**+**	**++**
Glass Containers	3221										
Emerging Fast Growth Cluster			**+**	**++**	**+**	**+**	**++**	**+**	**++**	**+**	**++**
Soybean Oil Mills	2075										
Ammunition, Except For Small Arms, N.E.C.	3483										
Machine Tools, Metal Forming Types	3542										
Food Products Machinery	3556										
Emerging Moderate Growth Cluster			**+**	**=**	**=**	**+**	**=**	**+**	**=**	**+**	**=**
Feed Grains	0110										
Hay and Pasture	0110										
Dimension Stone	1410	1420									
Poultry Processing	2015										
Pickles, Sauces, and Salad Dressings	2035										
Prepared Feeds, N.E.C	2048										
Roasted Coffee	2095										
Textile Bags	2393										
Pleating and Stitching	2395										
Hardwood Dimension and Flooring Mills	2426										
Wood Containers	2441	2449									

Industry and Standard Industrial Classification			***Economic Competitiveness Variables***								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Wood Pallets and Skids	2448										
Mattresses and Bedsprings	2515										
Metal Partitions and Fixtures	2542										
Furniture and Fixtures, N.E.C	2599										
Bags, Paper	2674										
Sanitary Paper Products	2676										
Envelopes	2677										
Blankbooks and Looseleaf Binders	2782										
Plate Making	2796										
Explosives	2892										
Paving Mixtures and Blocks	2951										
Asphalt Felts and Coatings	2952										
Rubber and Plastics Hose and Belting	3052										
Leather Tanning and Finishing	3110										
Personal Leather Goods	3172										
Cement, Hydraulic	3240										
Steel Wire and Related Products	3315										
Primary Nonferrous Metals, N.E.C.	3339										
Miscellaneous Fabricated Wire Products	3495	3496									
Internal Combustion Engines, N.E.C.	3519										
Welding Apparatus	3548										
Blowers and Fans	3564										

Industry and Standard Industrial Classification			***Economic Competitiveness Variables***								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Refrigeration and Heating Equipment	3585										
Transformers	3612										
Communications Equipment N.E.C.	3669										
Motor Vehicles	3711										
Truck Trailers	3715										
Boat Building and Repairing	3732										
Motorcycles, Bicycles, and Parts	3750										
Sporting and Athletic Goods, N.E.C.	3949										
Marking Devices	3953										
Railroads and Related Services	4010	4740									
Water Supply and Sewerage Systems	4940	4952									
Commercial Sports Except Racing	7941										
Emerging Slow Growth Cluster			**+**	**=**	**-**	**+**	**=**	**+**	**=**	**+**	**=**
Ranch Fed Cattle	0212										
Hogs, Pigs and Swine	0213										
Oil Bearing Crops	0116	0119									
Cheese, Natural and Processed	2022										
Condensed and Evaporated Milk	2023										
Cereal Preparations	2043										
Stationery Products	2678										
Polishes and Sanitation Goods	2842										

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*									
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Gum and Wood Chemicals	2861											
Shoes, Except Rubber	3143	3144										
Leather Gloves and Mittens	3150											
Primary Aluminum	3334											
Industrial Furnaces and Ovens	3567											
Scales and Balances	3596											
Motors and Generators	3621											
Electric Housewares and Fans	3634											
Storage Batteries	3691											
Primary Batteries, Dry and Wet	3692											
Aircraft	3721											

NOTE: High values denoted by **++**. Above average values denoted by **+**. Average values denoted by **=**. Below average values denoted by **-**. Low values are denoted by **--**.
SOURCE: IMPLAN.
ANALYSIS: Missouri Economic Research and Information Center (MERIC).

SUMMARY AND IMPLICATIONS

Missouri's 82 driver industries had a sizable impact on the state's economy, accounting for 42.8% of total foreign exports, 17.7% of total output, 10.0% of total compensation and 8.3% of total employment. In addition, these driver industries paid an average annual wage per job of $34,653, which was moderately more that the state average wage per job.

In general, Missouri's driver industries were concentrated in manufacturing, extractive industries and agriculture. For example, in manufacturing Missouri had a competitive advantage in greeting card publishing, automatic merchandising machines, lumber and wood products (i.e. sawmill products, hardwood floors, wood containers/pallets, and furniture), ammunition, paper products (i.e. paper bags, paper sanitary products, envelopes, and paper), and lastly in motor vehicles, which was substantially represented (i.e. motor vehicles, boats, motorcycles, aircraft, internal combustion engines, motors and generators, fans, and heating and cooling equipment). In the extractive industries, Missouri had a competitive advantage in lead mining, clay cricks, lime and stone quarrying, paving and asphalt products, and cement. Lastly, in agriculture and food products Missouri had a competitive advantage in agricultural production products (i.e. agricultural chemicals, grass seeds, prepared feeds, feed grains, hay, cattle, hogs, and oil crops) and in manufactured food products (i.e. pet foods, malt beverages, pasta products, poultry processing, pickles and sauces, roasted coffee, cheese and condensed milk, and cereals).

It is hoped that Target Missouri 3 can affect economic development policy by providing a well conceptualized and empirically based definition of which industries are drivers of a region's economy. By using the information provided by TM3, economic development policies and resources can be directed to the most viable parts of the economy, enhancing the success of industrial targeting and cluster policies. When targeted industries are identified using political rather than empirical justifications, development agencies run the risk of investing scare resources into groups of industries that will produce little to no economic benefits.

STATISTICAL APPENDIX

IDENTIFYING DRIVER INDUSTRIES

Data and Methods

To identify Missouri's driver industries, a mathematical cluster analysis was used to group industries based on how economically competitive they are relative to the national average. Once grouped, multivariate analysis of variance and discriminant function analysis were used to identify unique characteristics of the clusters and to assess the internal validity of the groupings. Use of cluster and discriminant analyses follows the work of Hill and Brennan (2000), who utilized these methods to identify drivers of regional economies.

Data in this analysis was taken from the Minnesota IMPLAN Group who compile cross-sectional data at the national, state and county level to construct a comprehensive and accurate database at the county-level that has a consistent structure (MIG, 1999). IMPLAN is used widely by researchers in industry, government and academia. Since the data is disaggregated by county, the analysis can be replicated for any combination of counties in Missouri to approximate economic regions. Nine variables comparing the Missouri industry average to the national industry average in terms of output, employment, compensation and foreign exports were used to measure the economic competitiveness of a given industry between 1997 and 2000.

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specialization in output, employment, compensation and exports were measured using location quotients. Scores greater than 1.0 indicate that Missouri is relatively more specialized in that industry relative to the national average, which indicates a comparative advantage or potential for growth. Scores less than 1.0 indicate that Missouri is relatively less specialized in that industry relative to the national average, which indicates a comparative disadvantage. The formula for a location quotient is given in equation (1), where X is the economic variable of interest, i is the industry, r the region and n the nation.

(1) $$LQX_{ir} = (X_{ir}/X_r)/(X_{in}/X_n)$$

To measure Missouri's growth in a given industry relative to the national industry average between 1997 and 2000, the difference in growth rates between Missouri and the United States was calculated for output, employment, compensation and exports. Positive scores indicate the percentage of regional industry growth above the national average, meaning that the industry in Missouri is growing faster than the national industry average. Negative scores indicate the percentage of regional industry growth below the national average, meaning that the industry in Missouri is growing slower than the national industry average. The formula used to calculate the difference in growth rates is given in equation (2), where X is the economic variable of interest, i is the industry, r the region, n the nation and t is time period.

(2) $$\Delta X_{ir} = \left(\left(\left(X_{ir}^{t} - X_{ir}^{t-1}\right)/X_{ir}^{t-1}\right)*100\right) - \left(\left(\left(X_{in}^{t} - X_{in}^{t-1}\right)/X_{in}^{t-1}\right)*100\right)$$

To measure Missouri's productivity in a given industry relative to the national industry average in 2000, the ratio of output per worker between Missouri and the United States was calculated. Scores greater than 1.0 indicate that the industry in Missouri is more productive than the national average, which indicates a comparative advantage. Scores less than 1.0 indicate that the industry in Missouri is less productive than the national average, which may indicate a comparative disadvantage. The formula used to calculate the productivity measure is given in equation (3), where O is output, E is employment, i is the industry, r the region and n the nation.

(3) $$PROD_{ir} = (O_{ir}/E_{ir})/(O_{in}/E_{in})$$

Table A1 About Here

Cluster analysis is the generic name for a wide variety of procedures that can be used to create a classification. These procedures start with data containing information about a sample of entities and attempts to mathematically reorganize these entities into relatively homogenous groups. Cluster analytic techniques are used to develop a classification or typology, to investigate conceptual schema for grouping entities, for hypothesis generation through data exploration or for hypothesis testing to determine if current typologies are actually present in the data.

Cluster analysis was used to group 509 industries according to their similarity along nine economic competitiveness variables. Ward's hierarchical agglomerative cluster method using the squared Euclidean distance measure was employed in the analysis to group industries into clusters. Industries are combined into clusters based on a distance matrix between all possible pairs of industries (Aldenderfer & Blashfield, 1984). At the first stage of the hierarchical agglomerative method, all industries are considered separate clusters. At the second step, two of the industries are combined into a single cluster based on the selected clustering method and the distance matrix is then recomputed using this new cluster. At the third step, either a third industry is added to the cluster formed in the second stage or two other industries are merged into a second new cluster, and the distance matrix is then recomputed. At each subsequent step this process is repeated, where individual industries are added to existing clusters or two industries are merged to form a new cluster. At the final stage, all industries have been merged into one cluster.

Squared Euclidean distance is used to measure the distance between clusters and industries. The formula for the squared Euclidean distance measure is given in equation (4). Here d_{ij} is the distance between industries i and j, and x_{ik} is the value of the k^{th} occupational variable for the i^{th} industry. Two industries or clusters are identical if each one is described by economic competitiveness variables with the same magnitudes, with the distance being zero. This distance measure has no upper bounds and is scale-dependent.

$$(4) \qquad d_{ij} = \sqrt{\sum_{k=1}^{p} \left(X_{ik} - X_{jk}\right)^2}$$

Ward's cluster method (Ward, 1963) is designed to optimize the minimum variance within clusters, with variance being defined using the error sum of squares (ESS). The method works by joining those industries that result in the minimum increase in the ESS, where the ESS is zero at the first step of the clustering process when each industry is its own cluster. Ward's

method has a tendency to create clusters of relative equal sizes and shapes as hyperspheres. The formula for the ESS is given in equation (5), where x_i is the distance score of the i^{th} industry.

(5) $$ESS = X_i^2 - 1/n(\sum X_i)^2$$

Once industries have been grouped using cluster analysis, the solution was statistically validated using multivariate analysis of variance (MANOVA) and discriminant function analysis (DFA). MANOVA is a generalization of ANOVA to a situation where there is more than one dependent variable. MANOVA tests whether mean differences among groups on a combination of dependent variables are likely to have occurred by chance. In MANOVA, a new dependent variable that maximizes group differences is created from a set of dependent variables in order to separate the groups as much as possible, and then ANOVA is run on the new dependent variable. In this analysis, MANOVA is used to test if the mean differences among clusters on a combined economic competitiveness variable are larger than would be expected by chance. If so, this indicates that the clusters are statistically different from each other in terms of their scores on the combined economic competitiveness dependent variable, supporting the assertion that the clusters are distinct entities. If this condition is true, then DFA can be used to predict cluster membership by taking into account the combination of economic competitiveness variables as predictors (Tabachnick & Fidell, 1996).

Discriminant function analysis (DFA) is chiefly used to predict group membership from a set of predictors. Specifically, DFA identifies the linear combination of variables that drive the classification process. This permits one to more closely examine the meaning of the clusters from the data, rather than subjectively labeling clusters by industry names. Mathematically, there is no distinction between the two methods, where DFA is essentially MANOVA turned around (Tabachnick & Fidell, 1996). In MANOVA, the independent variables are the clusters and the dependent variables are the economic competitiveness variables, while in DFA the independent variables are the economic competitiveness variables and the dependent variables are the clusters. The linear combination of variables – the discriminant function – can be interpreted like the right side of a regression equation. The coefficients can be used to assess the degree of strength and direction the function exerts on classification, which can also be used to classify new industries.

In this analysis, DFA was used to place industries into groups for the purposes of comparing and validating the cluster solution. The analysis used nine economic

competitiveness variables as independent or predictor variables, and the groupings from the cluster analysis were the dependent variables. The resulting discriminant functions were used to gauge the accuracy of the cluster analysis by comparing the percent of industries correctly classified into the cluster groupings. In addition, the functions were used to describe which combinations of economic competitiveness variables drove the classification process.

Grouping Industries Into Clusters

According to Aldenderfer and Blashfield (1984), the three main criteria for determining an appropriate cluster solution are fusion coefficients, Mojena's Stopping Rule and dendograms. Determination of the appropriate number of clusters is difficult since no single agreed upon methodology exists, so cluster determination is a subjective process that is based on these criteria. (Everitt, 1979). The results of the cluster analysis indicated a 13-cluster solution, based on the available evidence.

Fusion coefficients are an index of the loss of information incurred when merging two clusters. A large loss of information – a jump in the fusion coefficients – implies that two relatively dissimilar clusters have been merged, thus the number of clusters prior to the merger is the most probable cluster solution (Aldenderfer & Blashfield, 1984). There was a significant loss of information at stage 498 and convention dictates that one takes the prior cluster stage, which indicated in a 12-cluster solution.

Mojena's Stopping Rule is a method of determining clusters based on the mean and standard deviation of all fusion coefficients (Mojena, 1977). The Mojena method is a procedure by which a significant jump in the fusion coefficients can be better defined. The rule states that a group level or optimal partition of a hierarchical clustering solution was selected that satisfies the inequality given in equation (6).

(6) $$\alpha_{j+1} > \mu_\alpha + k\sigma_\alpha$$

Where a is the fusion coefficient at stage j, μ is the mean of the fusion coefficients for all stages, k is a constant set at 1.25 and s is the standard deviation of the fusion coefficients for all stages (Milligan & Cooper, 1985). The Mojena value exceeded the fusion coefficient at stage 495 and taking the previous stage this indicated a 15-cluster solution.

Examination of the dendogram indicated the presence of 13 to 14 clusters. Although dendograms are mainly heuristic devices, it provides an important validation of the cluster solution. Dendograms also permit the researcher to see where cases and clusters merge together to get a better understanding of the underlying structure of the data. Additionally, the

cluster solutions obtained using the above mentioned cluster method and distance measure were compared to other solutions using alternative methods and measures that included average within-groups linkage using squared Euclidean distance, and centroid method using squared Euclidean distance. All three methods yielded highly similar cluster solutions, indicating that there is an inherent structure in the data. All 13 clusters and the industries they are composed of are listed in Appendix A.

Table A2 About Here

The 13-cluster solution was also statistically validated using a variety of methods. Results of the MANOVA found that the mean differences across all economic competitiveness variables were significantly different from each other across the 13 clusters, using the Pillais Criterion ($F_{(108,4464)}$=32.91, p<0.000), Hotellings Trace Criterion ($F_{(108,4376)}$=506.82, p<0.000) and Wilks Lamba ($F_{(108,3565)}$=126.82, p<0.000) statistics. Univariate F-tests show that the nine economic competitiveness variables were significantly different between all 13 clusters at p > 0.000.

Results of the DFA indicated 6 discriminant functions, which correctly classified over 90% of the industries into the groups identified in the cluster analysis. Wilks Lambda measures the proportion of the total variance in the discriminant scores not explained by differences in the groups. According to Wilks Lambda, in functions one through four most of the variance is explained by group differences, indicating that the functions are useful in classifying industries. By transforming Wilks Lambda into an approximate chi-square distribution, one can test the null hypothesis that the means of all the economic competitiveness variables across the groups are equal, which indicates that the function has limited predictive power in classifying industries. According to the results of the DFA, all six functions were statistically significant at p<0.000, indicating that they have predictive power in correctly classifying industries. Further, the first four functions accounted for over almost 100% of the variance in the discriminant scores, with the first function accounting for slightly more than 70%.

Table A3 About Here

Description of the Clusters

The statistically significant functions were then described according to the size and direction of the correlations between the economic competitiveness variables and the standardized canonical discriminant functions. Using a standard employed by Hill and Brennan (2000), only correlations of $r>0.40$ were used in describing the functions, regardless of direction. Results of the DFA identified six discriminant functions that drove the classification process, which correctly classified 93.9% of all industries into the 13 groups derived from the cluster analysis. By examining the standardized canonical discriminant functions evaluated at the cluster means, which are interpreted similar to regression coefficients, one can identify which functions were statistically significant in classifying industries into the competitive industry clusters.

Table A4 About Here

The six clusters below were identified as drivers of Missouri's economy based on economic specialization relative to the national average. This resulted in 82 driver industries where Missouri had a locational competitive advantage relative to other states. Industries classified into the *competitive fast growth cluster* and the *competitive slow growth cluster* were highly specialized in output, employment, compensation and foreign exports relative to the national average (Function 2). Industries classified into the *emerging hyper growth cluster* had foreign exports that were growing faster than the national average (Function 1). Industries classified into the *emerging fast growth cluster* had output, employment and compensation that were growing faster than the national average and whose productivity per worker was below the national average (Function 3). Industries classified into the *emerging moderate growth cluster* and the *emerging slow growth cluster* were highly specialized in output, employment, compensation and foreign exports relative to the national average (Function 2).

Industries classified into the *U.S. average competitiveness cluster* had output, employment and compensation that were growing faster than the national average and whose productivity per worker was above the national average (Function 4). Industries classified into the *uncompetitive hyper growth cluster* and the *uncompetitive fast growth cluster* had output, employment and compensation that were growing faster than the national average and whose

productivity per worker was below the national average (Function 3). Industries not classified into the *uncompetitive slow growth cluster* were highly specialized in output, employment, compensation and exports relative to the national average (Function 2).

Industries classified into the *non-competitive high productivity cluster* had output, employment and compensation that were growing faster than the national average and whose productivity per worker was above the national average (Function 4); while industries not classified into this cluster had output, employment and compensation that were growing faster than the national average and whose productivity per worker was below the national average (Function 3). Industries classified into the *non-competitive low productivity cluster* had output, employment and compensation that were growing faster than the national average and whose productivity per worker was below the national average (Function 3); while industries not classified into this cluster had output, employment and compensation that were growing faster than the national average and whose productivity per worker was above the national average (Function 4).

Table A5 About Here

Table A6 About Here

TABLE A1
Economic Competitiveness Variables for Missouri.

Variable	*Description*
Output Specialization	Output location quotient, 2000.
Output Growth	Difference in output growth rates relative to the national average, 1997-2000.
Productivity	Productivity per worker relative to the national average, 2000.
Employment Specialization	Employment location quotient, 2000.
Employment Growth	Difference in employment growth rates relative to the national average, 1997-2000.
Compensation Specialization	Compensation location quotient, 2000.
Compensation Growth	Difference in compensation growth rates relative to the national average, 1997-2000.
Export Specialization	Foreign exports location quotient, 2000.
Export Growth	Difference in foreign exports growth rates relative to the national average, 1997-2000.

NOTE: Data taken from IMPLAN.

TABLE A2
Cluster Analysis Agglomeration Schedule.

Stage	*Number of Clusters*	*Fusion Coefficient*	*Slope Percent Change in Fusion Coefficient*	*Acceleration Percent Change in Slope Coefficient*	*Mojena Value*
479	30	1.6120	3.4660	6.7381	3.3435
480	29	1.6680	3.4739	0.2298	3.3435
481	28	1.7260	3.4772	0.0942	3.3435
482	27	1.7880	3.5921	3.3044	3.3435
483	26	1.8560	3.8031	5.8743	3.3435
484	25	1.9290	3.9332	3.4198	3.3435
485	24	2.0100	4.1991	6.7598	3.3435
486	23	2.0910	4.0299	-4.0299	3.3435
487	22	2.2100	5.6911	41.2225	3.3435
488	21	2.3340	5.6109	-1.4092	3.3435
489	20	2.4770	6.1268	9.1958	3.3435
490	19	2.6250	5.9750	-2.4785	3.3435
491	18	2.7730	5.6381	-5.6381	3.3435
492	17	2.9290	5.6257	-0.2203	3.3435
493	16	3.1050	6.0089	6.8116	3.3435
494	15	3.3210	6.9565	15.7708	3.3435
495	14	3.5730	7.5881	9.0786	3.3435
496	13	3.8440	7.5847	-0.0450	3.3435
497	12	4.1610	8.2466	8.7276	3.3435
498	11	4.7270	13.6025	64.9464	3.3435
499	10	5.3210	12.5661	-7.6191	3.3435
500	9	5.9210	11.2761	-10.2660	3.3435
501	8	6.5940	11.3663	0.8003	3.3435
502	7	7.7310	17.2429	51.7021	3.3435
503	6	8.9170	15.3408	-11.0312	3.3435
504	5	10.6100	18.9862	23.7625	3.3435
505	4	12.5090	17.8982	-5.7305	3.3435
506	3	16.1170	28.8432	61.1515	3.3435
507	2	20.0130	24.1732	-16.1910	3.3435
508	1	36.8940	84.3502	248.9404	3.3435

NOTE: Cluster analysis using Ward's Method and squared Euclidean distance.

TABLE A3
Discriminant Function Analysis Diagnostics.

Discriminant Function	*Wilks Lamba*	*Chi-Square*	*Percent Variance Explained*	*Correlation Coefficient*
1: Export Growth	0.000	5706.86***	71.10	
Export Growth (fast)				0.961
2: Full Specialization	0.001	3522.82 ***	20.00	
Compensation Specialization (high)				0.895
Output Specialization (high)				0.872
Export Specialization (high)				0.781
Employment Specialization (high)				0.665
3: Full Growth - Low Productivity	0.020	1954.40 ***	4.90	
Employment Growth (fast)				0.722
Compensation Growth (fast)				0.580
Output Growth (fast)				0.531
Productivity (low)				-0.459
4: Full Growth - High Productivity	0.127	1026.56 ***	3.70	
Productivity (high)				0.796
Employment Growth (fast)				0.576
Compensation Growth (fast)				0.502
Output Growth (fast)				0.462
5: Employment Specialization	0.657	208.74 ***	0.20	
Employment Specialization (high)				0.603
6: Export Specialization	0.796	113.52 ***	0.10	
Export Specialization (high)				0.508

NOTE: Correlations between occupational variables and the standardized canonical discriminant functions. * Significant at the 90% confidence level. ** Significant at the 95% confidence level.
*** Significant at the 99.9% confidence level.

TABLE A4
Classification of Industries by Cluster and Discriminant Function Analyses.

	Predicted Clusters Using Discriminant Function Analysis												
Original Clusters Using Cluster Analysis	Competitive Fast Growth	Competitive Slow Growth	Emerging Hyper Growth	Emerging Fast Growth	Emerging Moderate Growth	Emerging Slow Growth	US Avg Competitiveness	Uncompetitive Hyper Growth	Uncompetitive Fast Growth	Uncompetitive Slow Growth	Uncompetitive Declining	Non-Competitive High Productivity	Non-Competitive Low Productivity
Competitive Fast Growth	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Competitive Slow Growth	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emerging Hyper Growth	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emerging Fast Growth	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emerging Moderate Growth	0.0	0.0	0.0	0.0	97.8	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emerging Slow Growth	0.0	0.0	0.0	0.0	5.3	94.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
US Avg Competitiveness	0.0	0.0	0.0	0.0	2.6	0.0	90.5	0.0	0.0	5.8	1.1	0.0	0.0
Uncompetitive Hyper Growth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Uncompetitive Fast Growth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Uncompetitive Slow Growth	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.8	97.6	0.8	0.0	0.0
Uncompetitive Declining	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	4.3	85.1	0.0	8.5
Non-Competitive High Productivity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Non-Competitive Low Productivity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	98.1

NOTE: Percentage of industries classified in each cluster. Discriminant function analysis correctly classified 93.9% of industries into the original 13 clusters.

TABLE A5
Association Between Clusters and Discriminant Functions.

	Discriminant Functions					
Industry Clusters	Function 1: Export Growth	Function 2: Full Specialization	Function 3: Full Growth Low Productivity	Function 4: Full Growth High Productivity	Function 5: Employment Specialization	Function 6: Export Specialization
Competitive Fast Growth	-0.28	2.65***	-0.20	-0.48	-0.54	-0.26
Competitive Slow Growth	-0.31	2.65***	-0.56	-0.48	-0.12	-0.32
Emerging Hyper Growth	2.67***	-0.36	-0.33	-0.34	-0.33	-0.33
Emerging Fast Growth	-0.54	0.99	1.71*	1.14	-0.95	-0.85
Emerging Moderate Growth	-0.58	2.53**	-0.66	0.32	-0.19	0.02
Emerging Slow Growth	-0.37	2.59***	-0.64	-0.35	0.26	-0.34
US Average Competitiveness	-0.44	-0.80	-1.40	1.89*	0.26	-0.94
Uncompetitive Hyper Growth	-0.77	-0.39	2.21**	1.15	-0.33	-0.48
Uncompetitive Fast Growth	-0.35	-1.28	1.91*	1.34	-0.46	-0.11
Uncompetitive Slow Growth	-0.16	-2.44**	0.07	1.18	0.09	0.70
Uncompetitive Declining	-0.45	-1.40	-1.42	-0.75	0.64	0.89
Non-Competitive High Productivity	0.07	-0.52	-1.76*	2.14**	-0.09	0.17
Non-Competitive Low Productivity	-0.12	-0.97	1.94*	-1.76*	0.18	0.22

NOTE: z-scores of the canonical discriminant functions evaluated at the cluster means.
* Significant at the 90% confidence level. ** Significant at the 95% confidence level. *** Significant at the 99.9% confidence level.

TABLE A6
Industry Clusters in Missouri

Industry and Standard Industrial Classification		*Economic Competitiveness Variables*								
		Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Competitive Fast Growth Cluster		**++**	**+**	**+**	**++**	**++**	**++**	**++**	**++**	**+**
Lead and Zinc Ores	1030									
Greeting Card Publishing	2770									
Agricultural Chemicals, N.E.C	2879									
Small Arms Ammunition	3482									
Lead and Zinc Ores	1030									
Competitive Slow Growth Cluster		**++**	**=**	**=**	**++**	**=**	**++**	**=**	**++**	**=**
Grass Seeds	0139									
Dog, Cat, and Other Pet Food	2047									
Malt Beverages	2082									
Macaroni and Spaghetti	2098									
Special Product Sawmills, N.E.C	2429									
Footwear Cut Stock	3130									
Clay Refractories	3255									
Lime	3274									
Automatic Merchandising Machine	3581									

Industry and Standard Industrial Classification			***Economic Competitiveness Variables***								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Emerging Hyper Growth Cluster			**+**	**++**	**-**	**+**	**++**	**+**	**++**	**+**	**++**
Glass Containers	3221										
Emerging Fast Growth Cluster			**+**	**++**	**+**	**+**	**++**	**+**	**++**	**+**	**++**
Soybean Oil Mills	2075										
Ammunition, Except For Small Arms, N.E.C.	3483										
Machine Tools, Metal Forming Types	3542										
Food Products Machinery	3556										
Emerging Moderate Growth Cluster			**+**	**=**	**=**	**+**	**=**	**+**	**=**	**+**	**=**
Feed Grains	0110										
Hay and Pasture	0110										
Dimension Stone	1410	1420									
Poultry Processing	2015										
Pickles, Sauces, and Salad Dressings	2035										
Prepared Feeds, N.E.C	2048										
Roasted Coffee	2095										
Textile Bags	2393										
Pleating and Stitching	2395										
Hardwood Dimension and Flooring Mills	2426										
Wood Containers	2441	2449									

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Wood Pallets and Skids	2448										
Mattresses and Bedsprings	2515										
Metal Partitions and Fixtures	2542										
Furniture and Fixtures, N.E.C	2599										
Bags, Paper	2674										
Sanitary Paper Products	2676										
Envelopes	2677										
Blankbooks and Looseleaf Binders	2782										
Plate Making	2796										
Explosives	2892										
Paving Mixtures and Blocks	2951										
Asphalt Felts and Coatings	2952										
Rubber and Plastics Hose and Belting	3052										
Leather Tanning and Finishing	3110										
Personal Leather Goods	3172										
Cement, Hydraulic	3240										
Steel Wire and Related Products	3315										
Primary Nonferrous Metals, N.E.C.	3339										
Miscellaneous Fabricated Wire Products	3495	3496									
Internal Combustion Engines, N.E.C.	3519										
Welding Apparatus	3548										
Blowers and Fans	3564										

Industry and Standard Industrial Classification			***Economic Competitiveness Variables***								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Refrigeration and Heating Equipment	3585										
Transformers	3612										
Communications Equipment N.E.C.	3669										
Motor Vehicles	3711										
Truck Trailers	3715										
Boat Building and Repairing	3732										
Motorcycles, Bicycles, and Parts	3750										
Sporting and Athletic Goods, N.E.C.	3949										
Marking Devices	3953										
Railroads and Related Services	4010	4740									
Water Supply and Sewerage Systems	4940	4952									
Commercial Sports Except Racing	7941										
Emerging Slow Growth Cluster			**+**	**=**	**-**	**+**	**=**	**+**	**=**	**+**	**=**
Ranch Fed Cattle	0212										
Hogs, Pigs and Swine	0213										
Oil Bearing Crops	0116	0119									
Cheese, Natural and Processed	2022										
Condensed and Evaporated Milk	2023										
Cereal Preparations	2043										
Stationery Products	2678										
Polishes and Sanitation Goods	2842										

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Gum and Wood Chemicals	2861										
Shoes, Except Rubber	3143	3144									
Leather Gloves and Mittens	3150										
Primary Aluminum	3334										
Industrial Furnaces and Ovens	3567										
Scales and Balances	3596										
Motors and Generators	3621										
Electric Housewares and Fans	3634										
Storage Batteries	3691										
Primary Batteries, Dry and Wet	3692										
Aircraft	3721										
US Average Competitiveness Cluster			**=**	**=**	**=**	**=**	**=**	**=**	**=**	**-**	**=**
Dairy Farm Products	0240										
Poultry and Eggs	0250										
Range Fed Cattle	0212										
Miscellaneous Livestock	0271	0272									
Cotton	0131										
Food Grains	0110										
Forest Products	0181										
Landscape and Horticultural Services	0780										
New Residential Structures	1500										
New Industrial and Commercial Buildings	1500										

Industry and Standard Industrial Classification				*Economic Competitiveness Variables*								
				Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
New Utility Structures	1500											
New Highways and Streets	1500											
New Government Facilities	1500											
Maintenance and Repair, Residential	1500											
Maintenance and Repair Other Facilities	1500											
Meat Packing Plants	2011											
Sausages and Other Prepared Meats	2013											
Ice Cream and Frozen Desserts	2024											
Frozen Specialties	2038											
Flour and Other Grain Mill Products	2041											
Bread, Cake, and Related Products	2051	2053										
Confectionery Products	2064											
Shortening and Cooking Oils	2079											
Distilled Liquor, Except Brandy	2085											
Bottled and Canned Soft Drinks & Water	2086											
Flavoring Extracts and Syrups, N.E.C.	2087											
Potato Chips & Similar Snacks	2096											
Manufactured Ice	2097											
Food Preparations, N.E.C	2099											
Apparel Made From Purchased Materials	2310	2320	2330									
Curtains and Draperies	2391											
Canvas Products	2394											
Automotive and Apparel Trimmings	2396											

Industry and Standard Industrial Classification		*Economic Competitiveness Variables*								
		Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Sawmills and Planing Mills, General	2421									
Wood Kitchen Cabinets	2434									
Structural Wood Members, N.E.C	2439									
Wood Preserving	2491									
Wood Products, N.E.C	2499									
Wood Household Furniture	2511									
Upholstered Household Furniture	2512									
Public Building Furniture	2530									
Wood Partitions and Fixtures	2541									
Paperboard Containers and Boxes	2650									
Paper Coated & Laminated Packaging	2671									
Bags, Plastic	2673									
Die-cut Paper and Board	2675									
Newspapers	2710									
Book Publishing	2731									
Book Printing	2732									
Miscellaneous Publishing	2740									
Commercial Printing	2750									
Manifold Business Forms	2760									
Bookbinding & Related	2789									
Typesetting	2791									
Drugs	2830									
Soap and Other Detergents	2841									

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Paints and Allied Products	2850										
Fertilizers, Mixing Only	2875										
Adhesives and Sealants	2891										
Printing Ink	2893										
Lubricating Oils and Greases	2992										
Gaskets, Packing and Sealing Devices	3053										
Fabricated Rubber Products, N.E.C.	3060										
Miscellaneous Plastics Products	3080										
Womens Handbags and Purses	3171										
Leather Goods, N.E.C	3190										
Vitreous Plumbing Fixtures	3261										
Concrete Block and Brick	3271										
Concrete Products, N.E.C	3272										
Ready-mixed Concrete	3273										
Minerals, Ground Or Treated	3295										
Steel Pipe and Tubes	3317										
Secondary Nonferrous Metals	3340										
Copper Rolling and Drawing	3351										
Aluminum Rolling and Drawing	3353	3354									
Aluminum Foundries	3363	3365									
Brass, Bronze, and Copper Foundries	3364	3366									
Metal Heat Treating	3398										
Metal Cans	3411										

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Metal Barrels, Drums and Pails	3412										
Hand Saws and Saw Blades	3425										
Fabricated Structural Metal	3441										
Metal Doors, Sash, and Trim	3442										
Fabricated Plate Work (Boiler Shops)	3443										
Sheet Metal Work	3444										
Architectural Metal Work	3446										
Prefabricated Metal Buildings	3448										
Screw Machine Products and Bolts, Etc.	3450										
Nonferrous Forgings	3463										
Metal Stampings, N.E.C.	3469										
Plating and Polishing	3471										
Metal Coating and Allied Services	3479										
Industrial and Fluid Valves	3491	3492									
Pipe, Valves, and Pipe Fittings	3494	3498									
Farm Machinery and Equipment	3523										
Mining Machinery, Except Oil Field	3532										
Conveyors and Conveying Equipment	3535										
Machine Tools, Metal Cutting Types	3541										
Special Dies and Tools and Accessories	3544	3545									
Woodworking Machinery	3553										
Printing Trades Machinery	3555										
General Industrial Machinery, N.E.C	3569										

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Measuring and Dispensing Pumps	3586										
Service Industry Machines, N.E.C.	3589										
Carburetors, Pistons, Rings, Valves	3592										
Switchgear and Switchboard Apparatus	3613										
Electrical Industrial Apparatus, N.E.C.	3629										
Electric Lamps	3641										
Wiring Devices	3643	3644									
Lighting Fixtures and Equipment	3645	3646									
Electronic Components, N.E.C.	3675	3676									
Truck and Bus Bodies	3713										
Motor Vehicle Parts and Accessories	3714										
Railroad Equipment	3740										
Transportation Equipment, N.E.C	3799										
Laboratory Apparatus & Furniture	3821										
Automatic Temperature Controls	3822										
Surgical and Medical Instrument	3841										
Games, Toys, and Childrens Vehicles	3944										
Pens and Mechanical Pencils	3951										
Lead Pencils and Art Goods	3952										
Signs and Advertising Displays	3993										
Burial Caskets and Vaults	3995										
Manufacturing Industries, N.E.C.	3999										
Local, Interurban Passenger Transit	4100										

Industry and Standard Industrial Classification				*Economic Competitiveness Variables*								
				Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Motor Freight Transport and Warehousing	4200											
Air Transportation	4500											
Arrangement Of Passenger Transportation	4720											
Transportation Services	4730	4783										
Communications, Except Radio and TV	4810	4820	4840									
Radio and TV Broadcasting	4830											
Electric Services	4910											
Gas Production and Distribution	4920											
Sanitary Services and Steam Supply	4953	4959	4960									
Wholesale Trade	5000	5100										
Building Materials & Gardening	5200											
General Merchandise Stores	5300											
Food Stores	5400											
Automotive Dealers & Service Stations	5500											
Apparel & Accessory Stores	5600											
Furniture & Home Furnishings Stores	5700											
Eating & Drinking	5800											
Miscellaneous Retail	5900											
Banking	6000											
Credit Agencies	6100	6710	6720									
Security and Commodity Brokers	6200											
Insurance Carriers	6300											
Insurance Agents and Brokers	6400											

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Real Estate	6500										
Hotels and Lodging Places	7000										
Laundry, Cleaning and Shoe Repair	7210	7250									
Portrait and Photographic Studios	7220										
Beauty and Barber Shops	7230	7240									
Funeral Service and Crematories	7260										
Miscellaneous Personal Services	7290										
Advertising	7310										
Other Business Services	7320	7331									
Photofinishing, Commercial Photography	7334	7335									
Services To Buildings	7340										
Equipment Rental and Leasing	7350										
Personnel Supply Services	7360										
Computer and Data Processing Services	7370										
Detective and Protective Services	7381	7382									
Automobile Rental and Leasing	7510										
Automobile Parking and Car Wash	7520	7542									
Automobile Repair and Services	7530	7549									
Electrical Repair Service	7620										
Watch, Clock, Jewelry and Furniture Repair	7630	7640									
Miscellaneous Repair Shops	7690										
Theatrical Producers, Bands Etc.	7920										
Bowling Alleys and Pool Halls	7930										

Industry and Standard Industrial Classification				*Economic Competitiveness Variables*								
				Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Amusement and Recreation Services, N.E.C.	7910	7990										
Membership Sports and Recreation Clubs	7997											
Doctors and Dentists	8010	8020										
Nursing and Protective Care	8050											
Hospitals	8060											
Other Medical and Health Services	8070											
Legal Services	8110											
Colleges, Universities, Schools	8220											
Other Educational Services	8230	8240	8290									
Job Trainings & Related Services	8330											
Child Day Care Services	8350											
Social Services, N.E.C.	8320	8390										
Residential Care	8360											
Other Nonprofit Organizations	8400	8650	8690									
Business Associations	8610	8620										
Labor and Civic Organizations	8630	8640										
Engineering, Architectural Services	8710											
Accounting, Auditing and Bookkeeping	8720	8990										
Dairy Farm Products	0240											

Industry and Standard Industrial Classification		*Economic Competitiveness Variables*								
		Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Uncompetitive Hyper Growth Cluster		**-**	**++**	**-**	**-**	**++**	**--**	**++**	**--**	**++**
Steel Springs, Except Wire	3493									
Lawn and Garden Equipment	3524									
Uncompetitive Fast Growth Cluster		**--**	**++**	**=**	**--**	**++**	**--**	**++**	**--**	**++**
Carpets and Rugs	2270									
Coated Fabrics, Not Rubberized	2295									
Fabricated Textile Products, N.E.C.	2399									
Metal Household Furniture	2514									
Converted Paper Products, N.E.C	2679									
Petroleum and Coal Products, N.E.C.	2999									
Luggage	3160									
Nonferrous Rolling and Drawing, N.E.C.	3356									
Fluid Power Cylinders & Actuators	3593									
Fluid Power Pumps & Motors	3594									
Analytical Instruments	3826									

Industry and Standard Industrial Classification				*Economic Competitiveness Variables*								
				Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Uncompetitive Slow Growth Cluster				**--**	**=**	**=**	**--**	**=**	**--**	**=**	**--**	**=**
Tobacco	0132											
Fruits	0170											
Vegetables	0160	0134										
Miscellaneous Crops	0119											
Greenhouse and Nursery Products	0182											
Agricultural, Forestry, Fishery Services	0700											
Iron Ores	1010											
Coal Mining	1200											
Sand and Gravel	1440											
Clay, Ceramic, Refractory Minerals, N.E.C.	1450											
New Mineral Extraction Facilities	1500											
Creamery Butter	2021											
Fluid Milk	2026											
Canned Specialties	2032											
Canned Fruits and Vegetables	2033											
Dehydrated Food Products	2034											
Frozen Fruits, Juices and Vegetables	2037											
Cookies and Crackers	2052											
Wines, Brandy, and Brandy Spirits	2084											
Prepared Fresh Or Frozen Fish Or Seafood	2092											
Broadwoven Fabric Mills and Finishing	2210	2220	2230									

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Narrow Fabric Mills	2240										
Knit Outerwear Mills	2253										
Yarn Mills and Finishing Of Textiles, N.E.C.	2269	2281									
Textile Goods, N.E.C	2299										
Logging Camps and Logging Contractors	2410										
Millwork	2431										
Veneer and Plywood	2435	2436									
Mobile Homes	2451										
Prefabricated Wood Buildings	2452										
Reconstituted Wood Products	2493										
Household Furniture, N.E.C	2519										
Wood Office Furniture	2521										
Blinds, Shades, and Drapery Hardware	2591										
Pulp Mills	2610										
Paper Mills, Except Building Paper	2620										
Paperboard Mills	2630										
Periodicals	2720										
Industrial Gases	2813										
Inorganic Pigments	2816										
Inorganic Chemicals Nec.	2819										
Plastics Materials and Resins	2821										
Synthetic Rubber	2822										
Surface Active Agents	2843										

Industry and Standard Industrial Classification		*Economic Competitiveness Variables*								
		Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Toilet Preparations	2844									
Tires and Inner Tubes	3010									
Rubber and Plastics Footwear	3020									
Brick and Structural Clay Tile	3251									
Ceramic Wall and Floor Tile	3253									
Structural Clay Products, N.E.C	3259									
Fine Earthenware Food Utensils	3263									
Porcelain Electrical Supplies	3264									
Pottery Products, N.E.C	3269									
Cut Stone and Stone Products	3280									
Abrasive Products	3291									
Mineral Wool	3296									
Nonclay Refractories	3297									
Blast Furnaces and Steel Mills	3312									
Cold Finishing Of Steel Shapes	3316									
Iron and Steel Foundries	3320									
Primary Copper	3331									
Nonferrous Castings, N.E.C.	3369									
Hand and Edge Tools, N.E.C.	3423									
Metal Sanitary Ware	3431									
Plumbing Fixture Fittings and Trim	3432									
Heating Equipment, Except Electric	3433									
Miscellaneous Metal Work	3449									

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Iron and Steel Forgings	3462										
Automotive Stampings	3465										
Crowns and Closures	3466										
Metal Foil and Leaf	3497										
Fabricated Metal Products, N.E.C.	3499										
Steam Engines and Turbines	3511										
Construction Machinery and Equipment	3531										
Oil Field Machinery	3533										
Elevators and Moving Stairways	3534										
Hoists, Cranes, and Monorails	3536										
Industrial Trucks and Tractors	3537										
Industrial Patterns	3543										
Textile Machinery	3552										
Paper Industries Machinery	3554										
Special Industry Machinery N.E.C.	3559										
Pumps and Compressors	3561	3563									
Ball and Roller Bearings	3562										
Packaging Machinery	3565										
Power Transmission Equipment	3566	3568									
Electronic Computers	3571										
Commercial Laundry Equipment	3582										
Industrial Machines N.E.C.	3599										
Carbon and Graphite Products	3624										

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Relays & Industrial Controls	3625										
Household Vacuum Cleaners	3635										
Phonograph Records and Tape	3652										
Radio and Tv Communication Equipment	3663										
Printed Circuit Boards	3672										
Semiconductors and Related Devices	3674										
Engine Electrical Equipment	3694										
Magnetic & Optical Recording Media	3695										
Electrical Equipment, N.E.C.	3699										
Aircraft and Missile Engines and Parts	3724	3764									
Aircraft and Missile Equipment,	3728	3769									
Ship Building and Repairing	3731										
Complete Guided Missiles	3761										
Travel Trailers and Camper	3792										
Mechanical Measuring Devices	3823	3824									
Instruments To Measure Electricity	3825										
Optical Instruments & Lenses	3827										
Surgical Appliances and Supplies	3842										
Dental Equipment and Supplies	3843										
X-Ray Apparatus	3844										
Ophthalmic Goods	3850										
Jewelry, Precious Metal	3911										
Silverware and Plated Ware	3914										

Industry and Standard Industrial Classification				***Economic Competitiveness Variables***								
				Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Musical Instruments	3930											
Carbon Paper and Inked Ribbons	3955											
Brooms and Brushes	3991											
Water Transportation	4400											
Pipe Lines, Except Natural Gas	4600											
Motion Pictures	7800											
Elementary and Secondary Schools	8210											
Religious Organizations	8660											
Management and Consulting Services	8740											
Research, Development & Testing Services	8730											
Uncompetitive Declining Cluster				**--**	**--**	**-**	**--**	**--**	**--**	**--**	**--**	**--**
Tree Nuts	0173											
Metal Mining Services	1080											
Nonmetallic Minerals (Except Fuels) Service	1480											
Misc. Nonmetallic Minerals, N.E.C.	1490											
Blended and Prepared Flour	2045											
Wet Corn Milling	2046											
Sugar	2061	2062	2063									
Chocolate and Cocoa Products	2066											
Salted and Roasted Nuts & Seeds	2068											
Cottonseed Oil Mills	2074											
Animal and Marine Fats and Oils	2077											

Industry and Standard Industrial Classification				*Economic Competitiveness Variables*								
				Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Chewing and Smoking Tobacco	2130											
Tire Cord and Fabric	2296											
Nonwoven Fabrics	2297											
Housefurnishings, N.E.C	2392											
Wood Tv and Radio Cabinets	2517											
Metal Office Furniture	2522											
Paper Coated & Laminated N.E.C.	2672											
Cyclic Crudes, Interm. & Indus. Organic Chem.	2865	2869										
Nitrogenous and Phosphatic Fertilizers	2873	2874										
Chemical Preparations, N.E.C	2899											
Glass and Glass Products, Exc Containers	3210	3229	3230									
Gypsum Products	3275											
Nonmetallic Mineral Products, N.E.C.	3299											
Nonferrous Wire Drawing and Insulating	3357											
Cutlery	3421											
Hardware, N.E.C.	3429											
Small Arms	3484											
Power Driven Hand Tools	3546											
Rolling Mill Machinery	3547											
Metalworking Machinery, N.E.C.	3549											
Computer Storage Devices	3572											
Computer Terminals	3575											
Computer Peripheral Equipment,	3577											

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*								
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Calculating and Accounting Machines	3578										
Typewriters and Office Machines N.E.C.	3579										
Household Cooking Equipment	3631										
Household Laundry Equipment	3633										
Household Appliances, N.E.C.	3639										
Radio and TV Receiving Sets	3651										
Telephone and Telegraph Apparatus	3661										
Motor Homes	3716										
Search & Navigation Equipment	3812										
Electromedical Apparatus	3845										
Photographic Equipment and Supplies	3860										
Watches, Clocks, and Parts	3870										
Costume Jewelery	3961										
Non-Competitive High Productivity Cluster			**--**	**=**	**++**	**--**	**-**	**--**	**+**	**--**	**=**
Other Meat Animal Products	0219										
Non-Competitive Low Productivity Cluster			**--**	**=**	**--**	**--**	**=**	**--**	**=**	**--**	**=**
Cattle Feedlots	0211										
Sheep, Lambs and Goats	0214										
Sugar Crops	0133										
Forestry Products	0810	0830									

Industry and Standard Industrial Classification		*Economic Competitiveness Variables*								
		Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Commercial Fishing	0910									
Copper Ores	1020									
Gold Ores	1041									
Silver Ores	1044									
Ferroalloy Ores, Except Vanadium	1060									
Uranium-radium-vanadium Ores	1094									
Metal Ores, Not Elswhere Classified	1099									
Natural Gas & Crude Petroleum	1310									
Natural Gas Liquids	1320									
Potash, Soda, and Borate Minerals	1474									
Phosphate Rock	1475									
Chemical, Fertilizer Mineral Mininig, N.E.C.	1479									
New Farm Structures	1500									
Maintenance and Repair Oil and Gas Wells	1380									
Rice Milling	2044									
Chewing Gum	2067									
Vegetable Oil Mills, N.E.C	2076									
Malt	2083									
Canned and Cured Sea Foods	2091									
Cigarettes	2110									
Cigars	2120									
Tobacco Stemming and Redrying	2140									

Industry and Standard Industrial Classification			*Economic Competitiveness Variables*									
			Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Womens Hosiery, Except Socks	2251										
Hosiery, N.E.C	2252										
Knit Underwear Mills	2254										
Knit Fabric Mills	2257	2258									
Knitting Mills , N.E.C.	2259										
Thread Mills	2284										
Cordage and Twine	2298										
Schiffi Machine Embroideries	2397										
Alkalies & Chlorine	2812										
Cellulosic Man-made Fibers	2823										
Organic Fibers, Noncellulosic	2824										
Carbon Black	2895										
Petroleum Refining	2910										
House Slippers	3142										
Vitreous China Food Utensils	3262										
Asbestos Products	3292										
Electrometallurgical Products	3313										
Primary Metal Products, N.E.C	3399										
Other Ordnance and Accessories	3489										
Household Refrigerators and Freezers	3632										
Electron Tubes	3671										
Tanks and Tank Components	3795										

Industry and Standard Industrial Classification		*Economic Competitiveness Variables*								
		Output Specialization	**Output Growth**	**Productivity**	**Employment Specialization**	**Employment Growth**	**Compensation Specialization**	**Compensation Growth**	**Export Specialization**	**Export Growth**
Jewelers Materials and Lapidary Work	3915									
Dolls	3942									
Fasteners, Buttons, Needles, Pins	3965									
Hard Surface Floor Coverings	3996									
Owner-occupied Dwellings	9999									
Racing and Track Operation	7948									

NOTE: High values denoted by **++**. Above average values denoted by **+**. Average values denoted by **=**. Below average values denoted by **-**. Low values are denoted by **--**.
SOURCE: IMPLAN.
ANALYSIS: Missouri Economic Research and Information Center (MERIC).

ABOUT MERIC AT THE MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT .

The Missouri Economic Research and Information Center (MERIC) at the Missouri Department of Economic Development provides comprehensive analysis of Missouri's socioeconomic environment at the local, regional and state levels. To achieve this, MERIC employs a wide array of analysis tools, which include econometric models, geographic information systems and advanced statistical methods. On-going projects at MERIC include targeted development, economic and social impact assessments, industry and occupational analyses, layoff analyses, and information on Missouri's demographic and economic trends. Coupled with its analysis capability, MERIC is also the U.S. Department of Labor affiliate that maintains a comprehensive labor market database for Missouri. MERIC has current information on employment/unemployment, occupations, wages, layoffs, labor availability, and a variety of other information designed to help understand labor market conditions.

In addition, MERIC has developed an outreach infrastructure which includes a comprehensive web site, e-mail distribution list and monthly newsletter. MERIC's mission is to provide value-added research with a customer focus, which means offering accurate, relevant and timely information to decision makers and the public to facilitate a better understanding of Missouri's socioeconomic environment. Ultimately, MERIC and the rest of the Department of Economic Development strive to make Missouri the best place to live, work, vacation and conduct business.

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