MISSOURI'S TARGET INDUSTRIES
DRIVERS OF THE STATE ECONOMY

March 2004

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OFFICE OF SOCIAL AND ECONOMIC DATA ANALYSIS
UNIVERSITY OF MISSOURI – COLUMBIA

Transforming Data Into Information
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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.

- It is critical that economic development officials base target industry policies on sound economic theory and rigorous methods. This analysis 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.

- Missouri's 82 driver industries had a sizable impact on 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. The purpose of this analysis is to present a methodology for identifying the industrial drivers of an economy, grounded in economic base theory. This analysis 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.

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 academe. 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 1999. 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, 1999.
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.

DRIVERS OF THE MISSOURI ECONOMY .

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. Refer to Tables 3 and 4.

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 than 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: University of Missouri-Columbia, Office of Social and Economic Data Analysis (OSEDA).

TABLE 3
Economic Impacts of the Driver Industries in Missouri 2000.

	Economic Variables				
Competitive 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: University of Missouri-Columbia, Office of Social and Economic Data Analysis (OSEDA).

TABLE 4
Driver Industries in Missouri.

Industry Cluster	*Industry*
Competitive Core Fast Growth Cluster	Lead and Zinc Ores
	Greeting Card Publishing
	Agricultural Chemicals, N.E.C
	Small Arms Ammunition
Competitive Core Slow Growth Cluster	Grass Seeds
	Dog, Cat, and Other Pet Food
	Malt Beverages
	Macaroni and Spaghetti
	Special Product Sawmills, N.E.C
	Footwear Cut Stock
	Clay Refractories
	Lime
	Automatic Merchandising Machine
Emerging Hyper Growth Cluster	Glass Containers
Emerging Fast Growth Cluster	Soybean Oil Mills
	Ammunition, Except For Small Arms, N.E.C.
	Machine Tools, Metal Forming Types
	Food Products Machinery
Emerging Moderate Growth Cluster	Feed Grains
	Hay and Pasture
	Dimension Stone
	Poultry Processing
	Pickles, Sauces, and Salad Dressings
	Prepared Feeds, N.E.C
	Roasted Coffee
	Textile Bags
	Pleating and Stitching
	Hardwood Dimension and Flooring Mills
	Wood Containers
	Wood Pallets and Skids
	Mattresses and Bedsprings
	Metal Partitions and Fixtures
	Furniture and Fixtures, N.E.C
	Bags, Paper

Emerging Moderate Growth Cluster (continued)	Sanitary Paper Products
	Envelopes
	Blankbooks and Looseleaf Binder
	Plate Making
	Explosives
	Paving Mixtures and Blocks
	Asphalt Felts and Coatings
	Rubber and Plastics Hose and Belting
	Leather Tanning and Finishing
	Personal Leather Goods
	Cement, Hydraulic
	Steel Wire and Related Products
	Primary Nonferrous Metals, N.E.C.
	Miscellaneous Fabricated Wire Products
	Internal Combustion Engines, N.E.C.
	Welding Apparatus
	Blowers and Fans
	Refrigeration and Heating Equipment
	Transformers
	Communications Equipment N.E.C.
	Motor Vehicles
	Truck Trailers
	Boat Building and Repairing
	Motorcycles, Bicycles, and Parts
	Sporting and Athletic Goods, N.E.C.
	Marking Devices
	Railroads and Related Services
	Water Supply and Sewerage Systems
	Commercial Sports Except Racing
Emerging Slow Growth Cluster	Ranch Fed Cattle
	Hogs, Pigs and Swine
	Oil Bearing Crops
	Cheese, Natural and Processed
	Condensed and Evaporated Milk
	Cereal Preparations
	Stationery Products
	Polishes and Sanitation Goods
	Gum and Wood Chemicals
	Shoes, Except Rubber
	Leather Gloves and Mittens
	Primary Aluminum

Emerging Slow Growth Cluster (continued)	Industrial Furnaces and Ovens
	Scales and Balances
	Motors and Generators
	Electric Housewares and Fans
	Storage Batteries
	Primary Batteries, Dry and Wet
	Aircraft

SOURCE: IMPLAN.
ANALYSIS: University of Missouri-Columbia, Office of Social and Economic Data Analysis (OSEDA).

SUMMARY AND IMPLICATIONS .

Missouri's 82 driver industries had a sizable impact on 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 the results of this analysis 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 this analysis, 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.

ABOUT OSEDA AT THE UNIVERSITY OF MISSOURI .

OSEDA is about education. Our mission is to inform community leaders and citizens about social and economic trends impacting the state of Missouri, our people and our communities. At OSEDA we strive to transform public data into useful information. We believe the construction of meaningful information is an inherently collaborative enterprise. We believe "information" arises from "data" when facts are focused honestly on questions of interest to audiences. Therefore, we strive to engage our audiences and we especially seek communication from local community perspectives.

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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 academe. 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.

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 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 α 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 σ 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 Cluster	*Industry*
Competitive Core Fast Growth Cluster	Lead and Zinc Ores
	Greeting Card Publishing
	Agricultural Chemicals, N.E.C
	Small Arms Ammunition
Competitive Core Slow Growth Cluster	Grass Seeds
	Dog, Cat, and Other Pet Food
	Malt Beverages
	Macaroni and Spaghetti
	Special Product Sawmills, N.E.C
	Footwear Cut Stock
	Clay Refractories
	Lime
	Automatic Merchandising Machine
Emerging Hyper Growth Cluster	Glass Containers
Emerging Fast Growth Cluster	Soybean Oil Mills
	Ammunition, Except For Small Arms, N.E.C.
	Machine Tools, Metal Forming Types
	Food Products Machinery
Emerging Moderate Growth Cluster	Feed Grains
	Hay and Pasture
	Dimension Stone
	Poultry Processing
	Pickles, Sauces, and Salad Dressings
	Prepared Feeds, N.E.C
	Roasted Coffee
	Textile Bags
	Pleating and Stitching
	Hardwood Dimension and Flooring Mills
	Wood Containers
	Wood Pallets and Skids
	Mattresses and Bedsprings
	Metal Partitions and Fixtures
	Furniture and Fixtures, N.E.C
	Bags, Paper
	Sanitary Paper Products
	Envelopes
	Blankbooks and Looseleaf Binder
	Plate Making
	Explosives

Emerging Moderate Growth Cluster (continued)	Paving Mixtures and Blocks
	Asphalt Felts and Coatings
	Rubber and Plastics Hose and Belting
	Leather Tanning and Finishing
	Personal Leather Goods
	Cement, Hydraulic
	Steel Wire and Related Products
	Primary Nonferrous Metals, N.E.C.
	Miscellaneous Fabricated Wire Products
	Internal Combustion Engines, N.E.C.
	Welding Apparatus
	Blowers and Fans
	Refrigeration and Heating Equipment
	Transformers
	Communications Equipment N.E.C.
	Motor Vehicles
	Truck Trailers
	Boat Building and Repairing
	Motorcycles, Bicycles, and Parts
	Sporting and Athletic Goods, N.E.C.
	Marking Devices
	Railroads and Related Services
	Water Supply and Sewerage Systems
	Commercial Sports Except Racing
Emerging Slow Growth Cluster	Ranch Fed Cattle
	Hogs, Pigs and Swine
	Oil Bearing Crops
	Cheese, Natural and Processed
	Condensed and Evaporated Milk
	Cereal Preparations
	Stationery Products
	Polishes and Sanitation Goods
	Gum and Wood Chemicals
	Shoes, Except Rubber
	Leather Gloves and Mittens
	Primary Aluminum
	Industrial Furnaces and Ovens
	Scales and Balances
	Motors and Generators
	Electric Housewares and Fans
	Storage Batteries
	Primary Batteries, Dry and Wet
	Aircraft
US Average Competitiveness Cluster	Dairy Farm Products
	Poultry and Eggs
	Range Fed Cattle
	Miscellaneous Livestock

US Average Competitiveness Cluster (continued)	Cotton
	Food Grains
	Forest Products
	Landscape and Horticultural Services
	New Residential Structures
	New Industrial and Commercial Buildings
	New Utility Structures
	New Highways and Streets
	New Government Facilities
	Maintenance and Repair, Residential
	Maintenance and Repair Other Facilities
	Meat Packing Plants
	Sausages and Other Prepared Meats
	Ice Cream and Frozen Desserts
	Frozen Specialties
	Flour and Other Grain Mill Products
	Bread, Cake, and Related Products
	Confectionery Products
	Shortening and Cooking Oils
	Distilled Liquor, Except Brandy
	Bottled and Canned Soft Drinks & Water
	Flavoring Extracts and Syrups, N.E.C.
	Potato Chips & Similar Snacks
	Manufactured Ice
	Food Preparations, N.E.C
	Apparel Made From Purchased Materials
	Curtains and Draperies
	Canvas Products
	Automotive and Apparel Trimmings
	Sawmills and Planing Mills, General
	Wood Kitchen Cabinets
	Structural Wood Members, N.E.C
	Wood Preserving
	Wood Products, N.E.C
	Wood Household Furniture
	Upholstered Household Furniture
	Public Building Furniture
	Wood Partitions and Fixtures
	Paperboard Containers and Boxes
	Paper Coated & Laminated Packaging
	Bags, Plastic
	Die-cut Paper and Board
	Newspapers
	Book Publishing
	Book Printing
	Miscellaneous Publishing
	Commercial Printing
	Manifold Business Forms

US Average Competitiveness Cluster (continued)	Bookbinding & Related
	Typesetting
	Drugs
	Soap and Other Detergents
	Paints and Allied Products
	Fertilizers, Mixing Only
	Adhesives and Sealants
	Printing Ink
	Lubricating Oils and Greases
	Gaskets, Packing and Sealing Devices
	Fabricated Rubber Products, N.E.C.
	Miscellaneous Plastics Products
	Womens Handbags and Purses
	Leather Goods, N.E.C
	Vitreous Plumbing Fixtures
	Concrete Block and Brick
	Concrete Products, N.E.C
	Ready-mixed Concrete
	Minerals, Ground Or Treated
	Steel Pipe and Tubes
	Secondary Nonferrous Metals
	Copper Rolling and Drawing
	Aluminum Rolling and Drawing
	Aluminum Foundries
	Brass, Bronze, and Copper Foundries
	Metal Heat Treating
	Metal Cans
	Metal Barrels, Drums and Pails
	Hand Saws and Saw Blades
	Fabricated Structural Metal
	Metal Doors, Sash, and Trim
	Fabricated Plate Work (Boiler Shops)
	Sheet Metal Work
	Architectural Metal Work
	Prefabricated Metal Buildings
	Screw Machine Products and Bolts, Etc.
	Nonferrous Forgings
	Metal Stampings, N.E.C.
	Plating and Polishing
	Metal Coating and Allied Services
	Industrial and Fluid Valves
	Pipe, Valves, and Pipe Fittings
	Farm Machinery and Equipment
	Mining Machinery, Except Oil Field
	Conveyors and Conveying Equipment
	Machine Tools, Metal Cutting Types
	Special Dies and Tools and Accessories
	Woodworking Machinery

US Average Competitiveness Cluster (continued)	Printing Trades Machinery
	General Industrial Machinery, N.E.C
	Measuring and Dispensing Pumps
	Service Industry Machines, N.E.C.
	Carburetors, Pistons, Rings, Valves
	Switchgear and Switchboard Apparatus
	Electrical Industrial Apparatus, N.E.C.
	Electric Lamps
	Wiring Devices
	Lighting Fixtures and Equipment
	Electronic Components, N.E.C.
	Truck and Bus Bodies
	Motor Vehicle Parts and Accessories
	Railroad Equipment
	Transportation Equipment, N.E.C
	Laboratory Apparatus & Furniture
	Automatic Temperature Controls
	Surgical and Medical Instrument
	Games, Toys, and Childrens Vehicles
	Pens and Mechanical Pencils
	Lead Pencils and Art Goods
	Signs and Advertising Displays
	Burial Caskets and Vaults
	Manufacturing Industries, N.E.C.
	Local, Interurban Passenger Transit
	Motor Freight Transport and Warehousing
	Air Transportation
	Arrangement Of Passenger Transportation
	Transportation Services
	Communications, Except Radio and TV
	Radio and TV Broadcasting
	Electric Services
	Gas Production and Distribution
	Sanitary Services and Steam Supply
	Wholesale Trade
	Building Materials & Gardening
	General Merchandise Stores
	Food Stores
	Automotive Dealers & Service Stations
	Apparel & Accessory Stores
	Furniture & Home Furnishings Stores
	Eating & Drinking
	Miscellaneous Retail
	Banking
	Credit Agencies
	Security and Commodity Brokers
	Insurance Carriers
	Insurance Agents and Brokers

US Average Competitiveness Cluster (continued)	Real Estate
	Hotels and Lodging Places
	Laundry, Cleaning and Shoe Repair
	Portrait and Photographic Studios
	Beauty and Barber Shops
	Funeral Service and Crematories
	Miscellaneous Personal Services
	Advertising
	Other Business Services
	Photofinishing, Commercial Photography
	Services To Buildings
	Equipment Rental and Leasing
	Personnel Supply Services
	Computer and Data Processing Services
	Detective and Protective Services
	Automobile Rental and Leasing
	Automobile Parking and Car Wash
	Automobile Repair and Services
	Electrical Repair Service
	Watch, Clock, Jewelry and Furniture Repair
	Miscellaneous Repair Shops
	Theatrical Producers, Bands Etc.
	Bowling Alleys and Pool Halls
	Amusement and Recreation Services, N.E.C.
	Membership Sports and Recreation Clubs
	Doctors and Dentists
	Nursing and Protective Care
	Hospitals
	Other Medical and Health Services
	Legal Services
	Colleges, Universities, Schools
	Other Educational Services
	Job Trainings & Related Services
	Child Day Care Services
	Social Services, N.E.C.
	Residential Care
	Other Nonprofit Organizations
	Business Associations
	Labor and Civic Organizations
	Engineering, Architectural Services
	Accounting, Auditing and Bookkeeping
Uncompetitive Hyper Growth Cluster	Steel Springs, Except Wire
	Lawn and Garden Equipment
Uncompetitive Fast Growth Cluster	Carpets and Rugs
	Coated Fabrics, Not Rubberized
	Fabricated Textile Products, N.E.C.
	Metal Household Furniture

Uncompetitive Fast Growth Cluster (continued)	Converted Paper Products, N.E.C
	Petroleum and Coal Products, N.E.C.
	Luggage
	Nonferrous Rolling and Drawing, N.E.C.
	Fluid Power Cylinders & Actuators
	Fluid Power Pumps & Motors
	Analytical Instruments
Uncompetitive Slow Growth Cluster	Tobacco
	Fruits
	Vegetables
	Miscellaneous Crops
	Greenhouse and Nursery Products
	Agricultural, Forestry, Fishery Services
	Iron Ores
	Coal Mining
	Sand and Gravel
	Clay, Ceramic, Refractory Minerals, N.E.C.
	New Mineral Extraction Facilities
	Creamery Butter
	Fluid Milk
	Canned Specialties
	Canned Fruits and Vegetables
	Dehydrated Food Products
	Frozen Fruits, Juices and Vegetables
	Cookies and Crackers
	Wines, Brandy, and Brandy Spirits
	Prepared Fresh Or Frozen Fish Or Seafood
	Broadwoven Fabric Mills and Finishing
	Narrow Fabric Mills
	Knit Outerwear Mills
	Yarn Mills and Finishing Of Textiles, N.E.C.
	Textile Goods, N.E.C
	Logging Camps and Logging Contractors
	Millwork
	Veneer and Plywood
	Mobile Homes
	Prefabricated Wood Buildings
	Reconstituted Wood Products
	Household Furniture, N.E.C
	Wood Office Furniture
	Blinds, Shades, and Drapery Hardware
	Pulp Mills
	Paper Mills, Except Building Paper
	Paperboard Mills
	Periodicals
	Industrial Gases
	Inorganic Pigments
Uncompetitive Slow Growth Cluster	Inorganic Chemicals Nec.

(continued)	Plastics Materials and Resins
	Synthetic Rubber
	Surface Active Agents
	Toilet Preparations
	Tires and Inner Tubes
	Rubber and Plastics Footwear
	Brick and Structural Clay Tile
	Ceramic Wall and Floor Tile
	Structural Clay Products, N.E.C
	Fine Earthenware Food Utensils
	Porcelain Electrical Supplies
	Pottery Products, N.E.C
	Cut Stone and Stone Products
	Abrasive Products
	Mineral Wool
	Nonclay Refractories
	Blast Furnaces and Steel Mills
	Cold Finishing Of Steel Shapes
	Iron and Steel Foundries
	Primary Copper
	Nonferrous Castings, N.E.C.
	Hand and Edge Tools, N.E.C.
	Metal Sanitary Ware
	Plumbing Fixture Fittings and Trim
	Heating Equipment, Except Electric
	Miscellaneous Metal Work
	Iron and Steel Forgings
	Automotive Stampings
	Crowns and Closures
	Metal Foil and Leaf
	Fabricated Metal Products, N.E.C.
	Steam Engines and Turbines
	Construction Machinery and Equipment
	Oil Field Machinery
	Elevators and Moving Stairways
	Hoists, Cranes, and Monorails
	Industrial Trucks and Tractors
	Industrial Patterns
	Textile Machinery
	Paper Industries Machinery
	Special Industry Machinery N.E.C.
	Pumps and Compressors
	Ball and Roller Bearings
	Packaging Machinery
	Power Transmission Equipment
	Electronic Computers
	Commercial Laundry Equipment
Uncompetitive Slow Growth Cluster	Industrial Machines N.E.C.

(continued)	Carbon and Graphite Products
	Relays & Industrial Controls
	Household Vacuum Cleaners
	Phonograph Records and Tape
	Radio and Tv Communication Equipment
	Printed Circuit Boards
	Semiconductors and Related Devices
	Engine Electrical Equipment
	Magnetic & Optical Recording Media
	Electrical Equipment, N.E.C.
	Aircraft and Missile Engines and Parts
	Aircraft and Missile Equipment,
	Ship Building and Repairing
	Complete Guided Missiles
	Travel Trailers and Camper
	Mechanical Measuring Devices
	Instruments To Measure Electricity
	Optical Instruments & Lenses
	Surgical Appliances and Supplies
	Dental Equipment and Supplies
	X-Ray Apparatus
	Ophthalmic Goods
	Jewelry, Precious Metal
	Silverware and Plated Ware
	Musical Instruments
	Carbon Paper and Inked Ribbons
	Brooms and Brushes
	Water Transportation
	Pipe Lines, Except Natural Gas
	Motion Pictures
	Elementary and Secondary Schools
	Religious Organizations
	Management and Consulting Services
	Research, Development & Testing Services
Uncompetitive Declining Cluster	Tree Nuts
	Metal Mining Services
	Nonmetallic Minerals (Except Fuels) Service
	Misc. Nonmetallic Minerals, N.E.C.
	Blended and Prepared Flour
	Wet Corn Milling
	Sugar
	Chocolate and Cocoa Products
	Salted and Roasted Nuts & Seeds
	Cottonseed Oil Mills
	Animal and Marine Fats and Oils
	Chewing and Smoking Tobacco
Uncompetitive Declining Cluster	Tire Cord and Fabric
(continued)	Nonwoven Fabrics

	Housefurnishings, N.E.C
	Wood Tv and Radio Cabinets
	Metal Office Furniture
	Paper Coated & Laminated N.E.C.
	Cyclic Crudes, Interm. & Indus. Organic Chem.
	Nitrogenous and Phosphatic Fertilizers
	Chemical Preparations, N.E.C
	Glass and Glass Products, Exc Containers
	Gypsum Products
	Nonmetallic Mineral Products, N.E.C.
	Nonferrous Wire Drawing and Insulating
	Cutlery
	Hardware, N.E.C.
	Small Arms
	Power Driven Hand Tools
	Rolling Mill Machinery
	Metalworking Machinery, N.E.C.
	Computer Storage Devices
	Computer Terminals
	Computer Peripheral Equipment,
	Calculating and Accounting Machines
	Typewriters and Office Machines N.E.C.
	Household Cooking Equipment
	Household Laundry Equipment
	Household Appliances, N.E.C.
	Radio and TV Receiving Sets
	Telephone and Telegraph Apparatus
	Motor Homes
	Search & Navigation Equipment
	Electromedical Apparatus
	Photographic Equipment and Supplies
	Watches, Clocks, and Parts
	Costume Jewelery
Non-Competitive High Productivity Cluster	Other Meat Animal Products
Non-Competitive Low Productivity Cluster	Cattle Feedlots
	Sheep, Lambs and Goats
	Sugar Crops
	Forestry Products
	Commercial Fishing
	Copper Ores
	Gold Ores
	Silver Ores
	Ferroalloy Ores, Except Vanadium
	Uranium-radium-vanadium Ores
	Metal Ores, Not Elswhere Classified
Non-Competitive Low Productivity Cluster (continued)	Natural Gas & Crude Petroleum
	Natural Gas Liquids

Potash, Soda, and Borate Minerals
Phosphate Rock
Chemical, Fertilizer Mineral Mininig, N.E.C.
New Farm Structures
Maintenance and Repair Oil and Gas Wells
Rice Milling
Chewing Gum
Vegetable Oil Mills, N.E.C
Malt
Canned and Cured Sea Foods
Cigarettes
Cigars
Tobacco Stemming and Redrying
Womens Hosiery, Except Socks
Hosiery, N.E.C
Knit Underwear Mills
Knit Fabric Mills
Knitting Mills, N.E.C.
Thread Mills
Cordage and Twine
Schiffi Machine Embroideries
Alkalies & Chlorine
Cellulosic Man-made Fibers
Organic Fibers, Noncellulosic
Carbon Black
Petroleum Refining
House Slippers
Vitreous China Food Utensils
Asbestos Products
Electrometallurgical Products
Primary Metal Products, N.E.C
Other Ordnance and Accessories
Household Refrigerators and Freezers
Electron Tubes
Tanks and Tank Components
Jewelers Materials and Lapidary Work
Dolls
Fasteners, Buttons, Needles, Pins
Hard Surface Floor Coverings
Owner-occupied Dwellings
Racing and Track Operation