

# Carroll Region Pilot Regional Cluster Analysis



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## Table of Contents

Introduction.....	1
Methodology and Framework.....	1
Technology Benchmark Clusters.....	13
Benchmark Labor Skill Clusters.....	18
Summary, Recommendations and Next Steps.....	23
Bibliography .....	29

## Appendices

Appendix A	Benchmark Value-Chain Industry Clusters .....	30
Appendix B	Benchmark Technology-Intensive Clusters.....	39
Appendix C	Benchmark Labor Clusters .....	41

## List of Figures

Figure 1	Packaged Food Products Cluster Industry Mix .....	8
Figure 2	Metalworking and Industrial Machinery Cluster Industry Mix.....	9
Figure 3	Hospitals, labs, and Specialized Medical Services Cluster Industry Mix.....	10
Figure 4	Construction Materials Cluster Industry Mix .....	11
Figure 5	Transportation, Shipping and Logistics Cluster Industry Mix.....	12
Figure 6	U.S. Technology Value-Chain Cluster Trends .....	13
Figure 7	Iowa Technology Value-Chain Cluster Trends .....	14
Figure 8	Carroll Iowa Technology Value-Chain Cluster Trends.....	15
Figure 9	Motor Vehicle Manufacturing Technology Cluster Industry Mix.....	16
Figure 10	Communications Services and Software Technology Cluster Industry Mix.....	17
Figure 11	Health Services Labor Cluster Industry Mix .....	19
Figure 12	Low Skill, Misc. Manufacturing Labor Cluster.....	20
Figure 13	Distribution, Freight Handling Labor Cluster Industry Mix.....	20
Figure 14	Information Processing Labor Cluster Industry.....	21
Figure 15	Telcomm and Banking Labor Cluster Industry .....	22

## List of Tables

Table 1	Carroll Region – Employment Change and Location Quotients .....	5
Table 2	Carroll Region – Benchmark Value-Chain Clusters Employment and Average Wages.....	6
Table 3	Benchmark Value-chain Clusters Average Wages – U.S., Iowa and Carroll Region ...	7
Table 4	Carroll Region – Benchmark Technology Clusters.....	15
Table 5	Carroll Region – Benchmark labor Clusters.....	18

## Carroll Region Pilot Regional Cluster Analysis

### Introduction

Maintaining and growing industry clusters has become a focus for economic development professionals, elected officials and policy makers around the nation. A review of the academic and economic development practitioner literature provides a variety of definitions for what is an industry cluster. In the context of this regional cluster analysis, an appropriate definition for an industry cluster is from Michael Enright (1996) who defines an industry cluster as “a set of industries related through buyer-supplier and supplier-buyer relationships, or by common technologies, common buyers or distribution channels or common labor pools” (p 191).

The Iowa Department of Economic Development in 2000 released *Iowa Target Industry Cluster Analysis*, a study completed by SRI International which identified three major industry clusters for the state of Iowa: advanced manufacturing, life sciences and information solutions. As the State of Iowa has focused much of its economic development strategy upon an industry cluster approach, many rural communities across Iowa have questioned how their rural areas fit within the State’s cluster concept and how they can benefit from this approach.

In 2002, the Community Vitality Center (CVC), funded the Institute for Decision Making (IDM) at the University of Northern Iowa to undertake a research project to assist Iowa communities and regions to better determine how the communities and regions’ economic base ties into industry clusters that have been identified for the State of Iowa. The pilot project involves three regions in rural Iowa. The pilot regions were identified based on input and feedback from the Iowa Department of Economic Development, Iowa Workforce Development, Iowa State University’s Department of Economics, the Iowa Area Development Group and MidAmerican Energy. Each of the regions had one or more economic development organizations that already had a long-term working relationship with IDM staff.

### Methodology and Framework

#### A Framework for Regional Cluster Analysis:

As part of this project, IDM staff has worked closely with Dr. Ken Brown, Associate Professor, in UNI’s Department of Economics, to identify the most relevant literature and approaches for identifying industry clusters at a sub-regional level. IDM felt it was important that the methodology implemented provided local economic development organizations with useful information about the nature and scope of the industry cluster presence in their area, which they could utilize to shape their economic development strategies. After reviewing much of the literature on industry clusters, it was determined that a national industry cluster template framework initially developed by Edward J. Feser at the University of North Carolina and Edward M. Bergman at the University of Austria, and then enhanced and expanded by Feser and Koo, could be replicated for regions in Iowa.

In their initial analysis, Feser and Bergman identified 28 “benchmark value-chain clusters” by conducting a statistical analysis of the *Benchmark Input-Output Accounts of the United States* to identify the trading patterns and technological similarities between industry sectors (see Feser

and Bergman, 2000). Value-chain clusters are groups of industries in similar product chains, such as final market producers and their suppliers, or for non-manufacturing industries, groups of industries that utilize similar labor pools, such as banking and advertising. Feser and Koo enhanced the benchmark value-chain clusters by expanding the statistical analysis to include the *U.S. Staffing Patterns Matrix* and detailed occupational characteristics data from the U.S. Department of Labor, which led to the additional identification of eight “technology value-chain clusters” focusing on high-tech businesses (see Feser and Koo, 2001).

Feser and Koo also identified 17 “benchmark labor clusters” by analyzing the *Staff Patterns Matrix* along with data from the Occupational Information Network (ONET), which is a matrix that identifies the knowledge and skills required for over 1,100 occupations. The benchmark labor skills ranged from “low skill, non-durable manufacturing” to “information processing” to “health services.” Each benchmark labor cluster consists of industries with similar labor skill demands (see Feser and Koo, 2001).

The advantage to using this framework was that the benchmark value-chain clusters and technology benchmark clusters provide a set of industry clusters based on buyer-supplier linkages of industries. Benchmark labor clusters provide a set of industry clusters based on the utilization of similar workforce skills by industries. For each of the three cluster templates the industries within each cluster are identified at the four-digit Standard Industry Code (SIC) classification. It is important to keep in mind that many of the industrial sectors have a presence in more than one cluster. An example relevant to the Carroll Region is that refrigeration and heating equipment manufacturers (SIC 3585) are in both the metalworking and industrial machinery cluster and the construction materials cluster.

#### Data for Analysis:

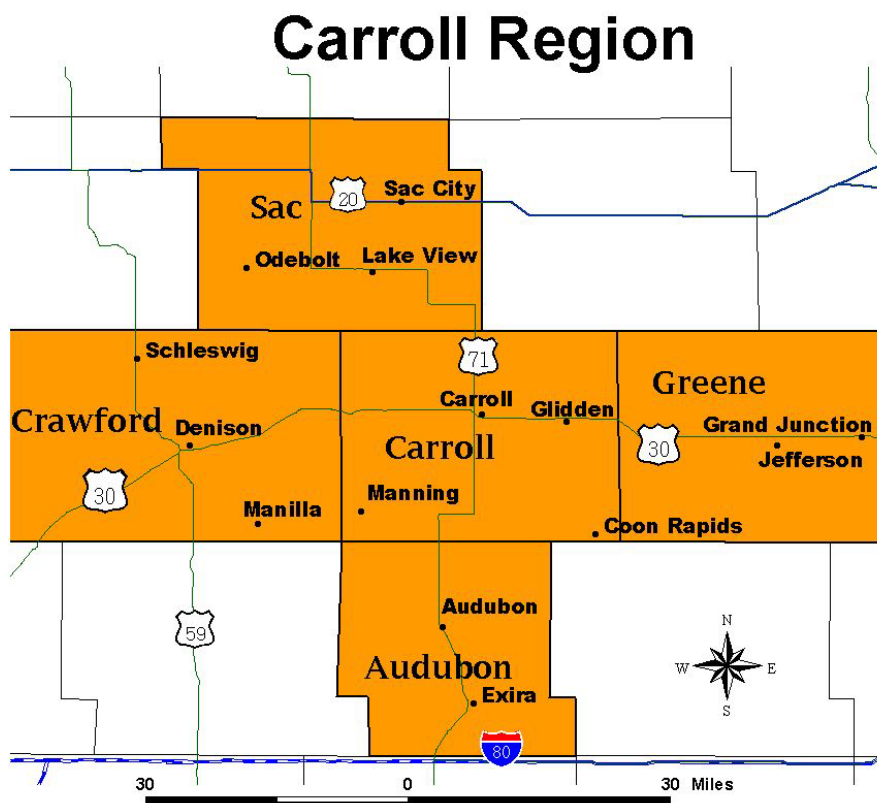
To apply the cluster template framework and conduct regional cluster analysis for the Carroll Region required IDM to acquire state and county level employment and wage data at the 4-digit SIC Code level from the Minnesota IMPLAN Group (MIG) since there was no available government data for many industry sectors at the county level due to federal data suppression requirements that protect the identify of businesses. MIG uses statistical modeling to estimate employment and wages for all industries present within a specific county. In order to examine cluster trends, IDM obtained data for 1990 and 2000 (the latest data available).

The IMPLAN data was then aggregated into the various benchmark value-chain clusters, technology benchmark clusters and benchmark labor clusters to determine the level of cluster presence in the region. What follows below is an analysis of that data for the Carroll Region to determine potential cluster presence and to compare the Carroll Region’s clusters with those clusters at the U.S. level.

#### Geography of the Carroll Region:

The Carroll Region consists of five Iowa counties: Audubon, Carroll, Crawford, Greene and Sac counties (see Map 1). The geography of this region was determined with the premise that the community of Carroll would be the central node of a region for the research. To determine which counties were logical, several different data sources were reviewed including the Carroll Laborshed Study completed by Iowa Workforce Development, 2000 Census data on worker

commuting, research completed by David Swenson and Liesl Eathington with the Department of Economics at Iowa State University and retail trade data collected by the Carroll Chamber of Commerce and mapped by IDM. Based on this review and discussions with Jim Gossett, Executive Director of the Carroll Chamber of Commerce and Carroll Area Development Corporation, the five counties were determined to be the basis for the Carroll Region.



## Benchmark Value-Chain Clusters

As described previously, the 28 benchmark value-chain clusters are based on buyer and supplier linkages of various industries. Table 1 provides a breakdown of employment and employment concentrations of the benchmark value-chain clusters for the Carroll Region. The table is sorted by total employment in year 2000. The Carroll Region did not have all of the benchmark value-chain clusters present. The packaged food products cluster had the highest employment in 2000, with more than 2,000 employees followed by the metalworking and industrial machinery cluster which had employment levels just above 1,000 employees.

Table 1 shows that of the 23 value-chain clusters with a presence in the Carroll Region, seven clusters experienced growth in employment from 1990 to 2000. Another five clusters remained stable but experienced no employment growth from 1990 to 2000. Eight clusters experienced a decline in employment from 1990 to 2000. At the national level for the same timeframe, for the same 23 clusters, 17 clusters experienced employment growth and six clusters experienced a decline in employment. For the State of Iowa as a whole, eleven clusters experienced

employment growth, nine experienced a decline in employment and three had no growth. Most of the clusters present in the Carroll Region had employment trends that did not mirror U.S. trends. A few of the clusters in the Carroll Region grew in employment while those same clusters declined at the national level (apparel cluster and aerospace cluster). However, six of the clusters experienced increases in employment at the national level while the Carroll Region had employment declines. Six of the value-chain clusters in the Carroll Region declined but grew statewide and six clusters grew in the Carroll Region while at the state level the clusters either declined or employment remained static between 1990 and 2000.

Location quotients are a useful analytical tool to compare the economic base of a region or state to other regions or states. A location quotient measures the “share” a region or state has of an industry or cluster compared to the other regions or states in the United States. If an industry or cluster has a location quotient equal to 1.0 that means that a region’s or state’s employment within that industry or cluster is relatively proportional to that industry’s or cluster’s employment at the national level. Location quotients greater than 1.0 typically imply industries that export their product outside of the local region while industries with location quotients less than 1.0 imply industries where products must be imported. There are, of course, exceptions to this rule and problems with this measure, but for a quick measure of importing and exporting industries the location quotient is standard.

Since a location quotient is based on employment levels, it is not surprising that the packaged and food products industry cluster had one of the highest location quotients (5.94) in the Carroll Region. Employment in the cluster remained level between 1990 and 2000, but the location quotient increased by 0.93 during that same period of time, which indicates that the proportion of national employment in the cluster fell. At the state level, this industry cluster had a location quotient of 2.33, which increased by 0.35 between 1990 and 2000. The food oil mills industry cluster had the highest location quotient in the Carroll Region with a value of 31.1 in 2000, which also was the industry cluster that had the highest location quotient at the state level. The wood products and furniture cluster was the only other cluster in the Carroll Region which had a location quotient above 2.0. Table 1 provides the location quotients for all of the value-chain industry clusters at the Carroll Region level and at the statewide level.

**Table 1**  
**Carroll Region**  
**Employment Change and Location Quotients**

Cluster	Employment							
	% Change				Location Quotients			
	CA IA 2000	CA IA '90- '00	IA '90-'00	US '90- '00	CA IA 2000	CA IA '90-'00	IA 2000	IA '90-'00
Packaged food products	2,046	0.0%	-0.1%	0.1%	5.94	0.93	2.33	0.35
Metalworking and industrial machinery	1,045	0.2%	-0.1%	0.6%	0.96	0.13	1.67	0.19
Hospitals, labs, and specialized medical services	944	0.0%	0.3%	3.5%	0.59	-0.10	0.82	-0.12
Construction materials	841	0.6%	0.3%	1.2%	1.15	0.15	1.11	0.11
Transportation, shipping, and logistics	744	-1.7%	0.2%	2.8%	1.03	-0.30	1.06	-0.08
Banking and advertising	647	0.0%	0.1%	1.2%	0.86	0.06	0.91	0.07
Securities and insurance	595	-0.5%	0.3%	2.1%	1.55	-0.10	1.25	0.01
Wood products and furniture	557	0.2%	0.7%	0.6%	2.62	0.35	1.32	0.23
Printing and publishing	478	0.9%	0.2%	3.4%	0.41	-0.02	0.93	-0.12
Information technology and instruments	337	-0.2%	0.0%	2.7%	0.35	-0.04	0.68	-0.06
Motor vehicle manufacturing	335	1.3%	0.0%	1.4%	0.54	0.09	1.16	0.05
Chemicals and plastics	220	-0.5%	0.1%	1.2%	0.38	0.01	0.97	0.08
Food oil mills	185	-0.3%	0.3%	-1.0%	31.13	7.11	4.65	1.24
Legal services	141	-0.4%	-0.1%	1.0%	0.67	0.03	0.59	0.05
Aerospace	89	0.1%	-0.2%	-5.1%	0.58	0.30	1.35	0.67
Canned and bottled beverages	59	-0.5%	-0.4%	-1.6%	1.48	0.38	4.37	1.14
Primary nonferrous metals	31	-0.3%	0.3%	0.8%	0.26	0.02	1.16	0.15
Apparel	22	0.5%	-1.1%	-4.6%	0.10	0.05	0.28	0.12
Boat building	21	NA	-1.9%	0.3%	0.49	0.49	0.68	-0.03
Leather goods	14	0.0%	-0.3%	-6.7%	1.09	0.64	0.59	0.34
Fabricated textiles	4	0.0%	0.0%	-3.5%	0.02	0.01	0.63	0.26
Petroleum products	3	NA	0.9%	-2.1%	0.11	0.11	0.36	0.14
Stone, clay, and glass products	3	NA	-1.7%	-1.3%	0.05	0.05	1.24	0.16
Aluminum	0	NA	0.2%	-2.9%	0.00	0.00	1.90	0.74
Jewelry	0	NA	1.2%	-2.4%	0.00	0.00	0.03	0.01
Pharmaceuticals	0	NA	0.3%	2.7%	0.00	0.00	0.65	-0.04
Platemaking and typesetting	0	NA	0.1%	-1.8%	0.00	0.00	1.27	0.40

Data source: U.S. Bureau of Labor Statistics ES-202 files (from Minnesota IMPLAN Group, Inc). The tobacco products cluster has been left out. CA IA = the Carroll Region.

Table 2 compares wage data for each of the clusters at the national level, at the state level and at the Carroll Region level for 1990 and 2000. The aerospace cluster had the highest average wage in 2000 for the Carroll Region. All but three of the clusters in the Carroll Region experienced an increase in their annual average wage from 1990 to 2000. All of the clusters at the U.S. level and state level had an increase in wages over the decade of the 1990s. Of the clusters with a significant employment presence in 2000 in the region, only the packaged food products cluster had an annual wage growth of one percent or higher. This is considerably different from the wage growth percentages for the clusters at the national level, where all clusters experienced an annual percentage increase since 1990, with the highest annual percentage being 10.3 percent for



the banking and advertising cluster and the lowest being 3.5 percent for the wood products and furniture cluster.

**Table 2**  
**Carroll Region**  
**Benchmark Value-Chain Clusters**  
**Employment and Average Wages**

Cluster	Employment					Average Wage			
	2000	Per Estab.	% Change			2000	% Change		
			CA IA '90-'00	IA '90-'00	US '90-'00		CA IA '90-'00	IA '90-'00	US '90-'00
Packaged food products	2,046	146.1	0.0%	-0.1%	0.1%	30,845	1.3%	0.3%	4.2%
Metalworking and industrial machinery	1,045	21.3	0.2%	-0.1%	0.6%	26,544	0.5%	0.4%	4.1%
Hospitals, labs, and specialized medical services	944	19.7	0.0%	0.3%	3.5%	25,750	0.9%	0.6%	8.1%
Construction materials	841	22.7	0.6%	0.3%	1.2%	27,997	0.3%	0.4%	5.1%
Transportation, shipping, and logistics	744	4.7	-1.7%	0.2%	2.8%	23,514	-1.3%	0.4%	3.4%
Banking and advertising	647	7.9	0.0%	0.1%	1.2%	29,662	0.4%	0.6%	10.3%
Securities and insurance	595	21.3	-0.5%	0.3%	2.1%	20,752	0.8%	0.5%	8.1%
Wood products and furniture	557	61.9	0.2%	0.7%	0.6%	28,042	0.3%	0.4%	3.5%
Printing and publishing	478	10.0	0.9%	0.2%	3.4%	26,413	1.0%	0.7%	8.7%
Information technology and instruments	337	18.7	-0.2%	0.0%	2.7%	22,330	0.5%	0.6%	10.2%
Motor vehicle manufacturing	335	25.8	1.3%	0.0%	1.4%	30,593	0.3%	0.5%	4.6%
Chemicals and plastics	220	6.5	-0.5%	0.1%	1.2%	24,460	1.0%	0.6%	4.1%
Food oil mills	185	37.0	-0.3%	0.3%	-1.0%	29,346	0.0%	0.4%	4.1%
Legal services	141	3.1	-0.4%	-0.1%	1.0%	28,576	2.5%	0.9%	5.0%
Aerospace	89	89.0	0.1%	-0.2%	-5.1%	35,034	0.2%	0.4%	5.2%
Canned and bottled beverages	59	7.4	-0.5%	-0.4%	-1.6%	24,414	-0.1%	0.5%	6.2%
Primary nonferrous metals	31	7.8	-0.3%	0.3%	0.8%	16,834	-2.0%	0.1%	4.0%
Apparel	22	11.0	0.5%	-1.1%	-4.6%	9,501	0.6%	0.1%	5.3%
Boat building	21	10.5	NA	-1.9%	0.3%	16,812	NA	2.0%	4.0%
Leather goods	14	7.0	0.0%	-0.3%	-6.7%	12,202	0.7%	0.4%	6.6%
Fabricated textiles	4	4.0	0.0%	0.0%	-3.5%	13,241	0.4%	0.2%	5.9%
Petroleum products	3	3.0	NA	0.9%	-2.1%	20,570	NA	0.1%	5.3%
Stone, clay, and glass products	3	3.0	NA	-1.7%	-1.3%	20,570	NA	0.4%	4.4%
Aluminum	0	NA	NA	0.2%	-2.9%	NA	NA	0.3%	4.0%
Jewelry	0	NA	NA	1.2%	-2.4%	NA	NA	0.2%	6.8%
Platemaking and typesetting	0	NA	NA	0.1%	-1.8%	NA	NA	1.1%	10.2%
Pharmaceuticals	0	NA	NA	0.3%	2.7%	30,845	1.3%	0.6%	4.3%

Data source: U.S. Bureau of Labor Statistics ES-202 files (from Minnesota IMPLAN Group, Inc). The tobacco products cluster has been left out. CA IA = the Carroll Region.



**Table 3**  
**Benchmark Value-Chain Clusters**  
**Average Wages – U.S., Iowa and Carroll Region**

Cluster	U.S.			Iowa			Carroll Region		
	Average Wage		%Chg	Average Wage		%Chg	Average Wage		%Chg
	1990	2000	'90-'00	1990	2000	'90-'00	1990	2000	'90-'00
Packaged food products	24,283	34,361	4.2%	30,665	31,559	0.3%	27,276	30,845	1.3%
Metalworking and industrial machinery	29,114	41,192	4.1%	37,261	38,880	0.4%	25,300	26,544	0.5%
Hospitals, labs, and specialized medical services	26,639	48,194	8.1%	29,221	31,073	0.6%	23,710	25,750	0.9%
Construction materials	28,703	43,416	5.1%	33,873	35,300	0.4%	27,167	27,997	0.3%
Transportation, shipping, and logistics	27,515	36,805	3.4%	29,386	30,482	0.4%	26,930	23,514	-1.3%
Banking and advertising	30,759	62,451	10.3%	35,754	37,860	0.6%	28,575	29,662	0.4%
Securities and insurance	29,722	53,939	8.1%	42,045	44,206	0.5%	19,219	20,752	0.8%
Wood products and furniture	24,879	33,692	3.5%	28,780	29,901	0.4%	27,278	28,042	0.3%
Printing and publishing	31,867	59,668	8.7%	35,207	37,632	0.7%	23,923	26,413	1.0%
Information technology and instruments	36,003	72,579	10.2%	38,959	41,180	0.6%	21,197	22,330	0.5%
Motor vehicle manufacturing	30,082	43,859	4.6%	32,758	34,284	0.5%	29,570	30,593	0.3%
Chemicals and plastics	29,979	42,372	4.1%	32,930	34,938	0.6%	22,172	24,460	1.0%
Food oil mills	29,395	41,474	4.1%	36,039	37,655	0.4%	29,350	29,346	0.0%
Legal services	39,997	59,969	5.0%	35,727	38,958	0.9%	22,951	28,576	2.5%
Aerospace	39,302	59,570	5.2%	47,569	49,278	0.4%	34,216	35,034	0.2%
Canned and bottled beverages	33,613	54,468	6.2%	45,778	48,304	0.5%	24,665	24,414	-0.1%
Primary nonferrous metals	27,708	38,688	4.0%	31,261	31,683	0.1%	20,969	16,834	-2.0%
Apparel	17,841	27,364	5.3%	22,061	22,237	0.1%	8,971	9,501	0.6%
Boat building	31,395	43,837	4.0%	45,445	55,490	2.0%	NA	16,812	NA
Leather goods	40,054	66,364	6.6%	25,493	26,595	0.4%	11,416	12,202	0.7%
Fabricated textiles	17,729	28,165	5.9%	25,753	26,255	0.2%	12,769	13,241	0.4%
Petroleum products	42,659	65,121	5.3%	34,827	35,283	0.1%	NA	20,570	NA
Stone, clay, and glass products	37,168	53,442	4.4%	47,193	49,239	0.4%	NA	20,570	NA
Aluminum	38,195	53,580	4.0%	59,012	60,681	0.3%	NA	NA	NA
Jewelry	17,439	29,344	6.8%	19,013	19,477	0.2%	NA	NA	NA
Platemaking and typesetting	43,202	87,128	10.2%	35,500	37,801	0.6%	NA	NA	NA
Pharmaceuticals	24,349	34,935	4.3%	40,565	45,120	1.1%	NA	NA	NA

Data source: U.S. Bureau of Labor Statistics ES-202 files (from Minnesota IMPLAN Group, Inc). The tobacco products cluster has been left out. CA IA = the Carroll Region.

Table 3 also shows that none of the 23 benchmark value-chain clusters that had a presence in the Carroll Region in 2000 had an annual wage higher than the cluster's national average. The composition of the industries within each cluster at the regional, state and national levels have a significant impact on employment and wage levels of that cluster. For most clusters, several key industries have a dominant influence on the cluster's make-up at the regional level. To examine this further, a more detailed analysis will be undertaken of the five benchmark value-chain clusters which have the largest employment in the Carroll Region in 2000: packaged food products cluster; metalworking and industrial machinery cluster; hospitals, labs and specialized medical services cluster; construction materials cluster; and the transportation, shipping and logistics cluster.

### Packaged Food Products Cluster

The packaged food products cluster in the Carroll Region in 2000 consisted of 14 establishments and 2,046 employees, which was slightly lower than its 1990 employment level of 2,056 employees. Its annual payroll was over \$61 million and had an annual average wage of \$30,845. The cluster's average wage increased by 1.2 percent annually between 1990 to 2000. The cluster's average annual wage at the U.S. level was \$34,361 in 2000 and had an annual percentage increase of 4.2 percent during the 1990s. The cluster's average annual wage at a statewide level was \$31,559 in 2000 and had an annual percent increase of 0.3 percent.

**Figure 1 - Packaged Food Products Cluster Industry Mix**

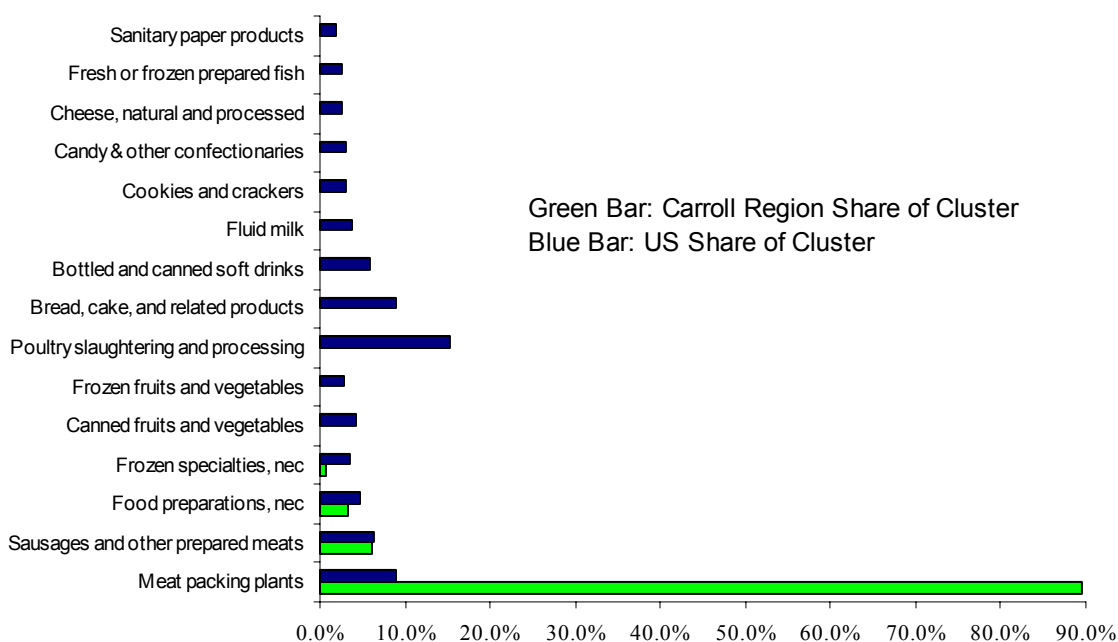


Figure 1 illustrates the distribution of employment by industry in the packaged food products cluster for the Carroll Region and the U.S. The meat packing industry (SIC 2011), the sausages and other prepared meats manufacturing industry (SIC 2013) and the food preparations, n.e.c. industry (SIC 2099) are the largest employers in the cluster in the Carroll Region. As figure 1 shows, the meat packing industry had nearly 90 percent of the cluster's employment in the region while that industry accounted for less than 10 percent of the cluster's employment at the U.S. level. The largest industry employers in the cluster at the national level are the poultry slaughtering and processing industry (SIC 2015), the bread, cake and related products industry (SIC 2051), meat packing industry (SIC 2011) and the sausages and other prepared meats manufacturing industry (SIC 2013). The meat packing industry (SIC 2011) and the sausages and other prepared meats manufacturing industry (SIC 2013) were also the two largest employers in this industry cluster at a statewide level. According to Dun and Bradstreet the largest employers in the packaged food products cluster in the Carroll Region are Farmland Foods, IBP, Crawford County Foods, Custom Ribs Company and Schleswig Specialty Meats.

### Metalworking and Industrial Machinery Cluster

The metalworking and industrial machinery cluster was the other cluster in the Carroll Region that had employment over 1,000 employees in 2000 with 1,045. This cluster consisted of 49 establishments and its annual payroll was \$27.7 million. The cluster's average annual wage was \$26,544 and it experienced an annual percentage wage increase of 0.5 percent between 1990 and 2000. The cluster's average at the U.S. level in 2000 was \$41,192 and had an annual growth rate of over 3.5 percent over its 1990 wage level, while the cluster had an annual average wage of \$38,880 and annual growth rate of 0.4 percent at the state level. Employment in the cluster in the Carroll Region increased by 0.6 percent annually from 1990 to 2000. This value-chain cluster had the highest employment level at the state level of all of the 28 industry clusters, yet it had a decline in employment between 1990 to 2000, an annual percentage decline of 0.1 percent.

**Figure 2 - Metalworking and Industrial Machinery Cluster**

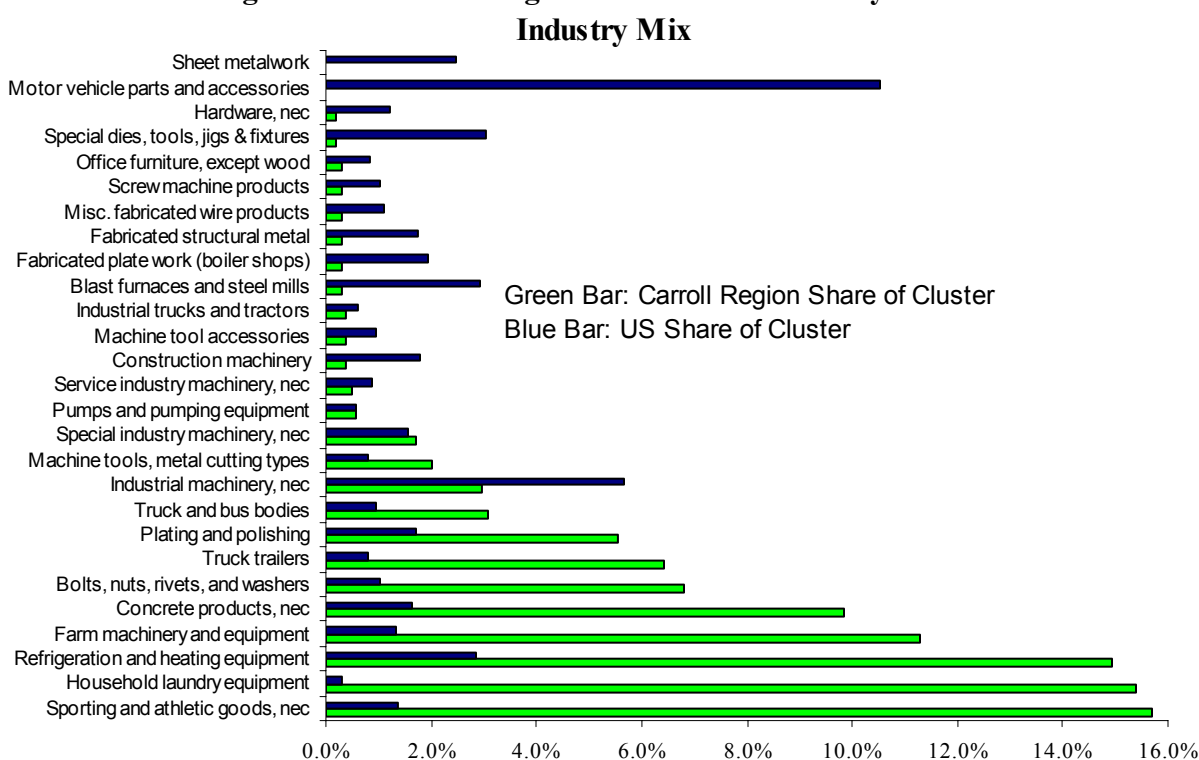


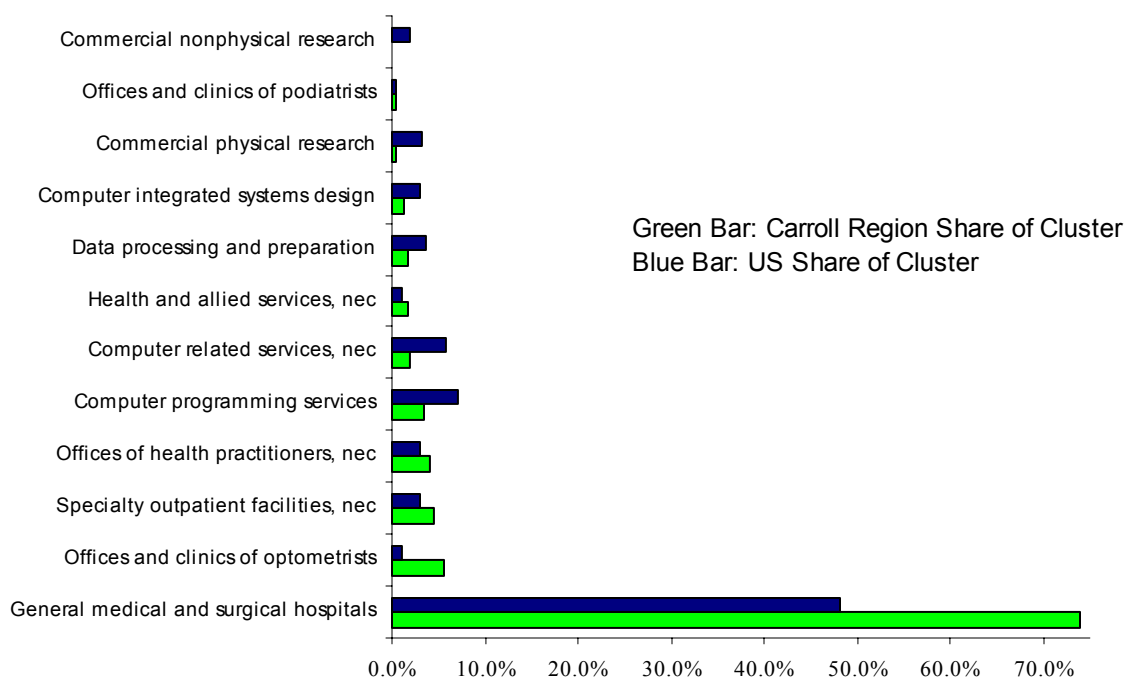
Figure 2 shows that the sporting and athletic goods industry (SIC 3949) was the largest industry employer in the metalworking and industrial machinery cluster in the Carroll Region. Other major employing industries were the household laundry equipment industry (SIC 3633), the refrigeration and heating equipment industry (SIC 3585), the farm machinery and equipment industry (SIC 3523) and concrete products industry (SIC 3272). At the U.S. level the largest employers in the cluster in 2000 were the motor vehicle parts industry (SIC 3714), the industrial machinery industry (SIC 3599), the special dies, tools, jigs and fixtures industry (SIC 3544) and the blast furnace and steel mills industry (SIC 3312). The two largest industries in this industry cluster in Iowa at the statewide level were the farm machinery equipment industry and the construction machinery industry (SIC 3531).

According to Dun and Bradstreet the largest employers in the metalworking and industrial machinery cluster include American Athletic Inc., Carroll Coolers Inc., Scranton Manufacturing, Petersen Manufacturing, Bohlman Inc., Chicago Rivet and Machine Company and Quality Machine of Iowa.

#### Hospitals, Labs and Specialized Medical Services Cluster

As Figure 3 shows, the hospitals, labs and specialized medical services cluster is dominated both at the U.S. level and at the Carroll Region level by general medical and surgical hospitals (SIC 8062). This industry has over 73 percent of the clusters employment in the Carroll Region, while it has just over 48 percent of the employment at the U.S. level and 57.4 percent at the statewide level. In the Carroll Region, several medical centers are the major employers, such as the Greene County Medical Center, the St. Anthony Regional Hospital, the Crawford County Memorial Hospital and the Audubon County Memorial Hospital. Other large cluster employers include Loring Home Health, Professional Computer Systems, and Tele Care.

**Figure 3 - Hospitals, Labs, and Specialized Medical Services Cluster**  
**Industry Mix**



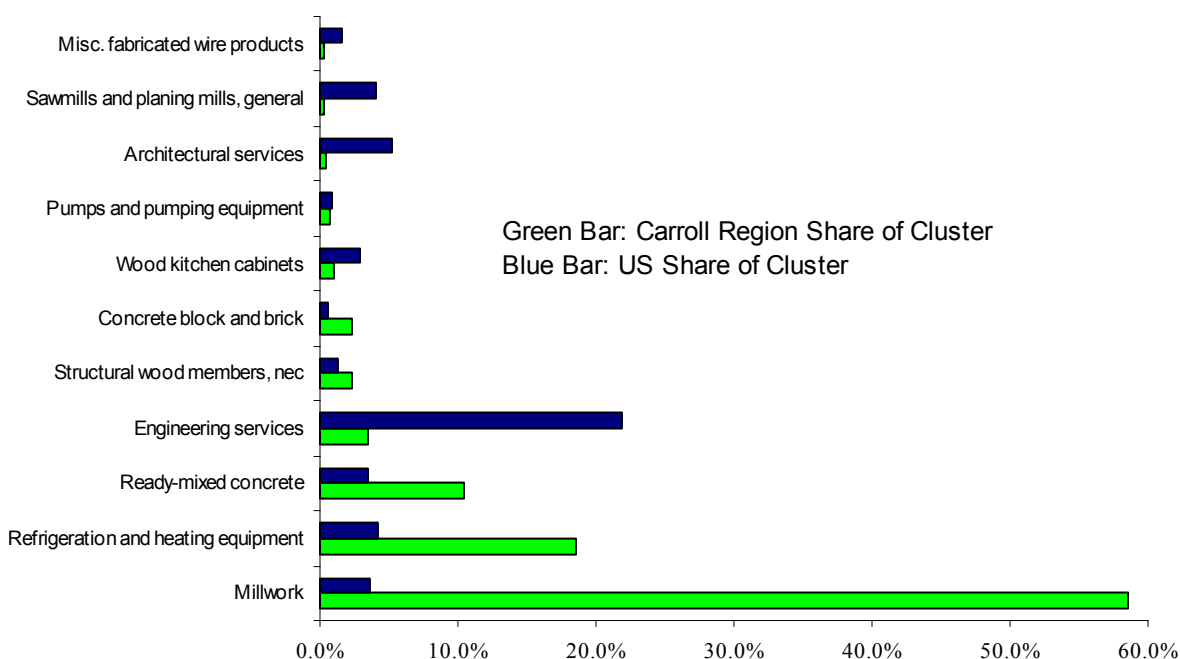
There is a considerable difference between the cluster's average annual wage in 2000 for the Carroll Region (\$25,750) and Iowa (\$31,073) and the U.S. (\$48,194) and Iowa. The wage differences are most dramatic in several industries that have only a small presence in the Carroll Region but do have some influence in the cluster at the national level. A few of these industries are the health and allied services industry (SIC 8099), the computer related services industry (SIC 7379) and the information retrieval services industry (SIC 7379). Each of these industries had average annual wage rates at the national level in 2000 that were well above the Carroll

Region. Once again the types of occupations within the industry that are present in the region are very much a determining factor to wage levels.

### Construction Materials Cluster

In the Carroll Region, the construction materials cluster gained in employment since 1990, with employment in 2000 at 841 workers. The cluster had 37 establishments in 2000, up from 33 in 1990. The largest industry sectors in the construction materials cluster are the millwork industry (SIC 2431), the refrigeration and heating equipment industry (SIC 3585) and the ready-mix concrete industry (SIC 3273). The Millwork industry was also the dominant employer in the cluster at the state level, with 20.0 percent of the employment. Figure 4 compares the employment distribution for the cluster in the Carroll Region and nationwide.

**Figure 4 - Construction Materials Cluster Industry Mix**



At the national level, employment in this cluster is dominated by the engineering services (SIC 8711) and architectural services (SIC 8712) industries, followed by the refrigeration and heating equipment industry (SIC 3585), the saw mills and planing mills industry (SIC 2421) and the sheet metalwork industry (SIC 3444). The significance of the engineering and architectural services sector at the national level provides some explanation of the difference in the annual average wage in 2000 between the Carroll Region (\$27,997), the U.S. (\$43,416) and Iowa (\$35,300). A closer look at wages for the individual industry sectors in the cluster that are present in the Carroll Region shows wage disparities between the U.S. level and the region within these industries. There was a minor difference in the millwork industry between the annual average wage at the U.S. level (\$30,151) and the Carroll Region (\$29,172), while the industry's average annual wage statewide was \$33,500. But there were significant differences in the refrigeration and heating equipment industry (U.S. - \$38,521, Iowa - \$33,467, Carroll Region - \$25,006) and the ready-mixed concrete industry (U.S. - \$38,572, Iowa - \$34,880, Carroll

Region - \$25,254). According to Dun & Bradstreet the major employers in this cluster in the Carroll Region include Goodrich Corporation, Carroll Coolers and Evapco, Inc.

### Transportation, Shipping and Logistics Cluster

Of the Carroll Region's five largest benchmark value-chain clusters, only the transportation, shipping and logistics cluster had fewer employees in 2000 than 1990, declining from 880 employees to 744 employees. Despite the decline in employment, the cluster saw an increase in the number of establishments, increasing from 148 firms in 1990 to 158 firms in 2000. The majority of the firms in the cluster were in the non-local trucking industry (SIC 4213) and local trucking industry (SIC 4212). These two industry sectors had the bulk of the cluster's employment in 2000. According to Dun & Bradstreet the major employers in the Carroll Region for this cluster include Mid-Continent Trucking Company, B-Bar-R Livestock Transportation, Jensen Brothers & Sons and Schleswig Transfer.

**Figure 5 - Transportation, Shipping and Logistics Cluster Industry Mix**

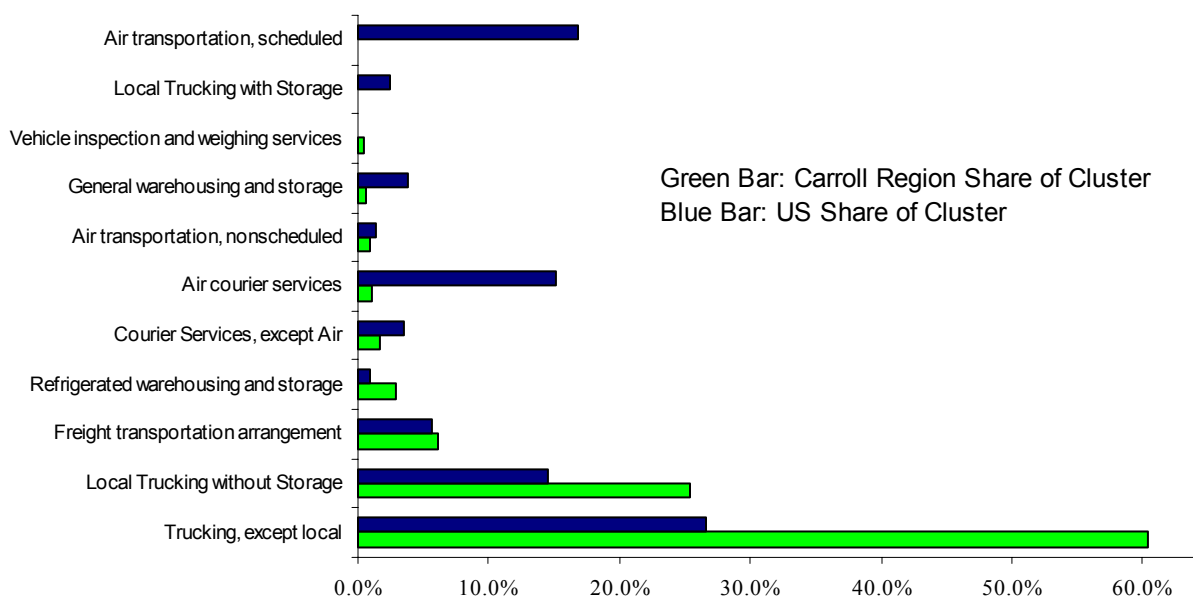


Figure 5 shows that at the U.S. level, in addition to the two trucking industries, the other two industry sectors that are major employers in the transportation, shipping and logistics cluster involve air transportation (scheduled air transportation and air courier services).

With the significant decline of employment in the transportation, shipping and logistics cluster in the Carroll Region, it is logical that the cluster would likely have a smaller total payroll in 2000 than in 1990. Unfortunately, the smaller aggregate payroll for the cluster is also reflected in the decline of the annual average wage for the cluster. In 1990, the cluster's average annual wage was \$26,930 and in 2000 it was \$23,514, which was an annual percentage decline of 1.3 percent. The cluster's national annual average wage in 2000 was \$36,805 with an annual percentage increase of 3.0 percent since 1990. Iowa's annual average wage for 2000 was \$30,482, an percentage annual wage increase of 0.4 percent.

## Technology Benchmark Clusters

As described above, the eight benchmark technology clusters that are identified in this research were derived from a statistical analysis of the interdependence among high-technology industries. It should be noted that these technology-intensive clusters are not simply sub-sets of the 28 benchmark value-chain industry clusters. Table 4 provides summary data about the technology clusters at the U.S., Iowa and Carroll Region levels. The analysis below will illustrate that employment levels within the technology clusters is very concentrated in several industry sectors. Several employers anchor these clusters' presence in the region and these industries and clusters in the region have not experienced the same rate of growth that the same industries and clusters experienced nationally during the same period of time.

An illustration of these differences in growth rates can be seen when comparing Figures 6, 7 and 8 which compare each technology cluster's employment growth rates and employment size against average wages in 2000. In each figure the vertical axis is the annual average wage in 2000, the horizontal axis is the annual growth rate for employment between 1990 and 2000 and the size of the bubble for each technology cluster is based on the cluster's employment level in 2000.

Figure 6 shows that at the U.S. level, the information technology and instruments technology cluster had the largest employment of the eight technology clusters. This technology cluster also had the highest annual average wage in 2000 for the U.S., \$75,343 (see Table 4).

**Figure 6 - US Technology Value-Chain Cluster Trends**

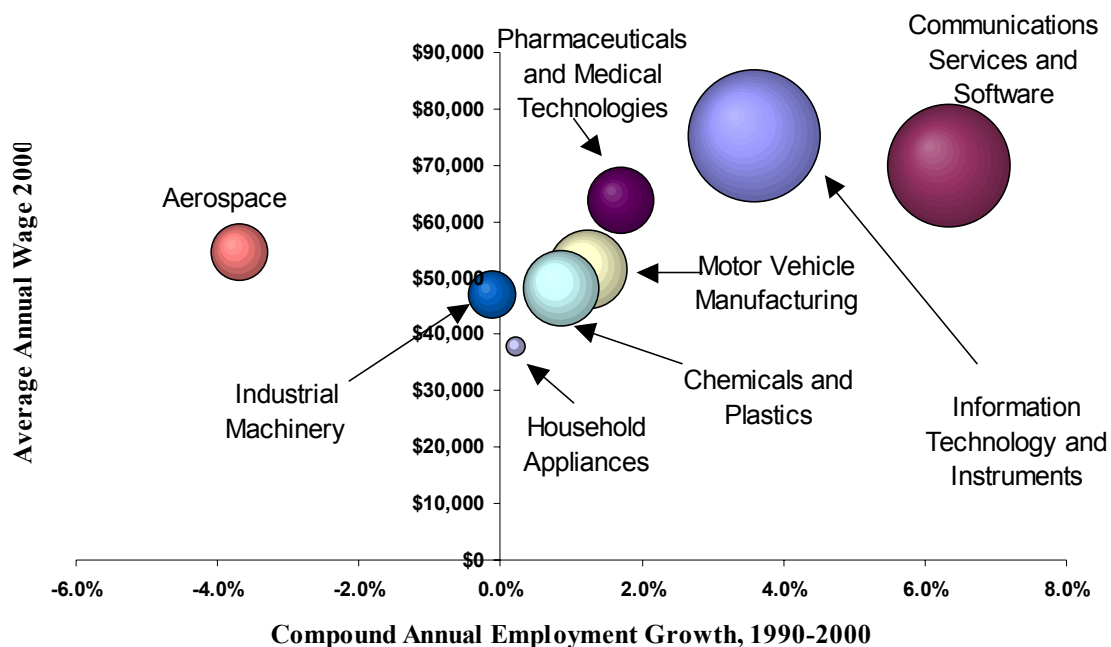
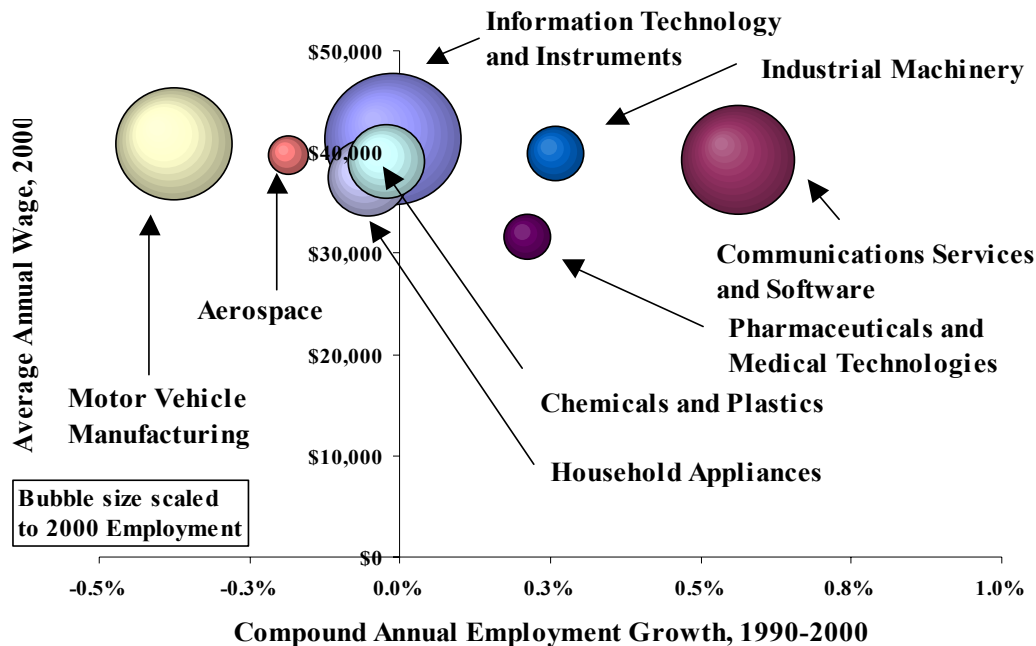


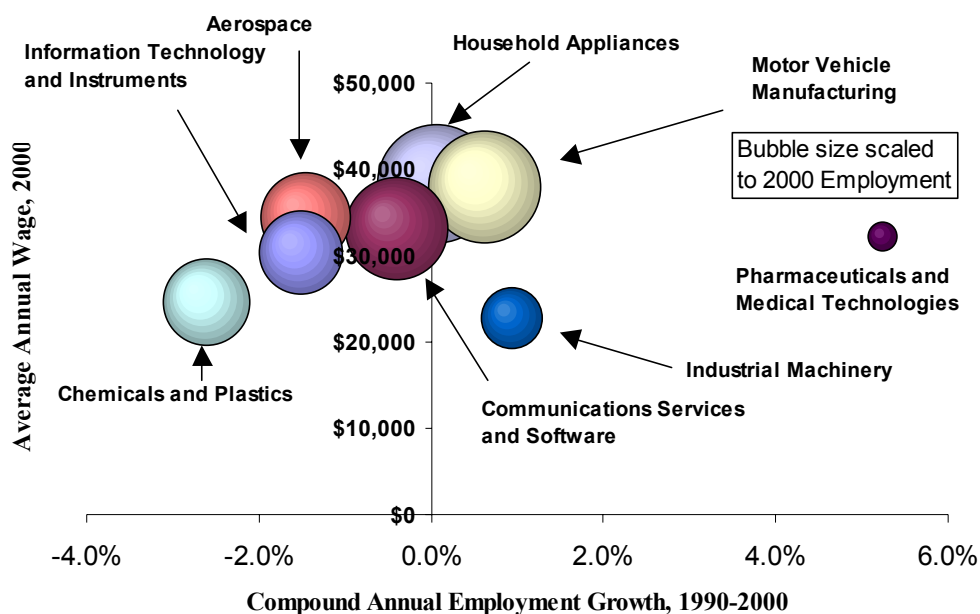


Figure 7 shows that for Iowa statewide, the largest technology cluster was the information technology and instruments technology cluster, followed by the motor vehicle manufacturing technology cluster and the communication services and software technology cluster (see Figure 7). The motor vehicle technology cluster had the highest annual percentage decline in employment between 1990 and 2000 with an annual rate of  $-0.4$  percent. The major industry sectors in this technology cluster included the construction machinery industry (SIC 3531) and the motor vehicle parts and accessories industry (SIC 3714). These two industries combined lost nearly 800 jobs during the decade of the 1990s.

**Figure 7 - Iowa Technology Value-Chain Cluster Trends**



**Figure 8 - Carroll Iowa Technology Value-Chain Cluster Trends**



At the U.S. level, all but two of the technology clusters experienced employment growth between 1990 and 2000, while only four of the clusters had employment growth in the Carroll Region during that same time. Five technology clusters at the state level experienced employment growth between 1990 and 2000.

**Table 4  
Carroll Region  
Benchmark Technology Clusters**

Description	Employment								Payroll						
	CAGR					Location Quotient		Establish.	Average Wage - 2000			CAGR '90-'00			
	2000	Per Estab.	CA IA '90-'00	IA '90-'00	US '90-'00	2000	Chg '90-'00	2000	CAGR '90-'00	CA IA	Iowa	US	CA IA	IA	US
Household Appliances	161	161.0	0.1%	-0.1%	0.2%	8.4	1.3	1	0.0%	38,320	37,511	37,861	0.6%	-0.2%	3.6%
Motor Vehicle Manufacturing	151	18.9	0.6%	-0.4%	1.2%	0.5	0.1	8	1.3%	37,997	40,755	51,561	0.3%	0.4%	4.0%
Communications Services and Software	124	6.2	-0.4%	0.6%	6.3%	0.2	-0.1	20	0.0%	33,132	39,202	69,973	1.2%	0.7%	6.5%
Aerospace	95	31.7	-1.5%	-0.2%	-3.7%	0.6	0.2	3	-2.8%	34,371	39,682	54,517	0.6%	0.4%	3.7%
Chemicals and Plastics	89	7.4	-2.6%	0.0%	0.9%	0.3	-0.1	12	-2.2%	24,699	39,080	48,152	1.1%	0.5%	3.9%
Information Technology and Instruments	79	7.2	-1.5%	0.0%	3.6%	0.1	0.0	11	-0.9%	30,280	41,288	75,343	1.3%	0.6%	7.7%
Industrial Machinery	45	11.3	0.9%	0.3%	-0.1%	0.4	0.1	4	2.9%	22,813	39,938	46,988	-0.6%	0.6%	4.5%
Pharmaceuticals & Medical Technologies	10	3.3	5.2%	0.2%	1.7%	0.0	0.0	3	4.1%	32,136	31,593	63,741	0.5%	0.4%	6.0%

Data source: U.S. Bureau of Labor Statistics ES-202 files (from Minnesota IMPLAN Group, Inc). CA IA = the Carroll Region. CAGR = compound annual growth rate

As Table 4 shows, the household appliance technology cluster has the largest employment in the region, with 161 workers in 2000. Since there is only one employer in the Carroll Region's five-county area that is in the household appliance technology cluster, it can be argued that a "cluster"

does not exist. The employer is in the household laundry equipment industry (SIC 3633). Statewide, the largest employers are in the household laundry equipment industry, the motor homes industry (SIC 3716) and the household refrigerators and freezers industry (SIC 3632). These three industries were the largest industries in the cluster at the U.S. level.

The motor vehicle manufacturing technology cluster employed nearly as many people (151) in 2000 as the household appliances technology cluster. Figure 9 provides the industry mix of the cluster. The majority of the employment in this cluster in the Carroll Region is in three industry sectors. Employment in the truck trailers industry (SIC 3715) was 67 employees in 2000. The motor vehicles and car bodies industry (SIC 3711) had 44 employees and the truck and bus bodies industry (SIC 3713) had 32 employees.

**Figure 9 - Motor Vehicle Manufacturing Technology Cluster Industry Mix**

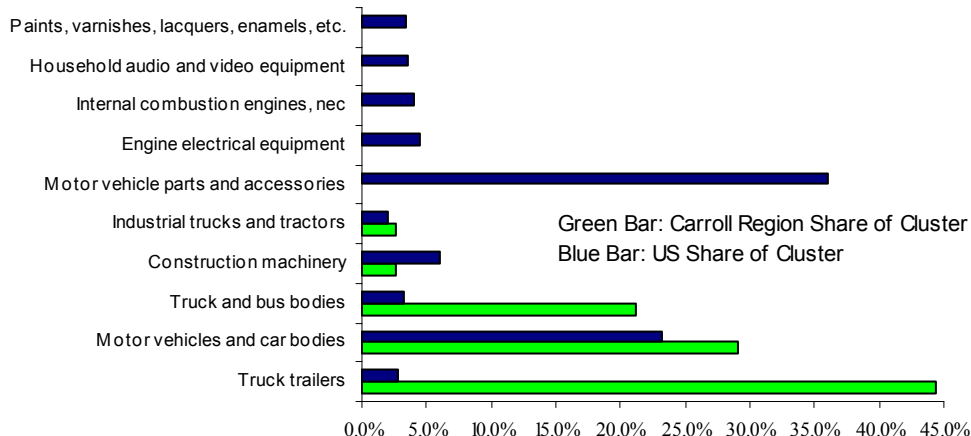
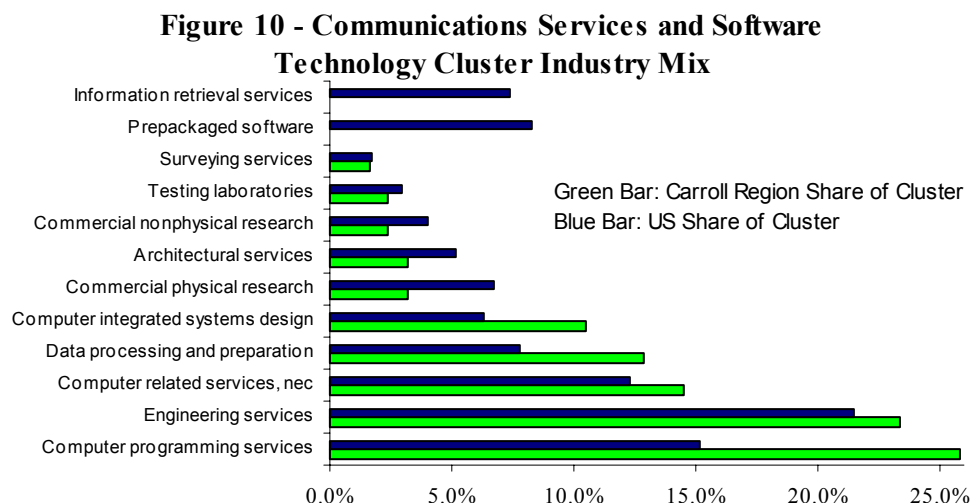


Figure 9 shows that the automobile manufacturing industry dominates this technology cluster at the U.S. level, particularly the motor vehicle parts and accessories industry (SIC 3714) with over 36 percent of the cluster's employment and the motor vehicles and car bodies industry (SIC 3711) with over 23 percent of the cluster's employment. According to Dun & Bradstreet, the two largest employers within this technology cluster in the Carroll Region are Hawkeye Eagle Trailer and Toyne's Iowa Fire Truck Service.

The motor vehicle manufacturing technology cluster at the national level experienced an annual average wage increase of 4.0 percent during the decade of the 1990s. The Carroll Region's annual wage growth rate was 0.6 percent per year for the same time period. Statewide, this technology cluster had an annual wage growth of 0.4 percent. In 2000, the cluster's average annual wage was \$37,997 in the Carroll Region, \$40,755 at the state level and \$51,561 at the U.S. level.

The communications services and software technology cluster had the third highest employment levels in the Carroll Region in 2000. However, the technology cluster experienced a decline in employment between 1990 and 2000 in the region, growing at the state and the U.S. levels. The cluster had an average annual wage in 2000 of \$33,132 in the Carroll Region which was less than

half of the cluster's U.S. annual average of \$69,973 and well below the cluster's state average of \$39,202. Figure 9 shows that the distribution of employment in this technology cluster in the Carroll Region is comparable to the cluster's mix at the U.S. level.



The largest employers in the Carroll Region for this technology cluster in 2000 are the computer programming services industry (SIC 7371) with 32 employees, the engineering services industry (SIC 8711) with 29 employees and the computer related services, n.e.c. industry (SIC 7379) with 18 employees. Two industries which had significant employment in the cluster at the U.S. level in 2000, but which were not present in the Carroll Region, are the prepackaged software industry (SIC 7372) and the information retrieval services industry (SIC 7375).

## Benchmark Labor Skill Clusters

Each of the 17 benchmark labor clusters consist of industries that utilize similar workforce skills and occupations. As described above, these industry clusters were identified through an analysis of data on the workforce staffing patterns of industries and data on the skills and knowledge requirements of occupations. An examination of the human capital of a region has become critical since the availability and quality of labor are considered critical site selection criteria for businesses.

**Table 5**  
**Carroll Region**  
**Benchmark Labor Clusters**

Description	Employment								Payroll						
	CAGR – '90-'00					Loc. Quotient	Establish.		Average Wage - 2000			CAGR '90-'00			
	2000	Per Estab.	CA IA	Iowa	US	2000	Chg '90-'00	2000	CAGR '90-'00	CA IA	Iowa	US	CA IA	IA	US
Health Services	2,338	18.1	0.1%	0.3%	2.6%	1.1	-0.1	129	0.0%	22,457	29,665	34,928	0.5%	0.4%	3.3%
Low Skill, Misc. Manufacturing	2,078	109.4	0.0%	0.2%	0.2%	5.9	0.9	19	1.1%	30,646	28,614	33,161	1.2%	0.2%	3.7%
Distribution, Freight Handling	915	5.2	-1.4%	0.2%	2.7%	1.3	-0.3	175	0.7%	23,213	30,755	35,845	-1.1%	0.4%	3.1%
Information Processing	810	11.9	-0.5%	0.7%	4.3%	0.7	-0.2	68	0.3%	21,772	40,521	59,714	0.8%	0.5%	6.7%
Telecomm and Banking	725	8.6	0.1%	0.2%	0.9%	0.9	0.1	84	0.0%	30,611	38,450	49,122	0.6%	0.7%	5.5%
Low Skill, Non-Durable Manufacturing	523	22.7	0.5%	-0.1%	-1.4%	0.8	0.2	23	0.9%	27,783	38,270	33,710	0.6%	0.5%	4.3%
Building Products	522	130.5	0.1%	0.5%	1.6%	4.3	0.2	4	0.0%	28,818	31,696	32,860	0.3%	0.4%	3.4%
High End Information/Business Services	433	6.4	1.0%	0.1%	0.6%	0.8	0.2	68	0.3%	23,344	33,864	50,280	1.5%	0.5%	4.5%
Specialized Labor Intensive	383	42.6	0.2%	0.0%	0.5%	0.8	0.1	9	2.5%	21,652	35,784	35,547	0.5%	0.3%	3.5%
Standardized Heavy Industry	292	15.4	0.4%	0.1%	0.4%	0.4	0.1	19	1.1%	31,153	37,069	47,271	0.5%	0.3%	3.8%
Food and Tobacco Manufacturing	232	21.1	-0.5%	-0.4%	-0.6%	1.3	0.2	11	-0.9%	28,111	41,846	43,456	0.0%	0.4%	4.0%
Petroleum	92	46.0	0.4%	-0.3%	-4.1%	0.8	0.4	2	7.2%	34,563	43,690	59,958	0.1%	0.2%	4.1%
High Tech Machinery, Instruments	76	8.4	-1.6%	0.0%	0.8%	0.4	0.0	9	-1.0%	20,580	36,785	43,601	-1.3%	0.5%	3.9%
Science Intensive	45	5.0	1.2%	0.1%	0.4%	0.1	0.0	9	0.0%	38,139	45,538	57,027	0.9%	0.4%	4.3%
Securities	36	2.1	-2.4%	0.4%	5.9%	0.2	-0.2	17	2.0%	46,571	72,278	147,281	1.4%	0.2%	8.6%
Chemicals, Pharmaceuticals	12	6.0	0.0%	-0.6%	-0.3%	0.1	0.0	2	-4.0%	28,968	46,692	73,849	0.4%	0.9%	6.0%
Electronics, Measuring Devices	0	NA	-100.0%	-0.4%	-0.4%	0.0	0.0	0	-100.0%	NA	37,401	66,125	NA	0.7%	7.0%

Data source: U.S. Bureau of Labor Statistics ES-202 files (from Minnesota IMPLAN Group, Inc). CA IA = the Carroll Region. CAGR = compound annual growth rate

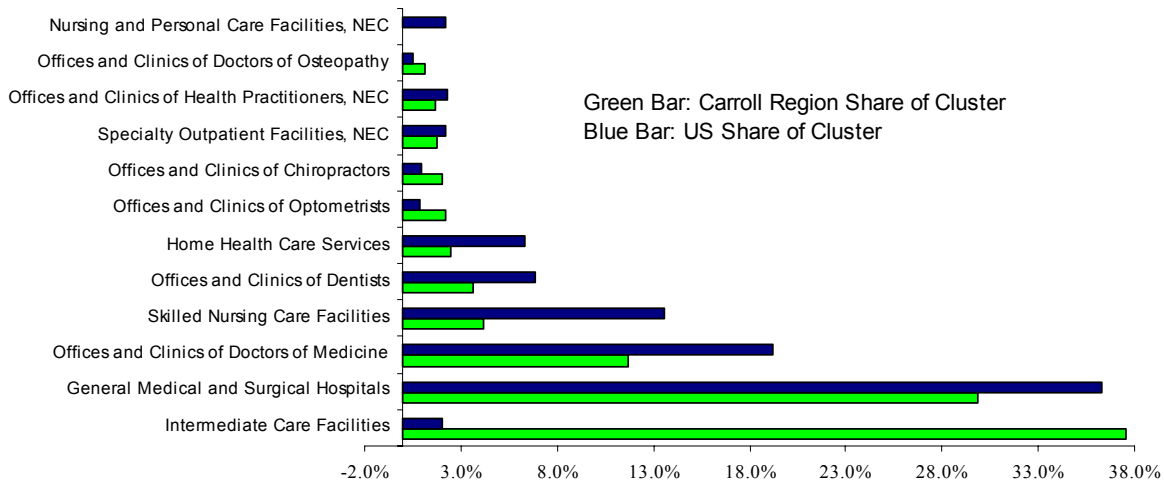
### Health Services Labor Cluster

The largest benchmark labor cluster in the Carroll Region, statewide and at the U.S. level was the health services labor cluster. At the U.S. level, this labor cluster had an annual growth rate of 2.6 percent, which was one of the highest annual percentage growth rates behind the securities, information processing and distribution, freight handling labor clusters. As Table 5 shows, the health services labor cluster in the Carroll Region had employment in 2000 of 2,338 employees. Employment in the labor cluster grew between 1990 and 2000 by an annual rate of 0.1 percent. The health services labor cluster had an average annual wage rate of \$22,457 in the Carroll Region, while the average annual wage at the national level was \$34,928 and the state annual average wage was \$29,665. The U.S. outpaced the Carroll Region's annual wage growth in this cluster between 1990 and 2000 with an annual rate of 3.3 percent. The state's annual wage growth rate was 0.4 percent and the Carroll Region's annual rate was 0.5 percent.

Figure 11 shows that in 2000 the intermediate care facilities industry (SIC 8052) was the largest industry sector employer in the health services labor cluster in the Carroll Region. However, at

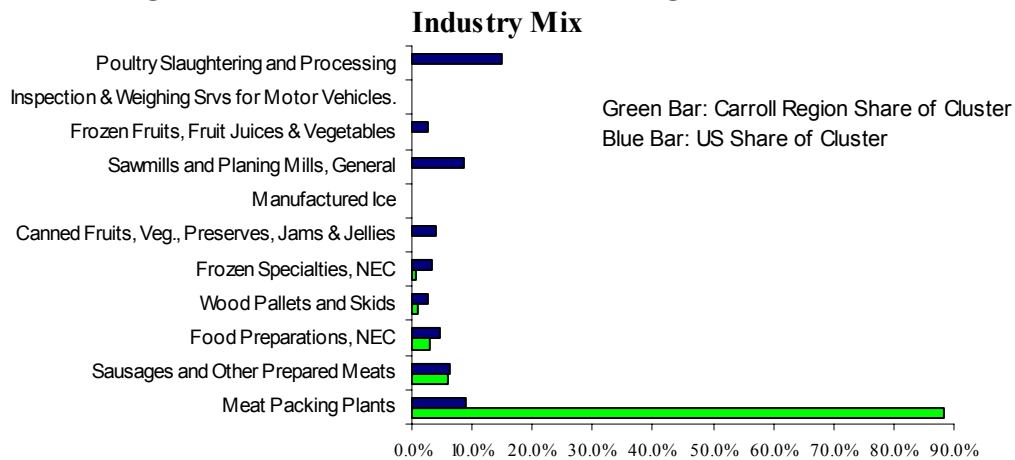
the U.S. and the state levels the general medical and surgical hospitals industry (SIC 8062) was the largest employer, the second largest employer in the Carroll Region. The most common occupations in the intermediate care facilities were nursing aides, orderlies and attendants and licensed practical nurses and licensed vocational nurses. In the general medical and surgical hospitals industry the most common occupations were registered nurses and nursing aides, orderlies and attendants.

**Figure 11 - Health Services Labor Cluster Industry Mix**



#### Low Skill, Miscellaneous Manufacturing Labor Cluster

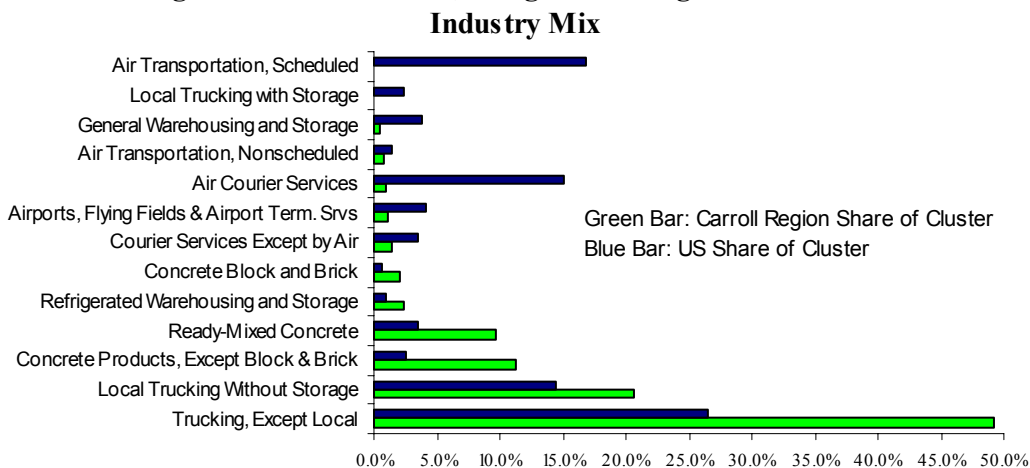
The low skill, miscellaneous manufacturing labor cluster had the second highest employment levels in 2000 in the Carroll Region with 2,078 employees. The meat packing industry (SIC 2011) dominated this labor cluster in the Carroll Region in 2000 (see Figure 12). The meat packing industry also dominates this labor cluster statewide. At the U.S. level the poultry slaughtering and processing industry (SIC 2015) was the largest industry sector. This labor cluster had an annual average wage in 2000 of \$30,646 in the Carroll Region, \$33,161 at the U.S. level and \$28,614 statewide. At the regional level and U.S. level, the labor cluster experienced annual percentage wage growth above one percent: 1.2 percent for the Carroll Region and 3.7 percent at the U.S. level. Statewide the labor cluster experienced an annual wage grow rate of 0.2 percent.

**Figure 12 - Low Skill, Misc. Manufacturing Labor Cluster**

The most common occupations in the meat packing industry were meat cutters and trimmers, slaughters and meat packers and packaging and filling machine operators and tenders.

#### Distribution, Freight Handling Labor Cluster

The distribution, freight handling labor cluster had the third highest employment in the Carroll Region in 2000 with 915 employees. As would be expected, the trucking industry, local (SIC 4213) and non-local trucking (SIC 4212), were the largest employers in the Carroll region. The labor cluster at the state level was also dominated by the trucking industry. At the U.S. level, the trucking industry and air transportation related industries were the largest employers.

**Figure 13 - Distribution, Freight Handling Labor Cluster**

The annual average wage for the distribution, freight handling labor cluster in the Carroll Region was considerably lower than the labor cluster's average wage at the U.S. level and the state level, \$23,213 compared to \$35,845 and \$30,755. A closer look at the local trucking and non-local trucking industries helps to explain the differences. The local trucking industry (SIC 4213) had an annual average wage of \$31,428 and the non-local trucking industry had an annual average

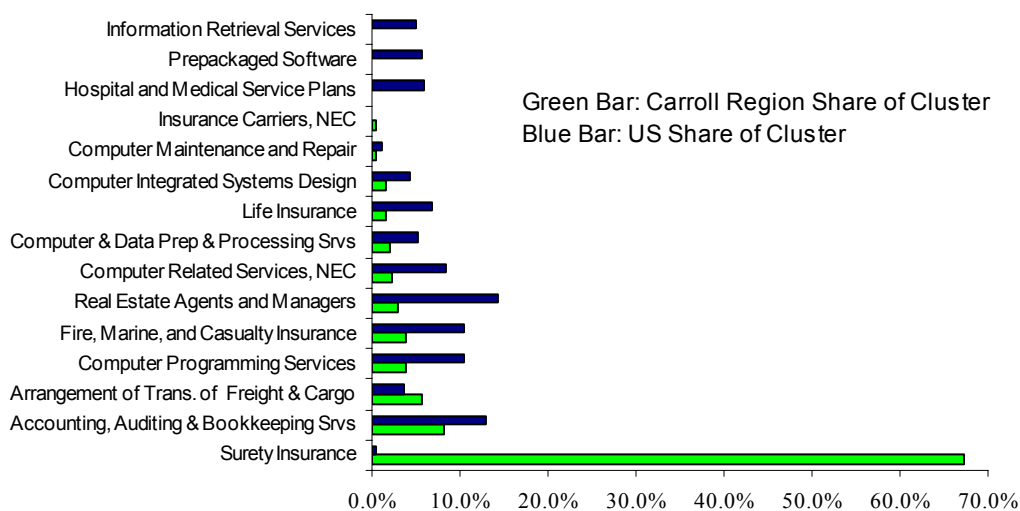


wage of \$35,510 nationwide, while those two industries in the Carroll Region had annual average wages of \$19,542 and \$25,226 respectively. The most common occupations in the trucking industry were heavy and tractor-trailer truck drivers, light or delivery services truck drivers and laborers and freight, stock and material movers.

#### Information Processing Labor Cluster

The fourth largest labor cluster by employment in the Carroll Region in 2000 was the information processing labor cluster. The surety insurance industry (SIC 6351) had over 67 percent of this labor cluster's employment in the Carroll Region in 2000, which was dominated by one major employer, American Home Shield. Figure 14 shows that at the U.S. level, the labor cluster's major industry sectors were the accounting industry (SIC 8721), the real estate agent and manager industry (SIC 6531), the computer programming services industry (SIC 7371) and the fire, marine and casualty insurance industry (SIC 6331). Statewide, as would be expected, insurance industries dominated employment in this labor cluster: the life insurance industry (SIC 6311) and the fire, marine and casualty insurance industry (SIC 6331). The third largest sector in this labor cluster in Iowa was the computer processing and data preparation and processing services (SIC 7374).

**Figure 14 - Information Processing Labor Cluster Industry Mix**

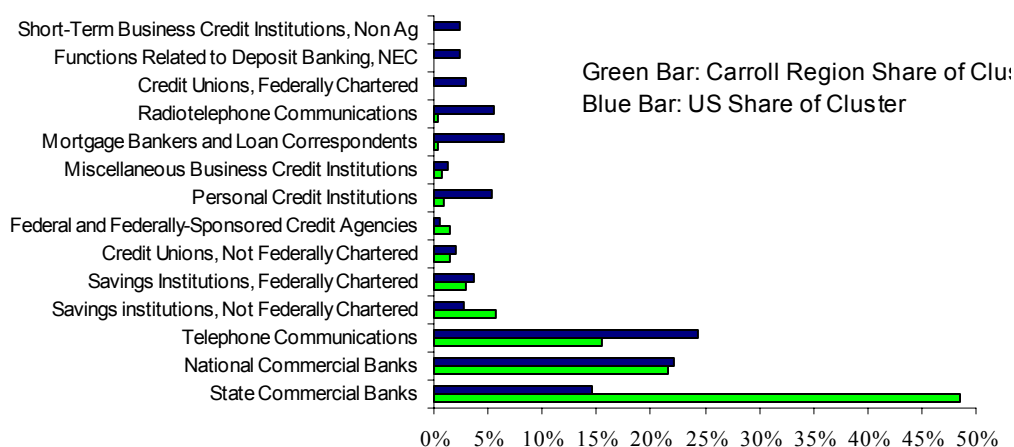


The information processing labor cluster at the U.S. level had an annual average wage in 2000 that was nearly three-times higher than that of the Carroll Region, \$59,714 compared to \$21,772. The average wage statewide was \$40,521. An obvious reason for this difference was that the industries within the information processing labor cluster which have higher paying occupations, such as the prepackaged software industry (SIC 7372), the information retrieval services industry (SIC 7375), the computer integrated systems design industry (SIC 7378) and the computer related services industry (SIC 7379), either have a small presence in the region or no presence at all. The major occupations within these industries are computer programmers, computer software engineers, computer support specialists and computer system analysts.

### Telecomm and Banking Labor Cluster

The telecomm and banking labor cluster in the Carroll Region had employment of 725 workers in 2000. The state and national commercial banking industries (SIC 6022 and SIC 6021) contained the majority of the employment in the Carroll Region. Figure 15 shows that this paralleled the trends at the U.S. level where those two industries, along with the telephone communications industry (SIC 4813), dominated the labor cluster's employment. Between 1990 and 2000, employment in the labor cluster grew at all three levels. The annual growth rates were 0.9 percent at the U.S. level, 0.2 percent at the state level and 0.1 percent for the Carroll Region.

**Figure 15 - Telcomm and Banking Labor Cluster Industry Mix**



The annual wage levels for the telecomm and banking labor cluster were considerably higher at the U.S. level and the state level than the Carroll Region's in 2000. The U.S. average annual wage was \$49,122 and the average annual wage was \$38,450 statewide, while the Carroll Region's average annual wage was \$30,611. At the U.S. level, the largest industry in this labor cluster is the telephone communications industry, nearly a fourth of the employment, which had an annual average wage of \$61,314. In the Carroll Region the two largest industry sectors, the state and national commercial banks, had annual average wages in 2000 of \$30,436 and \$31,179, which were roughly \$10,000 less than those sectors national annual average wages of \$41,829 and \$41,754. State commercial banks were also the largest employers statewide. The most common occupations in the commercial banking industry are tellers, customer service representatives and first-line supervisors/managers of office and administrative support workers.

## Summary, Recommendations and Next Steps

### Summary

There has been little growth in employment in most of this five-county Carroll Region's largest clusters between 1990 and 2000 and several clusters experienced employment declines due to plant closings or mass layoffs during the last several years. Businesses that have either closed or had layoffs since 2000 have included Farmland Foods, Rolling Meadows, A.J.H. Enterprises and Swift-Eckrick. These regional trends are not consistent with the clusters' activities at the U.S. level where many clusters, whether value-chain industry clusters, technology clusters or labor clusters, have experienced significant employment growth and only a few clusters have experienced employment declines. Obviously, the current national recession has tempered employment levels. Statewide, Iowa has seen a mix of employment growth and decline depending on the specific cluster. Wage rates within the Carroll Region and Iowa have grown very little when compared to wage growth at the national level.

### Benchmark Value-Chain Industry Clusters

Of the benchmark value-chain clusters that have a significant employment presence in the Carroll Region, 500 employees or more, six of the eight either remained stable or had a positive employment growth over the previous decade. The two largest value-chain industry clusters in the region were the packaged food products cluster and the metalworking and industrial machinery cluster. However, it is important to recognize the time lag with the data used in the analysis since the region has experienced job losses since 2000. As Tables 1, 2 and 3 show, most of the clusters which experienced employment growth and/or wage growth were at annual rates below the national growth rates.

The motor vehicle manufacturing industry cluster had the highest annual employment growth rate in the Carroll Region with a rate of 1.3 percent per year, while at the U.S. level the cluster had an annual growth rate of 1.4 percent. At the U.S. level the fastest growing value-chain clusters were the hospitals, labs and specialized medical services cluster (3.5 percent annually) and the printing and publishing industry cluster (3.4 percent annually), transportation, shipping, and logistics industry cluster (2.8 percent), information technology and instruments industry cluster (2.7 percent) and the pharmaceutical industry cluster (2.7 percent) in 2000. The first four of these value-chain clusters had significant presence in the Carroll Region, while the pharmaceuticals industry cluster did not have a presence. The transportation, shipping, and logistics industry cluster and the information technology and instruments industry cluster both grew at the U.S. level, and to a lesser extent statewide in Iowa, but experienced employment declines in the Carroll Region between 1990 and 2000.

All but one of the Carroll Region's eight largest value-chain clusters experienced growth in their average annual wages. The wage growth rates for the value-chain clusters in the region did not keep pace with the wage growth rates at the U.S. level, but were similar or higher compared to the wage growth rates statewide.

### Benchmark Technology Clusters

There was limited presence of the eight benchmark technology clusters in the Carroll Region. Only three of the benchmark technology clusters had employment above 100 in 2000 in the region (the household appliances technology cluster, the motor vehicle manufacturing technology cluster and the communications services and software technology cluster). Four of the technology clusters did experience employment growth in the region between 1990 and 2000: the household appliances technology cluster, the motor vehicle manufacturing technology cluster, the industrial machinery cluster and the pharmaceuticals and medical technologies technology cluster. At the U.S. level only two technology clusters experienced employment losses (aerospace and industrial machinery) during the same time period.

The annual average wages in the Carroll Region for the technology clusters were well below the averages at the U.S. level, except for the household appliances technology cluster which was slightly higher than the cluster's average wage at the U.S. level. As was discussed in the technology cluster section above, the types of occupations that are present in the region are a critical factor in the average wages paid. All of the technology clusters at the U.S. level had significant annual growth rates for wages between 1990 and 2000, from a high of 7.7 percent annually to a low of 3.6 percent annually. In the Carroll Region the wage growth rates ranged from -0.6 percent annually to 1.3 percent annually. Statewide the wage growth rates ranged from -0.2 percent annually to 0.7 percent annually.

### Benchmark Labor Clusters

Two of the benchmark labor clusters in the Carroll Region had employment levels over 2,000 (the health services labor cluster and the low skill, miscellaneous manufacturing labor cluster) and another five had employments levels above 500 (the distribution, freight handling labor cluster, the information processing labor cluster, the telecom and banking labor cluster, the low skill, non-durable manufacturing labor cluster and the building products labor cluster). Five of the seven largest labor clusters in the Carroll Region had employment growth between 1990 and 2000. For these same seven labor clusters at the U.S. level, six clusters had employment growth during the same time period. For the labor clusters with any real measurable employment in the Carroll Region (at least 200 employees) the fastest growing labor cluster was the high end information/business services labor cluster which grew at 1.0 percent annually. The securities labor cluster was the fastest growing labor cluster at the U.S. level with an annual rate of 5.9 percent. The securities labor cluster also had the highest annual average wage in the region (\$46,157), which was over \$100,000 below the labor cluster's average wage at the U.S. level (\$147,281). All of the labor clusters had a higher annual average wage at the U.S. level than the Carroll Region. The differences in the average annual wage between the U.S. level and the Carroll Region ranged from \$2,515 for the low skill, miscellaneous manufacturing labor cluster to \$100,710 for the securities labor cluster.

## **Recommendations and Next Steps**

Below are recommendations and next steps for the economic development organizations in the Carroll Region.

### **1. Determine if Industry Linkages and Organizational Relationships Exist, or Could Exist, in the Region:**

#### **A. What industry linkages/relationships actually exist in the region?**

It is important to understand that the analysis that is completed in this study for the value-chain industry clusters and technology clusters is based on industry linkages and relationships that have been identified at the U.S. level. Therefore, it is important that additional fact finding is completed locally and regionally to determine if actual buyer-supplier relationships within the various clusters and industry sectors actually exist or could exist in the future. This input can be obtained from employers through existing industry/business surveys and interviews, focus groups or industry roundtables. It is important to find out who businesses in the region “buy from” and “sell to” in order to determine if there are important economic relationships within the region.

#### **B. What support organizations and programs are utilized by clusters?**

It is also important to determine what support organizations are utilized by businesses within the region and what additional needs they have that could be addressed collectively through cluster-focused or industry-focused strategies. Programs being utilized could include workforce training or technology programs at Des Moines Area Community College or Iowa Central Community College or pollution prevention assistance through the Iowa Waste Reduction Center at the University of Northern Iowa. Needs might include exporting assistance or process evaluations to assist with increasing productivity and competitiveness.

Any efforts to evaluate whether value-chain and technology relationships exist within the region will enable the local development organizations and support organizations to gain a better understanding of the regional economy. A logical approach to gathering this information is to integrate the gathering activities into existing industry programming and business call programs that are undertaken by local economic development organizations or develop a joint effort regionally specifically for this effort.

### **2. Promote Regional Communication and Cooperation**

Labor markets and economic relationships flow across city, county and state political lines, so therefore it is important to recognize and understand these relationships (see recommendation #1). It is important that appropriate economic development efforts reflect these realities. Cluster-based economic development efforts typically require the implementation of strategies at a regional level whether the strategies focus on workforce development, technology and production enhancements for manufacturers or infrastructure development.

The economic development organizations in Audubon, Carroll, Crawford, Greene and Sac counties have begun conversations about regional cooperation. These discussions should continue and regional economic development efforts should be undertaken where appropriate. As needs and opportunities are identified within the value-chain industry clusters, technology clusters and the labor clusters, it is likely the actions will need to be regional in focus to have significant impact on the future of the region.

**3. Determine Potential Approaches for Business Development and Industry Recruitment:**

**A. What industries could be targeted based on the value-chain clusters and the technology clusters?**

If proactive recruitments are being undertaken by economic development organizations or are being considered for future activities, the analysis provided above should be a starting point for targeting. A key advantage of using the benchmark cluster framework is the ability to determine potential areas for growth in the region as industry gaps either within a value-chain cluster or technology cluster. For most of the value-chain clusters with a measurable presence in the Carroll Region, there are only a handful of industry sectors that have establishments within the region, so opportunities may exist for new industries which could compliment the existing industrial linkages in the region.

The packaged food products industry cluster and the construction materials industry cluster are two examples of where potential gaps might exist. In the packaged food products industry cluster in the Carroll Region nearly 90 percent of the employment is in the meat packing industry (SIC 2011), and in the construction materials industry cluster nearly 60 percent of the employment is in the millwork industry (SIC 2431) and another 18.5 percent is in the refrigeration and heating equipment industry (SIC 3585). At the U.S. level in the construction materials industry cluster the fastest growing sectors have been the transportation equipment manufacturing, n.e.c. industry (SIC 3799), the structural wood members manufacturing, n.e.c. industry (SIC 2439) and the wood kitchen cabinets industry (SIC 2434). In the packaged food products industry cluster at the U.S. level the fastest growing sectors have been the wines, brandy and brandy spirits industry (SIC 2084), the prepared flour mixes and doughs industry (SIC 2045) and the frozen specialties, n.e.c. industry (SIC 2038). In both of these clusters these growth industries have little or no presence within the Carroll Region but regional assets could favor recruitment of such segments.

**B. What industries could be targeted based on the labor clusters?**

Another approach is to identify growth industries within the benchmark labor clusters which might find the region's existing labor pool attractive, especially taking into account the job losses that have happened within the region over the past several years. An example of this is that the information processing labor cluster and the distribution, freight handling labor cluster each declined in employment in the Carroll Region between 1990 and 2000 while each labor cluster grew both statewide and nationally. Are there industries within this labor cluster that are growing nationally which would find the available labor in the Carroll Region attractive? Have there been recent mass



layoffs or business closures within the region which would be attractive to industries within the labor clusters in which the downsizing or closing businesses are located?

**C. Are there opportunities for entrepreneurs and existing employers within the region?**

The identification of gaps within a value-chain cluster, technology cluster or labor cluster could also provide opportunities for entrepreneurs and existing employers within the region to develop new products and enter new markets. Gaps might allow existing businesses to diversify out of declining product lines or industries to new markets existing within the region and beyond.

**D. Market Regionally**

If the proactive recruitment of industry is going to focus on industry clusters, then regional marketing efforts should be considered as the most appropriate approach. Marketing regionally helps to better describe the regional economy and regional advantages. Regional marketing has also been a good first step toward broader regional economic development strategies for other regional efforts around the country. Any effort to market regionally will require close collaboration between the local economic development professionals and their boards, and local governments and elected officials. It will also require that all participating organizations have a clear understanding of the purpose of the marketing effort, the targets and the clear set of policies and procedures for funding and implementing the marketing effort.

**4. Determine if Cluster-based Economic Development Strategies are Appropriate:**

**A. Can economic development strategies be adjusted to focus on clusters and can we work regionally?**

Cluster-based economic development strategies require a focus on the needs of multiple firms and industries over a broader geographic region than is typical for most community's economic development efforts. Implementation of cluster-based development strategies will likely require local economic development organizations to shift their programming and strategies to focus on maintaining and growing industry clusters in the region as opposed to a more narrow focus on just the needs of local individual local firms. Local economic development groups will also be required to work more closely with other economic development groups and service providers within the region and beyond. Service providers will also likely need to adjust their programming to fit the needs of industry clusters.

As cluster-based economic development strategies are considered, it is important to determine if funding is available locally and regionally to undertake cluster efforts. In addition, the organizations and local governments providing funding must have a clear understanding of the region's cluster-based economic development strategies and how the funds will be used and how these uses could be different from previous efforts.



**B. How balanced should economic development strategies be between economic diversification and industry concentration in our region?**

One of the concerns often raised about cluster-based economic development strategies is that they do not promote economic diversification, but rather the concentration of industries. With over-concentration, a region's economy could be severely impacted if the industry or industries experience a decline. The analysis above shows that in many of the industry clusters several industry sectors are dominant. An example is that in the construction materials cluster, close to 60 percent of the cluster's employment in 2000 was in the millwork manufacturing industry.

If economic development efforts in the region do focus on the growth of these industry clusters, a balanced approach should be considered which allows for the leveraging of the region's existing industry linkages and clusters while still allowing for economic diversification. An approach to achieving such a balance is to focus both on the value-chain and technology clusters along with the labor clusters since each of the three benchmark cluster frameworks focus on different inputs.

**5. Determine the Needs of Businesses within the Clusters**

Whether a cluster-based approach is undertaken or not, it is important to identify the needs and issues of existing businesses within the region. If a cluster-based approach is advanced, then the gathering of this information and the implementation of actions and strategies to meet those needs should be shaped around the industry clusters. This will require cooperation among the various economic development organizations and support organizations within the region. An example could be a regional industry call program that gathers identical information for significant companies within a cluster. The same contact teams would make visits across the region so there is consistency of information gathering. Common needs within an industry cluster could include market research, technology and modernization assistance, specific workforce training, exporting assistance or research and development assistance. Other issues might cut across clusters, such as the need for housing or transportation and infrastructure enhancements, access to fiber optics or clean lab facilities.

**6. Benchmark Progress of the Clusters and Region**

It is important for an economic development organization and community to measure their success or lack of success. Traditional measures have included job growth, wage rates and taxable valuations. Measuring success for cluster-based economic development efforts will require different measures that focus on the performance within a cluster, such as increased sales, profits, productivity, employment, and positive interaction among cluster firms. Obviously, some of these measures are hard to measure or are not readily available. Therefore, proxy measures will need to be developed which can provide insights into the progress being made with cluster development.

It is also useful to benchmark the region with the state, nation and other comparable regions to determine comparable progress over time.

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## Appendix A

## Benchmark Value-Chain Industry Clusters

<b>Metalworking and Industrial Machinery</b>			
SIC	Description		
2514	Metal household furniture	3483	Ammunition, exc. for small arms, nec
2522	Office furniture, except wood	3484	Small arms
2542	Partitions and fixtures, except wood	3489	Ordnance and accessories, nec
2591	Drapery hardware & blinds & shades	3491	Industrial valves
2599	Furniture and fixtures, nec	3492	Fluid power valves & hose fittings
3053	Gaskets, packing and sealing devices	3493	Steel springs, except wire
3255	Clay refractories	3494	Valves and pipe fittings, nec
3272	Concrete products, nec	3495	Wire springs
3274	Lime	3496	Misc. fabricated wire products
3312	Blast furnaces and steel mills	3498	Fabricated pipe and fittings
3313	Electrometallurgical products	3499	Fabricated metal products, nec
3315	Steel wire and related products	3511	Turbines and turbine generator sets
3316	Cold finishing of steel shapes	3519	Internal combustion engines, nec
3317	Steel pipe and tubes	3523	Farm machinery and equipment
3321	Gray and ductile iron foundries	3524	Lawn and garden equipment
3322	Malleable iron foundries	3531	Construction machinery
3324	Steel investment foundries	3532	Mining machinery
3325	Steel foundries, nec	3533	Oil and gas field machinery
3398	Metal heat treating	3534	Elevators and moving stairways
3411	Metal cans	3535	Conveyors and conveying equipment
3412	Metal barrels, drums, and pails	3536	Hoists, cranes, and monorails
3421	Cutlery	3537	Industrial trucks and tractors
3423	Hand and edge tools, nec	3541	Machine tools, metal cutting types
3425	Saw blades and handsaws	3542	Machine tools, metal forming types
3429	Hardware, nec	3543	Industrial patterns
3431	Metal sanitary ware	3544	Special dies, tools, jigs & fixtures
3433	Heating equipment, except electric	3545	Machine tool accessories
3441	Fabricated structural metal	3546	Power-driven handtools
3442	Metal doors, sash, and trim	3547	Rolling mill machinery
3443	Fabricated plate work (boiler shops)	3548	Welding apparatus .
3444	Sheet metalwork	3549	Metalworking machinery, nec
3446	Architectural metal work	3552	Textile machinery
3448	Prefabricated metal buildings	3553	Woodworking machinery
3449	Miscellaneous metal work	3554	Paper industries machinery
3451	Screw machine products	3555	Printing trades machinery
3452	Bolts, nuts, rivets, and washers	3556	Food products machinery
3462	Iron and steel forgings	3559	Special industry machinery, nec
3465	Automotive stampings	3561	Pumps and pumping equipment
3466	Crowns and closures	3562	Ball and roller bearings
3469	Metal stampings, nec	3563	Air and gas compressors
3471	Plating and polishing	3564	Blowers and fans
3479	Metal coating and allied services	3565	Packaging machinery
		3566	Speed changers, drives, and gears
		3567	Industrial furnaces and ovens

3568	Power transmission equipment, nec
3569	General industrial machinery, nec
3581	Automatic vending machines
3582	Commercial laundry equipment
3585	Refrigeration and heating equipment
3586	Measuring and dispensing pumps
3589	Service industry machinery, nec
3592	Carburetors, pistons, rings, valves
3593	Fluid power cylinders & actuators
3594	Fluid power pumps and motors
3599	Industrial machinery, nec
3612	Transformers, except electronic
3613	Switchgear and switchboard apparatus
3621	Motors and generators
3624	Carbon and graphite products
3631	Household cooking equipment
3632	Household refrigerators and freezers
3633	Household laundry equipment
3634	Electric housewares and fans
3639	Household appliances, nec
3643	Current carrying wiring devices
3644	Noncurrent carrying wiring devices
3692	Primary batteries, dry and wet
3713	Truck and bus bodies
3714	Motor vehicle parts and accessories
3715	Truck trailers
3731	Ship building and repairing
3732	Boat building and repairing
3743	Railroad equipment
3751	Motorcycles, bicycles, and parts
3795	Tanks and tank components
3821	Laboratory apparatus and furniture
3949	Sporting and athletic goods, nec
3995	Burial caskets

#### **Packaged Food Products**

SIC	Description
2011	Meat packing plants
2013	Sausages and other prepared meats
2015	Poultry slaughtering and processing
2021	Creamery butter
2022	Cheese, natural and processed
2023	Dry, condensed, evaporated products
2024	Ice cream and frozen desserts
2026	Fluid milk
2032	Canned specialties
2033	Canned fruits and vegetables
2034	Dehydrated fruits, vegetables, soups

2035	Pickles, sauces, and salad dressings
2037	Frozen fruits and vegetables
2038	Frozen specialties, nec
2043	Cereal breakfast foods
2044	Rice milling
2045	Prepared flour mixes and doughs
2051	Bread, cake, and related products
2052	Cookies and crackers
2053	Frozen bakery products, except bread
2061	Raw cane sugar
2062	Cane sugar refining
2063	Beet sugar
2064	Candy & other confectionaries
2066	Chocolate and cocoa products
2067	Chewing gum
2068	Salted and roasted nuts and seeds
2079	Edible fats and oils, nec
2082	Malt beverages
2084	Wines, brandy, and brandy spirits
2085	Distilled and blended liquors
2086	Bottled and canned soft drinks
2091	Canned and cured fish and seafoods
2092	Fresh or frozen prepared fish
2095	Roasted coffee
2096	Potato chips and similar snacks
2098	Macaroni and spaghetti
2099	Food preparations, nec
2676	Sanitary paper products
2861	Gum and wood chemicals
3262	Vitreous china table & kitchenware
3263	Semivitreous table & kitchenware
3556	Food products machinery
3565	Packaging machinery
3914	Silverware and plated ware

#### **Construction Materials**

SIC	Description
2273	Carpets and rugs
2394	Canvas and related products
2421	Sawmills and planing mills, general
2426	Hardwood dimension & flooring mills
2429	Special product sawmills, nec
2431	Millwork
2434	Wood kitchen cabinets
2435	Hardwood veneer and plywood
2436	Softwood veneer and plywood
2439	Structural wood members, nec
2452	Prefabricated wood buildings

2491 Wood preserving  
 2493 Reconstituted wood products  
 2499 Wood products, nec  
 2541 Wood partitions and fixtures  
 2679 Converted paper products, nec  
 2851 Paints, varnishes, lacquers, enamels, etc.  
 2951 Asphalt paving mixtures and blocks  
 2952 Asphalt felts and coatings  
 3251 Brick and structural clay tile  
 3253 Ceramic wall and floor tile  
 3259 Structural clay products, nec  
 3261 Vitreous plumbing fixtures  
 3264 Porcelain electrical supplies  
 3271 Concrete block and brick  
 3273 Ready-mixed concrete  
 3275 Gypsum products  
 3281 Cut stone and stone products  
 3291 Abrasive products  
 3296 Mineral wool  
 3315 Steel wire and related products  
 3357 Nonferrous wiredrawing & insulating  
 3425 Saw blades and handsaws  
 3431 Metal sanitary ware  
 3432 Plumbing fixture fittings and trim  
 3433 Heating equipment, except electric  
 3442 Metal doors, sash, and trim  
 3444 Sheet metalwork  
 3449 Miscellaneous metal work  
 3491 Industrial valves  
 3492 Fluid power valves & hose fittings  
 3494 Valves and pipe fittings, nec  
 3495 Wire springs  
 3496 Misc. fabricated wire products  
 3498 Fabricated pipe and fittings  
 3561 Pumps and pumping equipment  
 3563 Air and gas compressors  
 3585 Refrigeration and heating equipment  
 3586 Measuring and dispensing pumps  
 3613 Switchgear and switchboard apparatus  
 3634 Electric housewares and fans  
 3639 Household appliances, nec  
 3643 Current-carrying wiring devices  
 3644 Noncurrent-carrying wiring devices  
 3645 Residential lighting fixtures  
 3646 Commercial lighting fixtures  
 3647 Vehicular lighting equipment  
 3648 Lighting equipment, nec  
 3663 Radio & TV communications equipment

3669 Communications equipment, nec  
 3699 Electrical equipment & supplies, nec  
 3799 Transportation equipment, nec  
 3822 Environmental controls  
 3851 Ophthalmic goods  
 3991 Brooms and brushes  
 3996 Hard surface floor coverings, nec  
 8711 Engineering services  
 8712 Architectural services  
 8713 Surveying services

### Printing and Publishing

SIC	Description
2611	Pulp mills
2652	Setup paperboard boxes
2653	Corrugated and solid fiber boxes
2655	Fiber cans, drums & similar products
2656	Sanitary food containers
2657	Folding paperboard boxes
2671	Paper coated & laminated, packaging
2672	Paper coated and laminated, nec
2673	Bags: plastics, laminated, & coated
2674	Bags: uncoated paper & multiwall
2675	Die-cut paper and board
2676	Sanitary paper products
2677	Envelopes
2678	Stationery products
2679	Converted paper products, nec
2711	Newspapers: publishing, or pub. & printing
2721	Periodicals: publishing and printing
2731	Book publishing
2732	Book printing
2741	Miscellaneous publishing
2752	Commercial printing, lithographic
2754	Commercial printing, gravure
2759	Commercial printing, nec
2761	Manifold business forms
2771	Greeting cards
2782	Blankbooks and looseleaf binders
2789	Bookbinding and related work
2791	Typesetting
2796	Platemaking services
3275	Gypsum products
3861	Photographic equipment and supplies
3953	Marking devices
3955	Carbon paper and inked ribbons
3993	Signs and advertising specialties
3999	Manufacturing industries, nec

4812	Radiotelephone communications
4813	Telephone communications, exc. radio
4822	Telegraph & other message communications
4899	Communications services, nec
7371	Computer programming services
7372	Prepackaged software
7373	Computer integrated systems design
7374	Data processing and preparation
7375	Information retrieval services
7376	Computer facilities management
7377	Computer rental & leasing
7378	Computer maintenance & repair
7379	Computer related services, nec

#### Information Technology and Instruments

SIC	Description
3471	Plating and polishing
3571	Electronic computers
3572	Computer storage devices
3575	Computer terminals
3577	Computer peripheral equipment, nec
3578	Calculating and accounting equipment
3579	Office machines, nec
3596	Scales and balances, exc. laboratory
3625	Relays and industrial controls
3629	Electrical industrial apparatus, nec
3651	Household audio and video equipment
3661	Telephone and telegraph apparatus
3663	Radio & TV communications equipment
3669	Communications equipment, nec
3672	Printed circuit boards
3674	Semiconductors and related devices
3675	Electronic capacitors
3676	Electronic resistors
3677	Electronic coils and transformers
3678	Electronic connectors
3679	Electronic components, nec
3694	Engine electrical equipment
3699	Electrical equipment & supplies, nec
3728	Aircraft parts and equipment, nec
3761	Guided missiles and space vehicles
3769	Space vehicle equipment, nec
3812	Search and navigation equipment
3821	Laboratory apparatus and furniture
3822	Environmental controls
3823	Process control instruments
3824	Fluid meters and counting devices
3825	Instruments to measure electricity

3826	Analytical instruments
3827	Optical instruments and lenses
3829	Measuring & controlling devices, nec
3841	Surgical and medical instruments
3844	X-ray apparatus and tubes
3845	Electromedical equipment
3861	Photographic equipment and supplies
3873	Watches, clocks, watchcases and parts
3931	Musical instruments
7371	Computer programming services
7372	Prepackaged software
7373	Computer integrated systems design
7374	Data processing and preparation
7375	Information retrieval services
7376	Computer facilities management
7377	Computer rental & leasing
7378	Computer maintenance & repair
7379	Computer related services, nec

#### Chemicals and Plastics

SIC	Description
2087	Flavoring extracts and syrups, nec
2611	Pulp mills
2621	Paper mills
2631	Paperboard mills
2812	Alkalies and chlorine
2813	Industrial gases
2816	Inorganic pigments
2821	Plastics materials and resins
2822	Synthetic rubber
2823	Cellulosic manmade fibers
2824	Organic fibers, noncellulosic
2841	Soap and other detergents
2842	Polishes and sanitation goods
2843	Surface active agents
2851	Paints, varnishes, lacquers, enamels, etc.
2865	Cyclic crudes and intermediates
2869	Industrial organic chemicals, nec
2875	Fertilizers, mixing only
2879	Agricultural chemicals, nec
2891	Adhesives and sealants
2893	Printing ink
2899	Chemical preparations, nec
3011	Tires and inner tubes
3061	Mechanical rubber goods
3069	Fabricated rubber products, nec
3081	Unsupported plastics film & sheet
3082	Unsupported plastics profile shapes

3083	Laminated plastics plate & sheet
3084	Plastics pipe
3085	Plastics bottles
3086	Plastics foam products
3087	Custom compound purchased resins
3088	Plastics plumbing fixtures
3089	Plastics products, nec
3111	Leather tanning and finishing
3291	Abrasive products
3399	Primary metal products, nec
3559	Special industry machinery, nec
3692	Primary batteries, dry and wet
3996	Hard surface floor coverings, nec
8042	Offices and clinics of optometrists
8043	Offices and clinics of podiatrists
8049	Offices of health practitioners, nec
8071	Medical laboratories
8072	Dental laboratories
8092	Kidney dialysis centers
8093	Specialty outpatient facilities, nec
8099	Health and allied services, nec

#### Apparel

SIC	Description
2211	Broadwoven fabric mills, cotton
2221	Broadwoven fabric mills, manmade
2231	Broadwoven fabric mills, wool
2241	Narrow fabric and other smallwares mills
2251	Women's hosiery, except socks
2252	Hosiery, nec
2253	Knit outerwear mills
2254	Knit underwear mills
2257	Weft knit fabric mills
2258	Lace & warp knit fabric mills
2259	Knitting mills, nec
2261	Finishing plants, cotton
2262	Finishing plants, manmade
2269	Finishing plants, nec
2273	Carpets and rugs
2281	Yarn spinning mills
2282	Throwing and winding mills
2284	Thread mills
2296	Tire cord and fabrics
2297	Nonwoven fabrics
2298	Cordage and twine
2299	Textile goods, nec
2311	Men's and boys' suits, coats and overcoats
2321	Men's and boys' shirts

2322	Men's & boys' underwear and nightwear
2323	Men's and boys' neckwear
2325	Men's and boys' trousers and slacks
2326	Men's and boys' work clothing
2329	Men's and boys' clothing, nec
2331	Women's & misses' blouses & shirts
2335	Women's, junior's, & misses' dresses
2337	Women's and misses' suits and coats
2339	Women's and misses' outerwear, nec
2341	Women's and children's underwear
2342	Bras, girdles, and allied garments
2353	Hats, caps, and millinery
2361	Girls' & children's dresses, blouses
2369	Girls' and children's outerwear, nec
2371	Fur goods
2381	Fabric dress and work gloves
2384	Robes and dressing gowns
2385	Waterproof outerwear
2386	Leather and sheep-lined clothing
2387	Apparel belts
2389	Apparel and accessories, nec
2395	Pleating and stitching
2397	Schiff li machine embroideries
2824	Organic fibers, noncellulosic
3965	Fasteners, buttons, needles, & pins

#### Motor Vehicle Manufacturing

SIC	Description
2273	Carpets and rugs
2299	Textile goods, nec
2396	Automotive and apparel trimmings
2399	Fabricated textile products, nec
2531	Public building and related furniture
2599	Furniture and fixtures, nec
2851	Paints, varnishes, lacquers, enamels, etc.
2891	Adhesives and sealants
3011	Tires and inner tubes
3052	Rubber & plastics hose & belting
3061	Mechanical rubber goods
3069	Fabricated rubber products, nec
3081	Unsupported plastics film & sheet
3082	Unsupported plastics profile shapes
3083	Laminated plastics plate & sheet
3084	Plastics pipe
3085	Plastics bottles
3086	Plastics foam products
3087	Custom compound purchased resins
3088	Plastics plumbing fixtures



3089	Plastics products, nec
3142	House slippers
3211	Flat glass
3229	Pressed and blown glass, nec
3231	Glass products, made of purchased glass
3465	Automotive stampings
3493	Steel springs, except wire
3519	Internal combustion engines, nec
3524	Lawn and garden equipment
3585	Refrigeration and heating equipment
3592	Carburetors, pistons, rings, valves
3641	Electric lamps
3651	Household audio and video equipment
3694	Engine electrical equipment
3711	Motor vehicles and car bodies
3713	Truck and bus bodies
3714	Motor vehicle parts and accessories
3715	Truck trailers
3716	Motor homes

#### **Fabricated Textiles**

SIC	Description
2211	Broadwoven fabric mills, cotton
2221	Broadwoven fabric mills, manmade
2231	Broadwoven fabric mills, wool
2261	Finishing plants, cotton
2262	Finishing plants, manmade
2295	Coated fabrics, not rubberized
2311	Men's and boys' suits, coats and overcoats
2321	Men's and boys' shirts
2322	Men's & boys' underwear + nightwear
2323	Men's and boys' neckwear
2325	Men's and boys' trousers and slacks
2326	Men's and boys' work clothing
2329	Men's and boys' clothing, nec
2331	Women's & misses' blouses & shirts
2335	Women's, junior's, & misses' dresses
2337	Women's and misses' suits and coats
2339	Women's and misses' outerwear, nec
2341	Women's and children's underwear
2342	Bras, girdles, and allied garments
2353	Hats, caps, and millinery
2361	Girls' & children's dresses, blouses
2369	Girls' and children's outerwear, nec
2371	Fur goods
2381	Fabric dress and work gloves
2384	Robes and dressing gowns
2385	Waterproof outerwear

2386	Leather and sheep-lined clothing
2387	Apparel belts
2389	Apparel and accessories, nec
2391	Curtains and draperies
2392	Housefurnishings, nec
2393	Textile bags
2394	Canvas and related products
2396	Automotive and apparel trimmings
2399	Fabricated textile products, nec
2512	Upholstered household furniture
2515	Mattresses and bedsprings
2823	Cellulosic manmade fibers
3021	Rubber and plastics footwear
3052	Rubber & plastics hose & belting
3161	Luggage
3172	Personal leather goods, nec
3842	Surgical appliances and supplies
3942	Dolls and stuffed toys
3965	Fasteners, buttons, needles, & pins
3995	Burial caskets

#### **Stone, Clay and Glass Products**

SIC	Description
2873	Nitrogenous fertilizers
2874	Phosphatic fertilizers
2911	Petroleum refining
3011	Tires and inner tubes
3241	Cement, hydraulic
3255	Clay refractories
3261	Vitreous plumbing fixtures
3262	Vitreous china table & kitchenware
3263	Semivitreous table & kitchenware
3264	Porcelain electrical supplies
3269	Pottery products, nec
3274	Lime
3295	Minerals, ground or treated
3297	Nonclay refractories
3299	Nonmetallic mineral products, nec
3629	Electrical industrial apparatus, nec

#### **Wood Products and Furniture**

SIC	Description
2411	Logging
2426	Hardwood dimension & flooring mills
2431	Millwork
2434	Wood kitchen cabinets
2439	Structural wood members, nec
2441	Nailed wood boxes and shook

2448	Wood pallets and skids
2449	Wood containers, nec
2451	Mobile homes
2452	Prefabricated wood buildings
2493	Reconstituted wood products
2499	Wood products, nec
2511	Wood household furniture
2517	Wood TV and radio cabinets
2521	Wood office furniture
2611	Pulp mills
2621	Paper mills
2631	Paperboard mills
2861	Gum and wood chemicals
3792	Travel trailers and campers
3931	Musical instruments

#### **Primary Nonferrous Metals**

SIC	Description
3321	Gray and ductile iron foundries
3322	Malleable iron foundries
3324	Steel investment foundries
3325	Steel foundries, nec
3331	Primary copper
3339	Primary nonferrous metals, nec
3351	Copper rolling and drawing
3356	Nonferrous rolling and drawing, nec
3363	Aluminum die-castings
3364	Nonferrous die-casting exc. aluminum
3365	Aluminum foundries
3366	Copper foundries
3369	Nonferrous foundries, nec
3399	Primary metal products, nec
3599	Industrial machinery, nec

#### **Leather Goods**

SIC	Description
3111	Leather tanning and finishing
3131	Boot and shoe cut stock and findings
3142	House slippers
3143	Men's footwear, except athletic
3144	Women's footwear, except athletic
3149	Footwear, except rubber, nec
3151	Leather gloves and mittens
3171	Women's handbags and purses
3172	Personal leather goods, nec
3199	Leather goods, not elsewhere classified

#### **Tobacco Products**

SIC	Description
2111	Cigarettes
2121	Cigars
2131	Chewing and smoking tobacco
2141	Tobacco stemming and redrying

#### **Canned and Bottled Beverages**

SIC	Description
2046	Wet corn milling
2047	Dog and cat food
2048	Prepared feeds, nec
2083	Malt
2087	Flavoring extracts and syrups, nec
2873	Nitrogenous fertilizers
2874	Phosphatic fertilizers
2875	Fertilizers, mixing only
2879	Agricultural chemicals, nec
3221	Class containers
3411	Metal cans

#### **Fat Oil Mills**

SIC	Description
2074	Cottonseed oil mills
2075	Soybean oil mills
2076	Vegetable oil mills, nec
2077	Animal and marine fats and oils
2079	Edible fats and oils, nec

#### **Aerospace**

SIC	Description
3463	Nonferrous forgings
3482	Small arms ammunition
3483	Ammunition, exc. for small arms, nec
3721	Aircraft
3724	Aircraft engines and engine parts
3728	Aircraft parts and equipment, nec
3761	Guided missiles and space vehicles
3764	Space propulsion units and parts
3769	Space vehicle equipment, nec
3812	Search and navigation equipment

#### **Petroleum Products**

SIC	Description
2895	Carbon black
2911	Petroleum refining
2951	Asphalt paving mixtures and blocks
2952	Asphalt felts and coatings
2992	Lubricating oils and greases

2999 Petroleum and coal products, nec

#### **Jewelry**

SIC Description  
 3339 Primary nonferrous metals, nec  
 3911 Jewelry, precious metal  
 3915 Jewelers' materials & lapidary work  
 3961 Costume jewelry

#### **Boat Building**

SIC Description  
 3732 Boat building and repairing  
 3543 Industrial patterns  
 3541 Machine tools, metal cutting types  
 3519 Internal combustion engines, nec  
 3511 Turbines and turbine generator sets

#### **Aluminum**

SIC Description  
 2819 Industrial inorganic chemicals, nec  
 3334 Primary aluminum  
 3353 Aluminum sheet, plate, and foil  
 3354 Aluminum extruded products  
 3355 Aluminum rolling and drawing, nec  
 3411 Metal cans  
 3463 Nonferrous forgings  
 3497 Metal foil and leaf

#### **Hospitals, Labs, Specialized Medical Services**

SIC Description  
 2731 Book publishing  
 7371 Computer programming services  
 7372 Prepackaged software  
 7373 Computer integrated systems design  
 7374 Data processing and preparation  
 7375 Information retrieval services  
 7376 Computer facilities management  
 7377 Computer rental & leasing  
 7378 Computer maintenance & repair  
 7379 Computer related services, nec  
 8042 Offices and clinics of optometrists  
 8043 Offices and clinics of podiatrists  
 8049 Offices of health practitioners, nec  
 8062 General medical and surgical hospitals  
 8063 Psychiatric hospitals  
 8069 Specialty hospitals, except psychiatric  
 8071 Medical laboratories  
 8072 Dental laboratories

8092 Kidney dialysis centers  
 8093 Specialty outpatient facilities, nec  
 8099 Health and allied services, nec  
 8731 Commercial physical research  
 8732 Commercial nonphysical research  
 8734 Testing laboratories

#### **Platemaking and Typesetting**

SIC Description  
 2791 Typesetting  
 2796 Platemaking services  
 2893 Printing ink  
 3555 Printing trades machinery

#### **Securities and Insurance**

SIC Description  
 6231 Security and commodity exchanges  
 6282 Investment advice  
 6289 Security and commodity exchange nec  
 6311 life insurance  
 6321 Accident and health insurance  
 6324 Hospital and medical service plans  
 6351 Surety insurance  
 6361 Title insurance  
 6371 Pension, health, and welfare funds  
 6399 Insurance carriers, nec  
 6531 Real estate agents and managers

#### **Banking and Advertising**

SIC Description  
 6011 Federal reserve banks  
 6019 Central reserve depository institutions, nec  
 6021 National commercial banks  
 6022 State commercial banks  
 6029 Commercial banks, nec  
 6035 Savings institutions, Federally chartered  
 6036 Savings institutions, not Federally chartered  
 6061 Credit unions, Federally chartered  
 6062 Credit unions, not Federally chartered  
 6081 Branched and agencies of foreign banks  
 6082 Foreign trade & intl. banking institutions  
 6091 Nondeposit trust facilities  
 6099 Functions related to depository banking, nec  
 6111 Federal and Fed.-sponsored credit  
 6141 Personal credit institutions  
 6153 Short-term bus. credit institutions, exc. ag  
 6159 Misc. business credit institutions  
 6162 Mortgage bankers and loan correspondents

6163 Loan Brokers  
 6211 Security brokers, dealers, & flotation co  
 6221 Commodity contracts brokers and dealers  
 7311 Advertising agencies  
 7312 Outdoor advertising services  
 7313 Radio, TV, publisher representatives  
 7319 Advertising, nec

**Legal Services**

SIC Description  
 8111 Legal services

**Transportation, Shipping, & Logistics**

SIC Description  
 4212 Local Trucking without Storage  
 4213 Trucking, except local  
 4214 Local Trucking with Storage  
 4215 Courier Services, except Air  
 4221 Farm product warehousing and storage  
 4222 Refrigerated warehousing and storage  
 4225 General warehousing and storage  
 4226 Special warehousing and storage, nec  
 4231 Trucking terminal facilities  
 4311 U.S. Postal Service  
 4412 Deep sea foreign transportation of freight  
 4424 Deep sea domestic transportation of freight  
 4432 Freight trans. on Great Lakes - St. Lawrence

4449 Water transport of freight, nec  
 4481 Deep sea passenger trans., ex. ferry  
 4482 Ferries  
 4489 Water passenger transportation, nec  
 4491 Marine cargo handling  
 4492 Towing and tugboat service  
 4493 Marinas  
 4499 Water transportation services, nec  
 4512 Air transportation, scheduled  
 4513 Air courier services  
 4522 Air transportation, nonscheduled  
 4612 Crude petroleum pipelines  
 4613 Refined petroleum pipelines  
 4619 Pipelines, nec  
 4731 Freight transportation arrangement  
 4741 Rental of railroad cars  
 4783 Packing and crating  
 4785 Vehicle inspection and weighing services  
 4789 Transportation services, nec

**Pharmaceuticals**

SIC Description  
 2833 Medicinals and botanicals  
 2834 Pharmaceutical preparations  
 2835 Diagnostic substances  
 2836 Biological products exc. diagnostic

Source: Edward .J. Feser, Associate Professor, Department of City and Regional Planning, University of North Carolina – Chapel Hill (2003)

## Appendix B

## Benchmark Technology-Intensive Clusters

Chemicals and Plastics			
SIC	Description		
2812	Alkalies and chlorine	3631	Household cooking equipment
2813	Industrial gases	3643	Current-carrying wiring devices
2816	Inorganic pigments	3644	Noncurrent-carrying wiring devices
2821	Plastics materials and resins	3661	Telephone and telegraph apparatus
2822	Synthetic rubber	3663	Radio & TV communications equipment
2823	Cellulosic manmade fibers	3669	Communications equipment, nec
2824	Organic fibers, noncellulosic	3672	Printed circuit boards
2841	Soap and other detergents	3674	Semiconductors and related devices
2842	Polishes and sanitation goods	3675	Electronic capacitors
2843	Surface active agents	3676	Electronic resistors
2844	Toilet preparations	3677	Electronic coils and transformers
2851	Paints, varnishes, lacquers, enamels, etc.	3678	Electronic connectors
2865	Cyclic crudes and intermediates	3679	Electronic components, nec
2869	Industrial organic chemicals, nec	3694	Engine electrical equipment
2873	Nitrogenous fertilizers	3699	Electrical equipment & supplies, nec
2874	Phosphatic fertilizers	3812	Search and navigation equipment
2875	Fertilizers, mixing only	3821	Laboratory apparatus and furniture
2879	Agricultural chemicals, nec	3822	Environmental controls
2891	Adhesives and sealants	3823	Process control instruments
2893	Printing ink	3824	Fluid meters and counting devices
2899	Chemical preparations, nec	3825	Instruments to measure electricity
3559	Special industry machinery, nec	3826	Analytical instruments
3624	Carbon and graphite products	3827	Optical instruments and lenses
3692	Primary batteries, dry and wet	3829	Measuring & controlling devices, nec
3843	Dental equipment and supplies	3844	X-ray apparatus and tubes
8071	Medical laboratories	3845	Electromedical equipment
8072	Dental laboratories	7371	Computer programming services
8092	Kidney dialysis centers	7372	Prepackaged software
8093	Specialty outpatient facilities, nec	7373	Computer integrated systems design
8099	Health and allied services, nec	7374	Data processing and preparation
		7375	Information retrieval services
		7379	Computer related services, nec
Information Technology and Instruments		Industrial Machinery	
SIC	Description	SIC	Description
3571	Electronic computers	3511	Turbines and turbine generator sets
3572	Computer storage devices	3532	Mining machinery
3575	Computer terminals	3535	Conveyors and conveying equipment
3577	Computer peripheral equipment, nec	3536	Hoists, cranes, and monorails
3578	Calculating and accounting equipment	3541	Machine tools, metal cutting types
3579	Office machines, nec	3542	Machine tools, metal forming types
3625	Relays and industrial controls	3546	Power-driven handtools
3629	Electrical industrial apparatus, nec	3547	Rolling mill machinery

3549	Metalworking machinery, nec
3553	Woodworking machinery
3555	Printing trades machinery
3556	Food products machinery
3559	Special industry machinery, nec
3561	Pumps and pumping equipment
3563	Air and gas compressors
3564	Blowers and fans
3565	Packaging machinery
3612	Transformers, except electronic
3621	Motors and generators

#### Motor Vehicle Manufacturing

SIC	Description
2851	Paints, varnishes, lacquers, enamels, etc.
2893	Printing ink
3519	Internal combustion engines, nec
3531	Construction machinery
3534	Elevators and moving stairways
3537	Industrial trucks and tractors
3548	Welding apparatus
3641	Electric lamps
3645	Residential lighting fixtures
3646	Commercial lighting fixtures
3647	Vehicular lighting equipment
3648	Lighting equipment, nec
3651	Household audio and video equipment
3691	Storage batteries
3694	Engine electrical equipment
3711	Motor vehicles and car bodies
3713	Truck and bus bodies
3714	Motor vehicle parts and accessories
3715	Truck trailers

#### Aerospace

SIC	Description
3544	Special dies, tools, jigs & fixtures
3545	Machine tool accessories
3721	Aircraft
3724	Aircraft engines and engine parts
8734	Testing laboratories

3728	Aircraft parts and equipment, nec
3761	Guided missiles and space vehicles
3764	Space propulsion units and parts
3769	Space vehicle equipment, nec

#### Household Appliances

SIC	Description
3632	Household refrigerators and freezers
3633	Household laundry equipment
3635	Household vacuum cleaners
3639	Household appliances, nec
3716	Motor homes

#### Communications Services and Software

SIC	Description
4899	Communications services, nec
7371	Computer programming services
7372	Prepackaged software
7373	Computer integrated systems design
7374	Data processing and preparation
7375	Information retrieval services
7379	Computer related services, nec
8711	Engineering services
8712	Architectural services
8713	Surveying services
8731	Commercial physical research
8732	Commercial nonphysical research
8734	Testing laboratories

#### Pharmaceuticals and Medical Technologies

SIC	Description
2833	Medicinals and botanicals
2834	Pharmaceutical preparations
2835	Diagnostic substances
2836	Biological products exc. diagnostic
3634	Electric housewares and fans
3841	Surgical and medical instruments
3842	Surgical appliances and supplies
8731	Commercial physical research
8732	Commercial nonphysical research

Source: Edward .J. Feser, Associate Professor, Department of City and Regional Planning, University of North Carolina – Chapel Hill (2003)



## Appendix C

## Benchmark Labor Clusters

<b>Low Skill, Non-Durable Manufacturing</b>	
2211 Broadwoven Fabric Mills, Cotton	2342 Brassieres, Girdles, and Allied Garments
2221 Broadwoven Fabric Mills, Manmade Fiber and Silk	2353 Hats, Caps, and Millinery
2231 Broadwoven Fabric Mills, Wool (Including Dyeing and Finishing)	2361 Girls', Children's, and Infants' Dresses, Blouses, and Shirts
2241 Narrow Fabric and Other Smallware Mills: Cotton, Wool, Silk, and Manmade Fiber	2369 Girls', Children's, and Infants' Outerwear, NEC
2251 Women's Full-Length and Knee-Length Hosiery, Except Socks	2371 Fur Goods
2252 Hosiery, NEC	2381 Dress and Work Gloves, Except Knit and All-Leather
2253 Knit Outerwear Mills	2384 Robes and Dressing Gowns
2254 Knit Underwear and Nightwear Mills	2385 Waterproof Outerwear
2257 Weft Knit Fabric Mills	2386 Leather and Sheep-Lined Clothing
2258 Lace and Warp Knit Fabric Mills	2387 Apparel Belts
2259 Knitting Mills, NEC	2389 Apparel and Accessories, NEC
2261 Finishers of Broadwoven Fabrics of Cotton	2391 Curtains and Draperies
2262 Finishers of Broadwoven Fabrics of Manmade Fiber and Silk	2392 Housefurnishings, Except Curtains and Draperies
2269 Finishers of Textiles, NEC	2393 Textile Bags
2273 Carpets and Rugs	2394 Canvas and Related Products
2281 Yarn Spinning Mills	2395 Pleating, Decorative and Novelty Stitching, and Tucking for the Trade
2282 Yarn Texturizing, Throwing, Twisting, and Winding Mills	2396 Automotive Trimmings, Apparel Findings, and Related Products
2284 Thread Mills	2397 Schiffli Machine Embroideries
2295 Coated Fabrics, Not Rubberized	2399 Fabricated Textile Products, NEC
2296 Tire Cord and Fabrics	2821 Plastics Material and Synthetic Resins, and Nonvulcanizable Elastomers
2297 Nonwoven Fabrics	2822 Synthetic Rubber
2298 Cordage and Twine	2823 Cellulosic Manmade Fibers
2299 Textile Goods, NEC	2824 Manmade Organic Fibers, Except Cellulosic
2311 Men's and Boys' Suits, Coats, and Overcoats	2851 Paints, Varnishes, Lacquers, Enamels, and Allied Products
2321 Men's and Boys' Shirts, Except Work Shirts	3021 Rubber and Plastics Footwear
2322 Men's and Boys' Underwear and Nightwear	3052 Rubber and Plastics Hose and Belting
2323 Men's and Boys' Neckwear	3053 Gaskets, Packing, and Sealing Devices
2325 Men's and Boys' Trousers and Slacks	3061 Molded, Extruded, and Lathe-Cut Mechanical Rubber Goods
2326 Men's and Boys' Work Clothing	3069 Fabricated Rubber Products, NEC
2329 Men's and Boys' Clothing, NEC	3081 Unsupported Plastics Film and Sheet
2331 Women's, Misses', and Juniors' Blouses and Shirts	3082 Unsupported Plastics Profile Shapes
2335 Women's, Misses', and Juniors' Dresses	3083 Laminated Plastics Plate, Sheet, and Profile Shapes
2337 Women's, Misses' and Juniors' Suits, Skirts, and Coats	3084 Plastics Pipe
2339 Women's, Misses', and Juniors' Outerwear, NEC	3085 Plastics Bottles
2341 Women's, Misses', Children's, and Infants' Underwear and Nightwear	3086 Plastics Foam Products
	3087 Custom Compounding of Purchased Plastics Resins



3088 Plastics Plumbing Fixtures  
 3089 Plastics Products, NEC  
 3111 Leather Tanning and Finishing  
 3151 Leather Gloves and Mittens  
 3161 Luggage  
 3171 Women's Handbags and Purses  
 3172 Personal Leather Goods, Except Women's Handbags and Purses  
 3199 Leather Goods, NEC  
 3523 Farm Machinery and Equipment  
 3524 Lawn and Garden Tractors and Home Lawn and Garden Equipment  
 3531 Construction Machinery and Equipment  
 3532 Mining Machinery and Equipment, Except Oil and Gas Field Machinery and Equipment  
 3533 Oil and Gas Field Machinery and Equipment  
 3534 Elevators and Moving Stairways  
 3535 Conveyors and Conveying Equipment  
 3536 Overhead Traveling Cranes, Hoists, and Monorail Systems  
 3537 Industrial Trucks, Tractors, Trailers, and Stackers  
 3581 Automatic Vending Machines  
 3582 Commercial Laundry, Drycleaning, and Pressing Machines  
 3585 Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment  
 3586 Measuring and Dispensing Pumps  
 3589 Service Industry Machinery, NEC  
 3631 Household Cooking Equipment  
 3632 Household Refrigerators and Home and Farm Freezers  
 3633 Household Laundry Equipment  
 3634 Electric Housewares and Fans  
 3635 Household Vacuum Cleaners  
 3639 Household Appliances, NEC  
 3792 Travel Trailers and Campers  
 3795 Tanks and Tank Components  
 3799 Transportation Equipment, NEC  
 3911 Jewelry, Precious Metal  
 3914 Silverware, Plated Ware, and Stainless Steel Ware  
 3915 Jewelers' Findings and Materials, and Lapidary Work

#### **Information Processing**

4731 Arrangement of Transportation of Freight and Cargo  
 6311 Life Insurance  
 6321 Accident and Health Insurance

6324 Hospital and Medical Service Plans  
 6331 Fire, Marine, and Casualty Insurance  
 6351 Surety Insurance  
 6361 Title Insurance  
 6371 Pension, Health, and Welfare Funds  
 6399 Insurance Carriers, NEC  
 6531 Real Estate Agents and Managers  
 7371 Computer Programming Services  
 7372 Prepackaged Software  
 7373 Computer Integrated Systems Design  
 7374 Computer Processing and Data Preparation and Processing Services  
 7375 Information Retrieval Services  
 7376 Computer Facilities Management Services  
 7377 Computer Rental and Leasing  
 7378 Computer Maintenance and Repair  
 7379 Computer Related Services, NEC  
 8721 Accounting, Auditing, and Bookkeeping Services

#### **Low Skill, Misc. Manufacturing**

2011 Meat Packing Plants  
 2013 Sausages and Other Prepared Meats  
 2015 Poultry Slaughtering and Processing  
 2032 Canned Specialties  
 2033 Canned Fruits, Vegetables, Preserves, Jams, and Jellies  
 2034 Dried and Dehydrated Fruits, Vegetables, and Soup Mixes  
 2035 Pickled Fruits and Vegetables, Vegetable Sauces and Seasonings, and Salad Dressings  
 2037 Frozen Fruits, Fruit Juices, and Vegetables  
 2038 Frozen Specialties, NEC  
 2091 Canned and Cured Fish and Seafood  
 2092 Prepared Fresh or Frozen Fish and Seafoods  
 2095 Roasted Coffee  
 2096 Potato Chips, Corn Chips, and Similar Snacks  
 2097 Manufactured Ice  
 2098 Macaroni, Spaghetti, Vermicelli, and Noodles  
 2099 Food Preparations, NEC  
 2421 Sawmills and Planing Mills, General  
 2426 Hardwood Dimension and Flooring Mills  
 2429 Special Product Sawmills, NEC  
 2441 Nailed and Lock Corner Wood Boxes and Shook  
 2448 Wood Pallets and Skids  
 2449 Wood Containers, NEC  
 2499 Wood Products, NEC

2791 Typesetting  
 2796 Platemaking and Related Services  
 2841 Soaps and Other Detergents, Except Speciality Cleaners  
 2842 Speciality Cleaning, Polishing, and Sanitary Preparations  
 2843 Surface Active Agents, Finishing Agents, Sulfonated Oils, and Assistants  
 2844 Perfumes, Cosmetics, and Other Toilet Preparations  
 3142 House Slippers  
 3143 Men's Footwear, Except Athletic  
 3144 Women's Footwear, Except Athletic  
 3149 Footwear, Except Rubber, NEC  
 4412 Deep Sea Foreign Transportation of Freight  
 4424 Deep Sea Domestic Transportation of Freight  
 4432 Freight Transportation on the Great Lakes - St. Lawrence Seaway  
 4449 Water Transportation of Freight, NEC  
 4481 Deep Sea Transportation of Passengers, Except by Ferry  
 4482 Ferries  
 4489 Water Transportation of Passengers, NEC  
 4491 Marine Cargo Handling  
 4492 Towing and Tugboat Services  
 4493 Marinas  
 4499 Water Transportation Services, NEC  
 4783 Packing and Crating  
 4785 Fixed Facilities and Inspection and Weighing Services for Motor Vehicle Transportation  
 4789 Transportation Services, NEC

**Standardized Heavy Industry**

2611 Pulp Mills  
 2621 Paper Mills  
 2631 Paperboard Mills  
 3131 Boot and Shoe Cut Stock and Findings  
 3211 Flat Glass  
 3221 Glass Containers  
 3229 Pressed and Blown Glass and Glassware, NEC  
 3231 Glass Products, Made of Purchased Glass  
 3312 Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills  
 3313 Electrometallurgical Products, Except Steel  
 3315 Steel Wiredrawing and Steel Nails and Spikes  
 3316 Cold-Rolled Steel Sheet, Strip, and Bars  
 3317 Steel Pipe and Tubes  
 3321 Gray and Ductile Iron Foundries  
 3322 Malleable Iron Foundries

3324 Steel Investment Foundries  
 3325 Steel Foundries, NEC  
 3331 Primary Smelting and Refining of Copper  
 3334 Primary Production of Aluminum  
 3339 Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum  
 3341 Secondary Smelting and Refining of Nonferrous Metals  
 3351 Rolling, Drawing, and Extruding of Copper  
 3353 Aluminum Sheet, Plate, and Foil  
 3354 Aluminum Extruded Products  
 3355 Aluminum Rolling and Drawing, NEC  
 3356 Rolling, Drawing, and Extruding of Nonferrous Metals, Except Copper and Aluminum  
 3357 Drawing and Insulating of Nonferrous Wire  
 3363 Aluminum Die-Castings  
 3364 Nonferrous Die-Castings, Except Aluminum  
 3365 Aluminum Foundries  
 3366 Copper Foundries  
 3369 Nonferrous Foundries, Except Aluminum and Copper  
 3411 Metal Cans  
 3412 Metal Shipping Barrels, Drums, Kegs, and Pails  
 3421 Cutlery  
 3423 Hand and Edge Tools, Except Machine Tools and Handsaws  
 3425 Saw Blades and Handsaws  
 3429 Hardware, NEC  
 3431 Enameled Iron and Metal Sanitary Ware  
 3432 Plumbing Fixture Fittings and Trim  
 3433 Heating Equipment, Except Electric and Warm Air Furnaces  
 3451 Screw Machine Products  
 3452 Bolts, Nuts, Screws, Rivets, and Washers  
 3462 Iron and Steel Forgings  
 3463 Nonferrous Forgings  
 3465 Automotive Stamping  
 3466 Crowns and Closures  
 3469 Metal Stamping, NEC  
 3471 Electroplating, Plating, Polishing, Anodizing, and Coloring  
 3479 Coating, Engraving, and Allied Services, NEC  
 3482 Small Arms Ammunition  
 3483 Ammunition, Except for Small Arms  
 3484 Small Arms  
 3489 Ordnance and Accessories, NEC  
 3491 Industrial Valves  
 3492 Fluid Power Valves and Hose Fittings

3493 Steel Springs, Except Wire  
 3494 Valves and Pipe Fittings, NEC  
 3495 Wire Springs  
 3496 Miscellaneous Fabricated Wire Products  
 3497 Metal Foil and Leaf  
 3498 Fabricated Pipe and Pipe Fittings  
 3499 Fabricated Metal Products, NEC  
 3511 Steam, Gas, and Hydraulic Turbines, and Turbine Generator Set Units  
 3519 Internal Combustion Engines, NEC  
 3561 Pumps and Pumping Equipment  
 3562 Ball and Roller Bearings  
 3563 Air and Gas Compressors  
 3564 Industrial and Commercial Fans and Blowers and Air Purification Equipment  
 3565 Packaging Machinery  
 3566 Speed Changers, Industrial High-Speed Drives, and Gears  
 3567 Industrial Process Furnaces and Ovens  
 3568 Mechanical Power Transmission Equipment, NEC  
 3569 General Industrial Machinery and Equipment, NEC  
 3711 Motor Vehicles and Passenger Car Bodies  
 3713 Truck and Bus Bodies  
 3714 Motor Vehicle Parts and Accessories  
 3715 Truck Trailers  
 3716 Motor Homes  
 3743 Railroad Equipment  
 3841 Surgical and Medical Instruments and Apparatus  
 3842 Orthopedic, Prosthetic, and Surgical Appliances and Supplies  
 3843 Dental Equipment and Supplies  
 3844 X-Ray Apparatus and Tubes and Related Irradiation Apparatus  
 3845 Electromedical and Electrotherapeutic Apparatus  
 3851 Ophthalmic Goods  
 4311 United States Postal Service

#### **High End Information/Business Services**

2711 Newspapers: Publishing, or Publishing and Printing  
 2721 Periodicals: Publishing, or Publishing and Printing  
 2731 Books: Publishing, or Publishing and Printing  
 2732 Book Printing  
 2741 Miscellaneous Publishing  
 2752 Commercial Printing, Lithographic

2754 Commercial Printing, Gravure  
 2759 Commercial Printing, NEC  
 7311 Advertising Agencies  
 7312 Outdoor Advertising Services  
 7313 Radio, Television, and Publishers' Advertising Representatives  
 7319 Advertising, NEC  
 8111 Legal Services

#### **Distribution, Freight Handling**

2411 Logging  
 3271 Concrete Block and Brick  
 3272 Concrete Products, Except Block and Brick  
 3273 Ready-Mixed Concrete  
 3274 Lime  
 3275 Gypsum Products  
 4212 Local Trucking Without Storage  
 4213 Trucking, Except Local  
 4214 Local Trucking with Storage  
 4215 Courier Services Except by Air  
 4221 Farm Product Warehousing and Storage  
 4222 Refrigerated Warehousing and Storage  
 4225 General Warehousing and Storage  
 4226 Special Warehousing and Storage, NEC  
 4231 Terminal and Joint Terminal Maintenance Facilities for Motor Freight Transportation  
 4512 Air Transportation, Scheduled  
 4513 Air Courier Services  
 4522 Air Transportation, Nonscheduled  
 4581 Airports, Flying Fields, and Airport Terminal Services

#### **Electronics, Measuring Devices**

3571 Electronic Computers  
 3572 Computer Storage Devices  
 3575 Computer Terminals  
 3577 Computer Peripheral Equipment, NEC  
 3578 Calculating and Accounting Machines, Except Electronic Computers  
 3579 Office Machines, NEC  
 3612 Power, Distribution, and Specialty Transformers  
 3613 Switchgear and Switchboard Apparatus  
 3621 Motors and Generators  
 3624 Carbon and Graphite Products  
 3625 Relays and Industrial Controls  
 3629 Electrical Industrial Apparatus, NEC  
 3641 Electric Lamp Bulbs and Tubes  
 3643 Current-Carrying Wiring Devices

3644 Noncurrent-Carrying Wiring Devices  
 3645 Residential Electric Lighting Fixtures  
 3646 Commercial, Industrial, and Institutional Electric Lighting Fixtures  
 3647 Vehicular Lighting Equipment  
 3648 Lighting Equipment, NEC  
 3651 Household Audio and Video Equipment  
 3652 Phonograph Records and Prerecorded Audio Tapes and Disks  
 3661 Telephone and Telegraph Apparatus  
 3663 Radio and Television Broadcasting and Communications Equipment  
 3669 Communications Equipment, NEC  
 3671 Electron Tubes  
 3672 Printed Circuit Boards  
 3674 Semiconductors and Related Devices  
 3675 Electronic Capacitors  
 3676 Electronic Resistors  
 3677 Electronic Coils, Transformers, and Other Inductors  
 3678 Electronic Connectors  
 3679 Electronic Components, NEC  
 3691 Storage Batteries  
 3692 Primary Batteries, Dry and Wet  
 3694 Electrical Equipment for Internal Combustion Engines  
 3695 Magnetic and Optical Recording Media  
 3699 Electrical Machinery, Equipment, and Supplies, NEC  
 3821 Laboratory Apparatus and Furniture  
 3822 Automatic Controls for Regulating Residential and Commercial Environments and Appliances  
 3823 Industrial Instruments for Measurement, Display, and Control of Process Variables; and Related Products  
 3824 Totalizing Fluid Meters and Counting Devices  
 3825 Instruments for Measuring and Testing of Electricity and Electrical Signals  
 3826 Laboratory Analytical Instruments  
 3827 Optical Instruments and Lenses  
 3829 Measuring and Controlling Devices, NEC  
 3861 Photographic Equipment and Supplies

#### **Chemicals, Pharmaceuticals**

2812 Alkalies and Chlorine  
 2813 Industrial Gases  
 2816 Inorganic Pigments  
 2819 Industrial Inorganic Chemicals, NEC  
 2833 Medicinal Chemicals and Botanical Products

2834 Pharmaceutical Preparations  
 2835 In Vitro and In Vivo Diagnostic Substances  
 2836 Biological Products, Except Diagnostic Substances  
 2861 Gum and Wood Chemicals  
 2865 Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments  
 2869 Industrial Organic Chemicals, NEC  
 2873 Nitrogenous Fertilizers  
 2874 Phosphatic Fertilizers  
 2875 Fertilizers, Mixing Only  
 2879 Pesticides and Agricultural Chemicals, NEC  
 2891 Adhesives and Sealants  
 2892 Explosives  
 2893 Printing Ink  
 2895 Carbon Black  
 2899 Chemicals and Chemical Preparations, NEC

#### **Telecomm and Banking**

4812 Radiotelephone Communications  
 4813 Telephone Communications, Except Radiotelephone  
 6011 Federal Reserve Banks  
 6019 Central Reserve Depository Institutions, NEC  
 6021 National Commercial Banks  
 6022 State Commercial Banks  
 6029 Commercial Banks, NEC  
 6035 Savings Institutions, Federally Chartered  
 6036 Savings institutions, Not Federally Chartered  
 6061 Credit Unions, Federally Chartered  
 6062 Credit Unions, Not Federally Chartered  
 6081 Branches and Agencies of Foreign Banks  
 6082 Foreign Trade and International Banking Institutions  
 6091 Nondeposit Trust Facilities  
 6099 Functions Related to Deposit Banking, NEC  
 6111 Federal and Federally-Sponsored Credit Agencies  
 6141 Personal Credit Institutions  
 6153 Short-Term Business Credit Institutions, Except Agricultural  
 6159 Miscellaneous Business Credit Institutions  
 6162 Mortgage Bankers and Loan Correspondents  
 6163 Loan Brokers

### Science Intensive

- 3761 Guided Missiles and Space Vehicles
- 3764 Guided Missile and Space Vehicle Propulsion Units and Propulsion Unit Parts
- 3769 Guided Missile Space Vehicle Parts and Auxiliary Equipment, NEC
- 3812 Search, Detection, Navigation, Guidance, Aeronautical, and Nautical Systems and Instruments
- 4822 Telegraph and Other Message Communications
- 4899 Communications Services, NEC
- 8711 Engineering Services
- 8712 Architectural Services
- 8713 Surveying Services
- 8731 Commercial Physical and Biological Research
- 8732 Commercial Economic, Sociological, and Educational Research
- 8733 Noncommercial Research Organizations
- 8734 Testing Laboratories

### High Tech Machinery, Instruments

- 3541 Machine Tools, Metal Cutting Type
- 3542 Machine Tools, Metal Forming Type
- 3543 Industrial Patterns
- 3544 Special Dies and Tools, Die Sets, Jigs and Fixtures, and Industrial Molds
- 3545 Cutting Tools, Machine Tool Accessories, and Machinists' Precision Measuring Devices
- 3546 Power-Driven Handtools
- 3547 Rolling Mill Machinery and Equipment
- 3548 Electric and Gas Welding and Soldering Equipment
- 3549 Metalworking Machinery, NEC
- 3552 Textile Machinery
- 3553 Woodworking Machinery
- 3554 Paper Industries Machinery
- 3555 Printing Trades Machinery and Equipment
- 3556 Food Products Machinery
- 3559 Special Industry Machinery, NEC
- 3592 Carburetors, Pistons, Piston Rings, and Valves
- 3593 Fluid Power Cylinders and Actuators
- 3594 Fluid Power Pumps and Motors
- 3596 Scales and Balances, Except Laboratory
- 3599 Industrial and Commercial Machinery and Equipment, NEC
- 3931 Musical Instruments

### Petroleum

- 2911 Petroleum Refining
- 3721 Aircraft
- 3724 Aircraft Engines and Engine Parts
- 3728 Aircraft Parts and Auxiliary Equipment, NEC
- 4612 Crude Petroleum Pipelines
- 4613 Refined Petroleum Pipelines
- 4619 Pipelines, NEC

### Health Services

- 8011 Offices and Clinics of Doctors of Medicine
- 8021 Offices and Clinics of Dentists
- 8031 Offices and Clinics of Doctors of Osteopathy
- 8041 Offices and Clinics of Chiropractors
- 8042 Offices and Clinics of Optometrists
- 8043 Offices and Clinics of Podiatrists
- 8049 Offices and Clinics of Health Practitioners, NEC
- 8051 Skilled Nursing Care Facilities
- 8052 Intermediate Care Facilities
- 8059 Nursing and Personal Care Facilities, NEC
- 8062 General Medical and Surgical Hospitals
- 8063 Psychiatric Hospitals
- 8069 Specialty Hospitals, Except Psychiatric
- 8071 Medical Laboratories
- 8072 Dental Laboratories
- 8082 Home Health Care Services
- 8092 Kidney Dialysis Centers
- 8093 Specialty Outpatient Facilities, NEC
- 8099 Health and Allied Services, NEC

### Specialized Labor Intensive

- 1081 Metal Mining Services
- 2451 Mobile Homes
- 2452 Prefabricated Wood Buildings and Components
- 2491 Wood Preserving
- 2493 Reconstituted Wood Products
- 2511 Wood Household Furniture, Except Upholstered
- 2512 Wood Household Furniture, Upholstered
- 2514 Metal Household Furniture
- 2515 Mattresses, Foundations, and Convertible Beds
- 2517 Wood Television, Radio, Phonograph and Sewing Machine Cabinets
- 2519 Household Furniture, NEC
- 2521 Wood Office Furniture
- 2522 Office Furniture, Except Wood
- 2531 Public Building and Related Furniture



2591 Drapery Hardware and Window Blinds and Shades  
 2599 Furniture and Fixtures, NEC  
 2652 Setup Paperboard Boxes  
 2653 Corrugated and Solid Fiber Boxes  
 2655 Fiber Cans, Tubes, Drums, and Similar Products  
 2656 Sanitary Food Containers, Except Folding  
 2657 Folding Paperboard Boxes, Including Sanitary  
 2671 Packaging Paper and Plastics Film, Coated and Laminated  
 2672 Coated and Laminated Paper, NEC  
 2673 Plastics, Foil, and Coated Paper Bags  
 2674 Uncoated Paper and Multiwall Bags  
 2675 Die-Cut Paper and Paperboard and Cardboard  
 2676 Sanitary Paper Products  
 2677 Envelopes  
 2678 Stationery, Tablets, and Related Products  
 2679 Converted Paper and Paperboard Products, NEC  
 2761 Manifold Business Forms  
 2771 Greeting Cards  
 2782 Blankbooks, Loose-leaf Binders and Devices  
 2789 Bookbinding and Related Work  
 3011 Tires and Inner Tubes  
 3398 Metal Heat Treating  
 3399 Primary Metal Products, NEC  
 3441 Fabricated Structural Metal  
 3442 Metal Doors, Sash, Frames, Molding, and Trim Manufacturing  
 3443 Fabricated Plate Work (Boiler Shops)  
 3444 Sheet Metal Work  
 3446 Architectural and Ornamental Metal Work  
 3448 Prefabricated Metal Buildings and Components  
 3449 Miscellaneous Structural Metal Work  
 3731 Ship Building and Repairing  
 3732 Boat Building and Repairing  
 3751 Motorcycles, Bicycles, and Parts  
 3873 Watches, Clocks, Clockwork Operated Devices and Parts  
 3942 Dolls and Stuffed Toys  
 3944 Games, Toys, and Children's Vehicles, Except Dolls and Bicycles  
 3949 Sporting and Athletic Goods, NEC  
 3951 Pens, Mechanical Pencils, and Parts  
 3952 Lead Pencils, Crayons, and Artist's Materials  
 3953 Marking Devices  
 3955 Carbon Paper and Inked Ribbons  
 3961 Costume Jewelry and Costume Novelties, Except Precious Metals

3965 Fasteners, Buttons, Needles, and Pins  
 3991 Brooms and Brushes  
 3993 Signs and Advertising Specialties  
 3995 Burial Caskets  
 3996 Linoleum, Asphalted-Felt-Base, and Other Hard Surface Floor Coverings, NEC  
 3999 Manufacturing Industries, NEC

#### **Food and Tobacco Manufacturing**

2021 Creamery Butter  
 2022 Natural, Processed, and Imitation Cheese  
 2023 Dry, Condensed, and Evaporated Dairy Products  
 2024 Ice Cream and Frozen Desserts  
 2026 Fluid Milk  
 2041 Flour and Other Grain Mill Products  
 2043 Cereal Breakfast Foods  
 2044 Rice Milling  
 2045 Prepared Flour Mixes and Doughs  
 2046 Wet Corn Milling  
 2047 Dog and Cat Food  
 2048 Prepared Feed and Feed Ingredients for Animals and Fowls, Except Dogs and Cats  
 2051 Bread and Other Bakery Products, Except Cookies and Crackers  
 2052 Cookies and Crackers  
 2053 Frozen Bakery Products, Except Bread  
 2061 Cane Sugar, Except Refining  
 2062 Cane Sugar Refining  
 2063 Beet Sugar  
 2064 Candy and Other Confectionery Products  
 2066 Chocolate and Cocoa Products  
 2067 Chewing Gum  
 2068 Salted and Roasted Nuts and Seeds  
 2074 Cottonseed Oil Mills  
 2075 Soybean Oil Mills  
 2076 Vegetable Oil Mills, Except Corn, Cottonseed, and Soybeans  
 2077 Animal and Marine Fats and Oils  
 2079 Shortening, Table Oils, Margarine, and Other Edible Fats and Oils, NEC  
 2082 Malt Beverages  
 2083 Malt  
 2084 Wines, Brandy, and Brandy Spirits  
 2085 Distilled and Blended Liquors  
 2086 Bottled and Canned Soft Drinks and Carbonated Waters  
 2087 Flavoring Extracts and Flavoring Syrups NEC  
 2111 Cigarettes

2121 Cigars	Shelving, and Lockers
2131 Chewing and Smoking Tobacco and Snuff	2542 Office and Store Fixtures, Partitions, Shelving, and Lockers, Except Wood
2141 Tobacco Stemming and Redrying	3241 Cement, Hydraulic
2992 Lubricating Oils and Greases	3251 Brick and Structural Clay Tile
2999 Products of Petroleum and Coal, NEC	3253 Ceramic Wall and Floor Tile
<b>Securities</b>	3255 Clay Refractories
6211 Security Brokers, Dealers, and Flotation Companies	3259 Structural Clay Products, NEC
6221 Commodity Contracts Brokers and Dealers	3261 Vitreous China Plumbing Fixtures and China and Earthenware Fittings and Bathroom Accessories
6231 Security and Commodity Exchanges	3262 Vitreous China Table and Kitchen Articles
6282 Investment Advice	3263 Fine Earthenware (Whiteware) Table and Kitchen Articles
6289 Services Allied With the Exchange of Securities or Commodities, NEC	3264 Porcelain Electrical Supplies
<b>Building Products</b>	3269 Pottery Products, NEC
2431 Millwork	3281 Cut Stone and Stone Products
2434 Wood Kitchen Cabinets	3295 Minerals and Earths, Ground or Otherwise Treated
2435 Hardwood Veneer and Plywood	3296 Mineral Wool
2436 Softwood Veneer and Plywood	3299 Nonmetallic Mineral Products, NEC
2439 Structural Wood Members, NEC	
2541 Wood Office and Store Fixtures, Partitions,	

Source: Edward J. Feser, Associate Professor, Department of City and Regional Planning, University of North Carolina – Chapel Hill (2003).