# Economic Analysis and Insight into Development Opportunities

An Interactive Qualifying Project Report
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
Degree of Bachelor of Science
by


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December 18, 2003

## Executive Summary

Economic development is a critical portion of a community development plan in that the industries located in a community help determine both the character of a region and the composition of its residents. Industries give a city character by providing services which are generally more focused in particular sectors, such as manufacturing, the arts, or health care. The focus points of a city's economy can make or break the reputation of that city. For example, Silicon Valley is known as such due to the amount of computer chip manufacturing that takes place in the area. Similarly, the industries that comprise a large portion of Worcester's economy will shape the reputation the city has for any potential businesses that consider locating themselves there. Not only will the industries present in a city affect the character of a city and the types of businesses that decide to locate there, the industries provide employment opportunities for the residents. It is important for the employment opportunities of a city to meet the needs of the city's residents. The needs include the number and types of employment available. If few jobs are available to the residents of a city, the city's unemployment rate and poverty levels will be high. If there are sufficient employment opportunities, yet these opportunities are inaccessible to a city's residents due to the skills required to perform the job or the physical location of the job, a city's unemployment and poverty levels will be high as well. For these reasons, it is critical that a city address the needs of its community by implementing policies that attract the most appropriate types of businesses and place those businesses in the most appropriate areas.

This report addresses the economic development portion of Executive Order 418, which contains directions for analyzing the economic status of a community and ideas for developing plans to better meet the needs of a city's residents. In determining what the economic status of Worcester was, the city was compared to other cities deemed similar in terms of employment. These chosen cities of comparison included Springfield, Lowell, Cambridge, and Providence. As a result of these comparisons, Worcester was found to be competitive in terms of household income distribution. Financially, the residents of Worcester fare better than those of Providence and Springfield but not quite as well as those of Lowell and Cambridge. In terms of education, Worcester's workforce is more highly educated than those of the other comparison cities with the exception of Cambridge. Seeing that Worcester is home to several colleges, this statistic is not so surprising. What is surprising is the percentage of Cambridge's workforce that is more highly educated. Cambridge's workforce is not just marginally more educated than Worcester's workforce. Close to 70% of Cambridge's workforce has a college education while around 30% of Worcester's workforce meets that same standard. In terms of employment rate, Worcester's workforce has a lower unemployment rate that those of Lowell and Springfield. The workforces of Cambridge and Providence enjoy a lower unemployment rate than Worcester. In terms of median household income and per capita income, Worcester performs well compared to the comparison cities. The median household incomes of both Cambridge and Lowell exceed Worcester's median household income. However, only Cambridge's per capita income exceeds that of Worcester. In comparing the residents of Worcester with those of the other cities, Worcester's residents seem to be well educated and make average amounts of money.

In identifying which industries provide considerable employment opportunities when compared to the state, a quotient analysis was conducted. A quotient ratio greater than one indicated industries in which the city's proportion of employment in that particular industry is greater than the state's proportion of employment in that same industry. Quotient ratios equal to one mean the proportion of employment for the city is equal to the state's proportion of employment in that industry. Thus, quotient ratios less than one indicate which industries have a lower concentration of employment at the city level than at the state level. In examining the quotient ratios of all major 2-digit NAICS industry sectors, the five that topped the list were 1) health care and social assistance, 2) management of companies and enterprises, 3) educational services, 4) finance and insurance, and 5) other services, except public administration. In comparing the quotient ratios of those five leading industries for Worcester with the resulting quotient ratios of those industries for the other cities, Worcester outperformed all other cities in health care and social assistance. Worcester matched Providence in management of companies and enterprises but outperformed the other cities. In education services, however, Cambridge's quotient ratio of nearly 3 exceeded Worcester's quotient ratio of 1.3 by a large margin. In both finance and insurance and other services, Springfield's quotient ratios are higher than the corresponding ratios of Worcester.

In examining the lowest five industries of Worcester, with the exception of agricultural services, the list includes 1) accommodation and food services, 2) real estate, rental, and leasing, 3) professional and technical services, 4) information, and 5) transportation and warehousing. In both accommodation and food services and information, Worcester's quotient ratios are lower than those of the comparison cities. Being a college town, Worcester's performance in accommodation and food services seems surprisingly poor. In real estate, rental, and leasing and transportation and warehousing, only Cambridge has a lower quotient ratio than Worcester. Cambridge's quotient ratio for professional and technical services is nearly 3. Worcester performs only above Springfield in that sector. Worcester's performance in professional and technical services as well as information should be higher considering the educational facilities in the area.

We examined industry sectors that are complimentary to the strong sectors of Worcester's economy but are weak in comparison. These include manufacturing, construction, information, and professional and technical services. The latter two were mentioned as trailing industries for the city.

A suitability analysis was completed for the City in order to determine the most appropriate locations for specific types of industries. The suitability analysis is based on a list of scoring criteria that includes proximity to major roads, complementary industries, similar industries, rail, etc. Resulting from this analysis, we find that manufacturing tends to fall in a vertical line down the center of the City. Arts, entertainment, and recreation is most suitable downtown, and retail is most suitable right above the area.

Three recommendations of which industries to bring into the city were made: 1) professional and technical services, 2) arts, entertainment, and recreation, and 3) medical and precision instrument manufacturing. It seems appropriate to introduce professional and technical services. For Worcester, this industry is trailing. For Cambridge, this industry sector has a quotient ratio of 2.8. The professional and technical services sector would provide employment opportunities for recent college graduates. In this manner,

the education level of the City's residents might increase. According to the suitability map, there are many suitable locations for this sector of the economy, seeing that office space is all that is needed to accommodate this type of industry. Professional and technical service industries also complement existing industries. Another recommendation is to make the downtown portion of the city into an arts district. Worcester's quotient ratio for arts, entertainment, and recreation is nearly one, meaning that sector of the City's economy has the potential to be considerable. There is currently a master plan for Worcester's Art District in that exact location. Industries that fall in the arts, entertainment, and recreation sector are appealing to college students. If more industries of that type existed in the City, college students might spend more of the money within City boundaries, thus, improving the economy of the region. Finally, an arts district would create aesthetic incentives for incoming businesses. As a last recommendation, introducing medical and precision instrument manufacturing to the area may be beneficial. There are many brownfield sites located in the City, when manufacturing companies relocated out of Worcester in the mid to late 40's. These sites are unsuitable for most industry types. However, other manufacturing industries would fit nicely in these underutilized parcels of land. These parcels are also large enough to situate manufacturing companies. This type of high tech manufacturing would complement the medical and education sectors of Worcester's economy.

These industries would help secure Worcester's reputation as a biotech and high tech city and would enhance the cultural and visual appeal of the city. These industries would create jobs for the college students of the area after graduation as well as recreational opportunities that take advantage of this population group. In considering employment opportunities and city character, these industries seem like they could be a positive addition. In making these recommendations, the City may present these recommendations and/or others of their choice to the community to determine which projects are supported by the City's residents and thus, are worth pursuing.

**Authorship**

All project members took part in the design and writing of this project. The introduction, literature review, methodology, and evaluation of data sources, conclusions, and final recommendations sections were collectively written and edited by all three of us. Jessica was primarily responsible for writing the time series analysis, quotient analysis, and comparison to the consolidated metropolitan area sections of the report. Chris was primarily responsible for writing comparison with other cities and the evaluation of data sources. He also contributed towards the mapping and portions of the suitability analysis sections. Joshua was primarily responsible for writing the suitability analysis sections. He was also responsible for generating the many suitability databases, maps, and other technical aspects of the project.

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## Chapter 1: Introduction

In the grandest sense our project aims to provide a framework for constructing economic development plans for Worcester. These plans for the future will have the long-term effect of increasing the quality of life for the citizens of Worcester and establish sustainability for the years to come.

We will accomplish this by analyzing Worcester's businesses, industries, and general economy. Our goals include determining which areas of the City are available for new business, where existing business can expand, and determining the positive and negative effects these changes would have on the City. By looking at current employment rates, business, housing, and population changes we can assess how Worcester needs to adapt to better suit the current and future economies.

Since we are completing the initial analysis as stated in Executive order 418, there is no previous information on Worcester's economic status for us to examine. Thus, it is our task to gather the required data, organize it, and present it in a meaningful way so that city planners may be better equipped to make decisions regarding the City. This gap in previous studies on Worcester's economy also gives us an opportunity to look at its economy from a fresh perspective, so that we might suggest possible improvements that no one has previously considered.

In completing this project, we will use several analysis techniques such as cluster analysis, time series analysis, and suitability analysis. Cluster analysis will be used to identify industry clusters within the City. This information is useful because it will identify which industries are thriving in Worcester and which are not. Time series analysis will give us a historical perspective in seeing how businesses have grown and developed, or declined. This information is useful because it will identify trends in the economy. If we notice a particular declining trend we may want to suggest improvements to bring that particular industry back into the economy. Suitability analysis allows us to take the results of our previous analysis and develop our own recommendations for the City in terms of which industries need to be brought into the city and where can they be placed.

In making our recommendations, we will determine whether the best plan of action is to strengthen industry clusters that are already thriving or to focus on the weak sectors of the economy. We may also try to deepen a thriving industry cluster by introducing complementary industries. Ultimately, we want to make Worcester a sustainable city that does not rely heavily on nearby economies. As much as we want strong industry clusters, we also want Worcester to have a diversified economy. In order for city planners to make informed decisions, a strong basis of information is essential. Developing this basis of information is the main focus of our project.

## Chapter 2: Literature Review

Our project involves researching and analyzing Worcester's businesses, industries, and general economy. Our goals include determining which areas of the city are available for new business, where existing business can expand, and determining the positive and negative effects these changes would have on the city. By looking at current employment rates, business, housing, and population changes we can assess how Worcester needs to adapt to better suit the current and future economies.

Specific goals for this project are developing an economic profile of Worcester, a suitability analysis for future economic growth and development, the creation of maps depicting areas most suitable for growth, major employers and commercial sites, and creating a map of economic development activities. In order to develop an economic profile of Worcester we must examine government data sources, such as the North American Industry Classification System (NAICS) and Covered Employment and Wages (ES-202), identify industry clusters through quotient analysis, do a time series analysis of Worcester's economy, and complete a spatial analysis of Worcester's employment and economic development.

In researching our goals for the project we have identified two main areas of knowledge required for the success of our project. The first major area we need to address is background on the city of Worcester. Major subsets of this area include knowing about Worcester's economic history, previous plans for economic change, current plans and ongoing projects to improve the City's economy, and examining the current state of Worcester's economy.

Knowledge of Worcester's past is vitally important to our project because by examining its past we can plan for the future. By looking at Worcester's economic history we can better understand the original industries of the city and how the city grew from them. We can use the successes of businesses in the past as models to show us how to develop current industry into a thriving economy. Previous plans that have been developed are also instrumental to our project. By looking at previous IQPs, town plans, and economic analyses, we can see what the goals of the city of Worcester were. Having an idea of what the city's plans and long term goals are will aid us in our development of strategies to help strengthen the Worcester economy. Examining Worcester's current economy and ongoing projects is another necessary component of our project. Applying Worcester's current economic plans to our analysis enables us to forecast where the city is heading and if it's heading in the right direction.

The second major area of our project that we need to address is economic assessment techniques. Having a complete mastery of these techniques is absolutely crucial to our project. The following techniques make it possible for us to carry out a critical analysis of the data we obtain, and to draw our conclusions from that data: suitability analysis, identification of industry clusters through location quotient analysis, determination of current trends in the economy through time series analysis, and creation of GIS maps primarily using spatial analysis.

The first section of the literature review will contain an economic history of Worcester and an overview of Worcester's previous plans. The second section of the literature review will contain an overview of the economic planning process including a section on best practices. The third section will contain the context for our project.

Studies conducted in other cities using different methods of analysis will be looked at and from them we can apply their techniques to our project.

## 2.1 Brief Economic History of Worcester

Worcester's beginnings as a city can largely be attributed to its location and to the abundance of resources. With the rise of new industry, efficient means of transportation were vital. The Blackstone Canal, which connects Worcester to Providence, was the first source of efficient transportation available. In 1835, Boston and Worcester rail line began its operation (Tymeson 1948). Within only a few years, there were six separate railroad lines coming into the City (Tymeson 1948). Worcester became the rail-hub and major manufacturing center of the Central Massachusetts region. The effect of this success was the organization of many industrial, social, and cultural clubs and associations (Tymeson 1948). By 1848, due mainly to emigration from Europe, Worcester had grown from a town to a "modern city" (Tymeson 1948).

Many schools were founded in the span of fifty years, including Clark University and Worcester Polytechnic Institute (Tymeson 1948). Many industries also thrived, such as the Norton Company, which produced pottery, Washburn's wire manufacturing company, and the Loring Coes Company that manufactured knives (Tymeson 1948). Worcester was an expanding city as the twentieth century emerged. Two events severely marred the economy: the Great Depression of the 1930's and the years following World War II. The latter was due mostly to the collapse of the textile industry. The region's wide industrial diversification prevented an economic crisis. Worcester's economy continued to grow until the mid 1900's, when the region's once flourishing manufacturing industries deserted the region for more suitable locations. The region's rural and small-town population grew at a faster rate than the metropolitan population. Trends in the economy included a preference for suburban living, a redistribution of service and retail establishments, a decline in shopping in the downtown area, and a relative decrease in the importance of the railroad (Columbia U 1963).

The development of highways and suburban expansion affected the layout of the lower Worcester plateau was more than anywhere else. Many functions once confined to that region now stretched for miles along major roads.

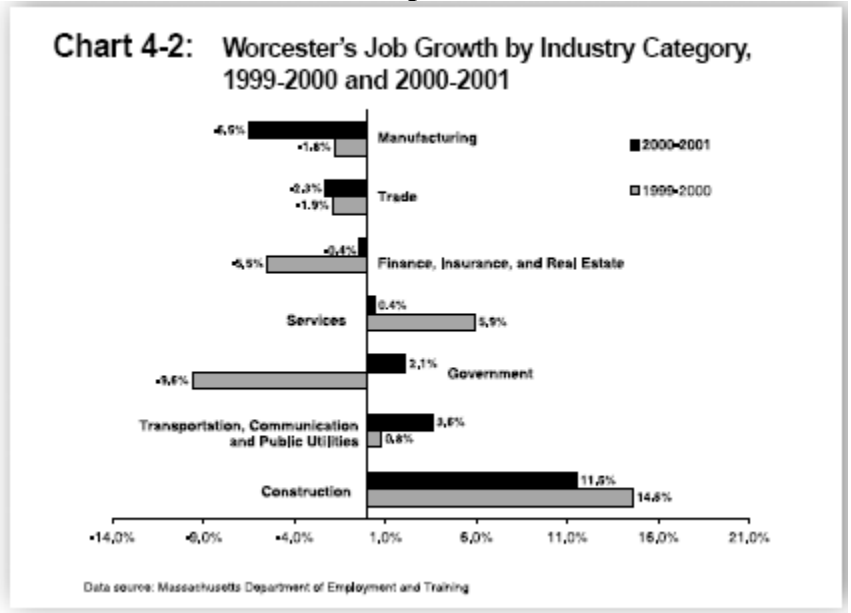
The economy of the 1960's and 1970s relied heavily on manufacturing, although a shift was detectable from reliance on the manufacturing of goods, to the supplying of services (Columbia U 1963). Problems with the development of Worcester could be attributed to the generally sluggish economy with a low rate of capital investment, a declining central business district, a net out-migration of population and a consequent slow rate of growth, and a complete lack of coordination in planning and development of the region (Columbia U 1963).

Like many medium-sized American cities, Worcester has faced significant economic challenges in recent years. Over the past several decades, Worcester's economy has transformed from manufacturing to service, where the two largest employment sectors are health care and higher education. Recently, a number of successful and growing private biotechnology firms have located their operations in Worcester. This is due to the presence of medical centers, and the fact that there are ten colleges and universities in the immediate area. These institutions include UMass

Medical School, WPI, Clark University, The College of the Holy Cross, Quinsigamond Community College, and the Boston-based Massachusetts College of Pharmacy (Goodman and Schaefer 2003).

In painting a picture of Worcester's current situation, the Worcester Regional Research Bureau issued a report entitled *Benchmarking Economic Development in Worcester: 2002*. The report attempted to measure Worcester's economy according to several indicators including employment and labor force growth. According to data provided by the Massachusetts Department of Employment and Training, the size of Worcester's labor force increased by around 2,000 people during fiscal year 2002 although the number of jobs in the city declined by almost 200. Many individuals were forced to work outside of the City, and according to the 2002 Census, the percentage of Worcester residents who commute more than 30 minutes to work increased from 19% to 25% between 1990 and 2000. Graph 2.1 below was taken from the report and summarizes Worcester's job growth by industry category.

**Graph 2.1**




The two primary objectives of the City's economic development efforts include growth in the City's tax base and the creation of jobs. It is our task to determine which businesses and industries would create jobs suitable for local residents and would generate tax revenue for the City (Goodman and Schaefer 2003).

## 2.2 Previous Economic Development Projects

Throughout Worcester's history, there have been many different plans, some of which were implemented, and some that exist only as ideas that can serve to inform future economic development plans. Of the projects that were implemented in Worcester, only some of them were successful. The following section describes several examples of previous projects and the effects that they had on the city of Worcester. These projects were conducted without the help of a formal economic development plan.

For this reason, these projects had some unexpected side effects. We hope that our economic analysis will help the City to prevent similar mistakes from occurring.

One such project was the construction of I-290. In 1960, I-290 was constructed in order to alleviate some of the traffic problems in Worcester, as well as to facilitate travel into, and out of the city. Though the project did accomplish this goal, there were several negative side effects that resulted. One of the more glaring consequences was that it boxed Union station in between the highway and the train tracks. This subtracted dramatically from the beauty that the historic building added to that particular section of the City. Along with taking away from Union station's majestic appearance, the construction of I-290 destroyed neighborhoods. "Among the properties slated for condemnation were two schools, three synagogues, two ethnic social clubs, a fire station, the Worcester State Hospital and the old Union Station clock tower" ("Worcester Expressway … " 2003). It also divided the city into two halves, which "…resulted in the City not only being destroyed physically, but socially as well" (Foster 2002).

Another earlier plan was one devised by a group of students from Columbia University. Not all of the proposed ideas were carried out, but the most notable ones that were completed include the Worcester Common Fashion Outlets, the Centrum Center, and more parking to accommodate the increased traffic that was expected downtown (Foster 2002). The Centrum Center has had a respectable amount of success. It was the number one grossing facility in the world for its size in 1996 (*Worcester's Centrum Centre* 2003). The Worcester Common Outlet mall, however "…is a failure as a shopping center, and a failure as a urban renewal project" (Murray 2003).

"Worcester: A Search for Synergy" is an IQP that explores possible compatibilities between different economic development visions. The project concluded that an increased tax base was necessary to help to better the economy. Housing was also a major concern among those interviewed for the project. It was determined that "people would rather use the existing resources first before adding to the building population (Foster 2002)."

Previous economic development projects help give us a flavor for the types of methods that were used in the past to correct known problems. We can then analyze the previous techniques and decide whether or not we believe that Worcester should go in the same direction, and possibly try some of the same types of strategies. The above projects were all expected to have positive impacts on the City's economy. When these projects were developed, the City used the same types of data that we will be using to conduct our study. This can help us learn from the mistakes and successes of the past in analyzing the data we obtain. Examining previous plans is also critical to completing one of our goals: Developing a GIS map of economic development activities.

### 2.3 Theoretical Planning Process

The community development process is not a new and revolutionary idea. Communities all around the country have been creating community development programs for quite some time. We intend to obtain a template of the theoretical planning process in order to gain a better understanding of the steps we need to take.

*Building Vibrant Communities* is a framework for such a plan. It contains an "overview" of the community development plan process, as well as a section on the

"*Economic Development Element of a CD Plan.*" This overview provides an outline of the task.

1. *GIS maps, buildout analysis and other community data*

   This preliminary step involves collecting data, and using it to create GIS maps and buildout analysis. These two things will pull the data together in a very user-friendly way, thereby making it much less difficult to draw conclusions from the data.

2. *Develop an Economic Statistical Profile*

   This helps residents in understanding the current state of the economy. That is, its current and future economic assets and constraints. The recommended requirements that the packet describes are:

   - Location and number of businesses, employers, and employees in the community. Types of businesses should be classified by industry, using SIC code or NAIC;
   - Recent growth trends;
   - Workforce development programs serving the community, and their compatibility with business employment needs in the community;
   - Current and projected job growth, including work force characteristics, age composition, distribution, average wage, and commuter routes;
   - Current characteristics of the labor force, including: education, skill levels, and training needs;
   - Changes in workforce due to diversification, technology, and communications;
   - Possible brownfield sites and vacant industrial and commercial space;
   - Factors that are unique to the community;

   The *Building Vibrant Communities* packet also requires a future economic profile. This section describes the city's economic development potential. This can help citizens determine economic goals by outlining the constraints and possibilities of the local economy. This section includes the following:

   - Availability of land/buildings for economic development;
   - Predicted workforce and job availability, identifying any gap between employment demands and supply;
   - Availability of needed services;
   - Compatibility of proposed economic development with adjacent land uses and resource protection concerns;

- Availability of housing in the community/region for present and expected workforce. Take into account expected income of the workforce;
- Needs of local and regional businesses based on projected expansion plans or plans to move to another town/region;
- Revenue generation and service demands;
- Compatibility of economic development opportunities and preferences with neighboring towns and the region;

*3.Establish Economic Development Goals*

From the information gathered in the statistical profile, the community can then begin to develop goals. Communities should conduct public, consensus-oriented meetings to establish objectives. The handout describes several examples of potential economic development goals. They include:

- Foster economic development in areas close to transportation and services;
- Provide incentives for live-work units or artisan studios;
- Encourage redevelopment of vacant industrial buildings into incubator space for small and micro-business, as well as residential units;

*4.Assess Economic Development Objectives in relationship to Growth Suitability Maps*

After the community has determined its goals, it must assess these goals using several maps. These are maps of 1) developed land and absolute constraints, which illustrates areas of possible redevelopment, and of 2) developable land and partial constraints, which illustrates buildable land by zoning category. Using these types of maps, residents can identify possible types of development based on zoning.

5. *Identify and Evaluate Alternative Economic Development Strategies*

Once the community has developed its goals and assessed them using the maps described above, the next step in the process is to generate strategies with which the community can achieve its goals. Appendix BB of *Building Vibrant Communities* provides a detailed description of many useful strategies. Some of the strategies included in the packet are:

- Zoning changes, which allow at-home businesses, conversion of industrial space to commercial use, or live/work units;
- Streamlining of the local permitting process for developers, while protecting the interests of the community and its residents;

- Reuse of brownfields sites;

It is imperative for us to know how a planner operates. The *Building Vibrant Communities* packet offers just this. It gives us a good, working description of what communities should do to develop under EO 418.

**2.4 General Economic Development Planning**

In order to get a sense of the economic planning process, we decided to utilize a very detailed plan for the city of Raleigh, North Carolina. The plan begins by stating very broad goals that the City plans to reach with the help of the development plan. These are goals such as "Quality of Life Goal: Raleigh will strive for a high quality of life for all of its citizens," and "Economic Development Goal: Raleigh will strive to maintain a dynamic and diverse economy capable of providing full employment, exceptional level of services and a wide range of business opportunities (City of Raleigh 2003)." These goals are general, and fairly generic. They provide us with little specific information on the process of planning. The part of the plan that we will be focusing on begins with a description of what Raleigh is currently like, pointing out inherent flaws in the current system.

> "The present urban form of Raleigh is primarily low-density, composed of suburban neighborhoods and heavily dependent on the automobile for transportation. The quiet single family neighborhood, with tree-lined streets, is an image of Raleigh which is frequently cited very positively by residents. Although this low density development pattern is comfortable and familiar, it has drawbacks. In the future it will become increasingly more difficult and expensive, to supply the quantities of land and roadways that are necessary for this development style. The environment is degraded by the use of fossil fuel, land is inefficiently used in automobile dominated areas and the cost of keeping roadways working smoothly continues to escalate."
> (City of Raleigh 2003)

The next section describes several individual elements that "shape the urban form of the city." Among those included are 1) Natural Corridors, 2) Transportation Corridors, 3) Transition Areas, 4) Neighborhoods, and 5) Employment Areas. Also included in this section are examples of how the Raleigh is "shaped" by these elements. The following is an excerpt from the Raleigh development plan. It was taken from the "Natural Corridors" section.

> "Natural corridors are formed by the streams that cross the Raleigh area: Crabtree Creek, Walnut Creek, Swift Creek, the Neuse River and their smaller tributaries. These streams cut across the city and define floodplains and the high ground in between, suggesting areas that can be built upon and those that cannot. These corridors serve as open space, pedestrian circulation (greenways) and nature preserves. They have the ability to reduce stormwater runoff and improve environmental quality;"

(City of Raleigh 2003)

These elements are also applicable to Worcester. We will be able to use them to try and describe Worcester's current state.

The plan then goes on to depict several policies that the City would like to see enforced under the community development plan. Some of the policies that the plan mentions are noted below. These excerpts, like the one above were taken from the "Natural Corridors" section of the plan.

- Minimize disturbance of environmentally significant areas;
- Encourage a variety of building types and techniques to permit environmentally significant areas to be developed with a minimum of ecological disturbance;
- In stream valleys, floodplains and floodways should be protected as natural areas; An undisturbed floodplain helps preserve trees, existing vegetation and wildlife habitats, decreases erosion, improves water quality, provides natural absorption of runoff and helps in stormwater management;
- Scenic views of important landscapes and natural features should be recognized and protected. These features are important in establishing the visual character of the city;

(City of Raleigh 2003)

The remainder of the plan describes the projects that were completed to adhere to these policies. The projects were not available, but the information given here was adequate to provide an understanding of how a city creates a development plan. Worcester's situation, however, is very different from that of Raleigh. For example, Raleigh was described as a kind of suburban city, whereas Worcester is more what one would consider an urban city.

Though the cities are different, the process is basically the same. The plan created for Raleigh, North Carolina will help us to develop our own plan, by providing us with a loose framework around which we can form our own economic development plan.

## 2.5 Time Series

A time series analysis provides insight into the main factors that influence the movement of businesses and industries into and out of Worcester. This information will allow us to determine which businesses will thrive in the region under current and future conditions. A good example of the application of time series analysis is a model of urban road traffic and accidents conducted in Stockholm. Using a program called TRIO, which uses a multiple regression model, the researchers assessed the importance of many factors on the number and severity of car accidents in the area. These variables included socio-economic factors, laws and regulations, road and public transport data, vehicle fleet data, climate data and other related information. Their study was done according to the DRAG (Demand for Road use, Accidents and their Gravity) philosophy, which aims at creating an enhanced understanding of two aspects of mobility: the demand for road usage and the complex interactions affecting road accidents. This philosophy considers risk exposure and accident rate and severity (Tegner and Loncar Lucassi 2003).

The study identified over thirty factors that explain the monthly variations in the number of road accidents with personal injuries or deaths. The two main factors were the

density of road traffic and the number of remarks a car receives from its annual inspection (Tegner and Loncar Lucassi, 2003).

Time Series analysis can help us explain the factors behind the movement of businesses and industries in Worcester. The key is to quantify and identify which factors may potentially contribute to the movement of businesses and industries before we construct a model. In conjunction with spatial analysis (using GIS), we can use zoning regulations, population density, and transportation and open space as variables for the study. We will use both SIC and NAICS data to conduct our analysis. In correlating the changes in those variables with the changes in Worcester's business and industry composition, we can determine the factors most likely to influence the composition of businesses in the region. We can also determine how various factors affect the different types of businesses in the City. Thus, time series will provide an increased level of understanding in the reasons for business and industry relocation.

### 2.6 Identification of Industry Clusters

Location quotient analysis is a very important statistical analysis tool for our project. In a broad sense quotient analysis allows one to look at a particular cluster of industries in a small area and develop a ratio that relates the employment in that small cluster to the national employment in that industry. The result of the ratio identifies the industry cluster as either "basic" or "non-basic" and how much higher the basic economy is than the national employment in that industry. A "basic" sector can be defined as:

> "Basic Sector: This sector is made up of local businesses (firms) that are entirely dependent upon external factors. For example, Boeing builds and sells large airplanes to companies and countries located throughout the world. Their business is dependent almost entirely upon non-local firms. Boeing does not sell planes to families or households locally, so their business is very much dependent upon exporting their goods. Manufacturing and local resource-oriented firms (like logging or mining) are usually considered to be basic sector firms because their fortunes depend largely upon non-local factors, they usually export their goods (Chapin 2003)".

A "non basic" sector can be described as:

> "Non-basic Sector: The non-basic sector, in contrast, is composed of those firms that depend largely upon local business conditions. For example, a local grocery store sells its goods to local households, businesses, and individuals. Its clientele is locally based and, therefore, its products are consumed locally. Almost all local services (like drycleaners, restaurants, and drug stores) are identified as non-basic because they depend almost entirely on local factors (Chapin 2003)".

Having a location quotient ratio of less than one indicates that all employment in that industry cluster is non-basic and is less than the national level of employment. It also indicates that production in these industries is not sufficient for local demand and

production needs to be imported. Having a location quotient equal to one tells us that this particular industry meets the needs of the local demand and no production is imported or exported and is therefore a non-basic industry. Having a location quotient greater than one indicates that the local cluster industry has shares larger than the national levels (Guihathakurta 2003). This means that production in the local cluster industry meets the local needs and extra production is exported. Since production is being exported, money is being brought into the city which is excellent for the economy. Once a basic industry has been identified, a basic employment formula is available to determine how many jobs of the local cluster contributed to the local production needs and how many contribute to the exported production (Chapin 2003).

In October of 2000 a quotient analysis was conducted comparing the industry clusters of the major counties of Connecticut to the nation. From this analysis Connecticut was successful in identifying that the finance, insurance, and real estate industries were leading economic sectors. The data used for this analysis can be found in the appendix. By identifying major industry clusters through location quotient analysis, the state of Connecticut was better able to generate an economic development plan (Joo 2003).

By examining which sectors of its economy were greater than (and which were less than) their respective national levels, Connecticut was able to have a better outlook on its economy. Performing this analysis will be invaluable to the city of Worcester, and to our project. This analysis will allow us to examine the industry clusters of Worcester and to make decisions based upon our findings. If one particular industry is weak compared to the state of the nation we may want to recommend developing more jobs of that specific industry so that we do not have to rely on bringing in production to meet the cities needs. If an industry has a higher ratio than the state or the nation we may wish to nurture it further or leave it alone since its making money for the city and driving the cities economy further. Balancing out the economic needs of Worcester by performing the cluster analysis is one step closer towards having a sustainable economy.

### 2.7 Suitability Analysis

A suitability analysis is a process in which sites in the city are examined for the possibility of growth and expansion. This is a multi-step process that mainly involves the layering of GIS maps. The first steps of a suitability analysis include defining a method for rating the various environmental, socio-economic, and infrastructure resources in the area ("What is Development Suitability Analysis?" 2003). Rating can be done easily by developing a suitability matrix. With this you can compare the possible land uses with the land attributes, giving a higher ranking to the best possibilities for development. Next a compiled map of the city is created that highlights the sections of the city that have the highest suitability ratings. Once specific areas have been identified, further analysis is conducted on a case by case basis to find out whether or not the site is suitable. A list of considerations for a suitable site for each layer of the map would be:

- Environmental
    - Sensitive lands (Note: wetlands and 100 year floodplains – assigned very low suitability rank)

- Proximity to Public wells
- Fragmentation Sensitivity
- Wildlife Habitat
- PNDI Sites
- Natural Heritage Sites
- Forested Ridge tops
- Water Quality by Curve Number
- Stream Buffers
- Proximity to State Gamelands, Parks and Forests
- Proximity to Ponds and Lakes
- Major Sinkhole locations
- Proximity to Quarry Operations

- Socio-Economic
  - Agricultural Security Areas and Proposed Agricultural Easements
  - Prime agricultural soils
  - Soils limitations for building construction
  - Soils limitations for on-lot septic systems
  - Proximity to residential neighborhoods.
  - Topography – steep slope areas

- Infrastructure
  - Availability of public water ( includes proposed utilities in 5 & 10 year plans)
  - Availability of public sewer (includes proposed utilities in 5 & 10 year plans)
  - Proximity to I-99 interchanges
  - Proximity to Limited Access Roadways
  - Proximity to Major Arterial
  - Proximity to Minor Arterial
  - Proximity to Major Collector

("What is a Development Suitability Analysis?" 2003)

A suitability analysis would allow the City of Worcester to rank developable areas for different types of economic expansion. The city of Cedar Rapids, Iowa used a suitability analysis to find an alternative for a solid waste land fill. A focus group met and developed criteria such as economics, environmental soundness, flexibility, and public acceptability. They then used these criteria to narrow 72 possible systems down to four that were feasible based upon their criteria ("Solid Waste Agency …" 2003). The four possibilities were then examined on a case by case basis and a final plan was chosen. A table of the four final choices is in the appendix.

Suitability analysis will be especially valuable to our project because this is where we are able to make recommendations about how we want to bring business into Worcester. From the results of our own suitability analysis we will identify sectors of the

city that have room for economic growth and from our other analysis we will be able to suggest what types of industry to bring in to the cities.

### 2.8 Creative Economic Initiative

Quality of life is becoming an increasingly important factor in business and personal location decisions. The idea is that a more desirable location will draw more people and businesses that reflect the qualities found in that community. A community's quality of life is determined by several factors. Culture and the arts are near the top of the list that includes quality education, public safety and affordable housing. For these reasons, New England has issued the Creative Economy Initiative which strives to strengthen the economy by encouraging arts and culture in the area (*Creative Economy Initiative* 2000).

> "The classic variables of land, labor and capital as well as utility rates, taxes and the elusive business climate and entrepreneurial environment are now essentially available universally. As the focus of economic activity shifts more toward the service sector we are beginning to see other transformations … the new variable has become psychic income. This translates into a higher value placed on more intangible variables such as quality of life and amenities. (James Segedy)"

The New England Council collected data from various sources including the United States Economic Census, the Department of Commerce, the International Trade Administration, and the Massachusetts Office of Travel and Tourism in attempts to quantify the impact of arts and culture on the economic life of New England. The council found that more than 245,000 jobs or 3.5 percent of the total job base of New England are related directly or indirectly to the production of cultural products. In addition, 2.1 percent of New England's entire work force includes workers defined as the "thinkers" and "doers" trained in specific cultural and artistic skills. These people drive the success of industries that include arts and culture. This proportion is well above the national average of 1.5 percent. The competitive edge of a community full of people and businesses that deal with culture and the arts is more important than ever in an economic environment like New England, where the availability of labor is the biggest challenge for businesses (*Creative Economy Initiative* 2000).

The state of West Virginia had such a vision when $18 million was invested in the creation of the Tamarack to build the economy, expand job opportunities and promote the history and culture of the state. Funded by toll revenues and completed in 1996, the Tamarack offers over 59,000 square feet of retail space that houses a variety of handmade arts and crafts as well as delicious foods from around the state, including fare from the renowned five star Greenbrier Resort. The Tamarack has both a direct and indirect economic impact. It has provided and supported 285 construction jobs and 433 jobs in the immediate seven-county area and involves more than 2,000 jobs through the vendors who supply the Tamarack. The Tamarack also represents the work of more than 1,900 artisans. The Tamarack facilitated the expansion of tourism within the Beckley area. Private developers constructed hotels and restaurants, and an increase in employment and tourism helped the area to prosper (Frier 2003). As successful as the Tamarack is, there are still a few problems with it including the high cost of the items and crafts, the fact that

is not well known outside of the state, and its inconvenient location as a rest stop for travelers driving through the state. Possible solutions include lowering the prices of the items sold at the facility, encouraging other states to have similar projects (thereby, helping to market the Tamarack), and introducing more popular attractions to draw visitors to the area. The state built an amphitheater in the region for this very reason (Carter 2003). In spite of these drawbacks, the Tamarack is considered one of West Virginia's greatest economic development initiatives (Frier 2003).

In response to this initiative, Worcester developed a Master Plan for an arts district. This plan seeks to occupy vacant manufacturing buildings and to beautify the downtown region among other things. One of the recommended projects includes an Art at Home section, which would contain up to 100,000 square feet of retail space within the historic manufacturing district (*Master Plan for the Worcester Arts District* 2002). The region would also provide areas for dining, entertainment, and education. This project is essentially a larger scale version of the Tamarack. In paying attention to factors that make an economy sustainable, which include maintaining the historical character of a region, this project should attract visitors to Worcester, and should support the artists currently living in the area. Possibly more important than a thoroughly planned project is community support. The Tamarack was the collective vision of artisans, agriculturists, business people, community members and public officials from every county in West Virginia. Keeping in mind the interests and needs of the community, versions of the projects outlined in Worcester's Master Plan for the Art's District have potential for enhancing the character of the area.

## Chapter 3: Methodology

The goals of the project are to develop an economic profile of Worcester, to conduct a suitability analysis for future economic growth and development, and to create Geographic Information System maps depicting areas most suitable for growth, locations of major employers and commercial sites, and economic development activities. In order to develop an economic profile of Worcester we must examine government data sources, such as NAICS and ES-202, to identify industry clusters through quotient analysis, complete a time series analysis of Worcester's economy, and complete a spatial analysis of Worcester's employment and economic development.

### 3.1 Evaluation of Data Sources

Our first task of the project is to create an overview of government employment data sources, which include the North American Industry Classification System (NAICS), ES-202, County Business Patterns, and Regional Economic Information Systems (REIS). Evaluating the strengths and weaknesses of each data source is required by our sponsor. Some of the data from the various government sources has already been compiled in Worcester's buildout analysis done by the Central Massachusetts Regional Planning Committee (CMRPC), which we can use to begin analyzing the data for Worcester. The focus of this evaluation will be noting the history of the data source, the organization that collects the data source, how the data is collected, and the limitations of the source. The evaluation will make it easier to determine which source of data is appropriate for each type of analysis. A brief overview of each source is discussed below.

#### 3.1.1 NAICS

NAICS is a classification system prepared by the US government that is used to identify industries in particular states and cities. This system is used through out the United States, Canada and Mexico. The NAICS system of classification was adopted in 1997 to replace the Standard Industrial Classification (SIC) system as a result of the North American Free Trade Agreement. Table 3.1 shows the layout of the NAICS coding.

**Table 3.1**

| NAICS Codes | |
|---|---|
| 2-digit | Sector |
| 3-digit | Sub sector |
| 4-digit | Industry Group |
| 5-digit | NAICS Industry |
| 6-digit | National |

In 1997, an economic census for the city of Worcester was conducted by the United States Census Bureau. This report contains information about the number of establishments, amount of sales, annual payroll, and number of employees for all the industry clusters organized by NAICS codes. This information will be used in our project for developing an economic profile of Worcester and identifying major industry clusters through quotient analysis. We can obtain this information online from the Census Bureau's website.

### 3.1.2 ES-202

The Covered Employment and Wages program, a.k.a. ES-202, "…is a comprehensive and accurate source of employment and wage data, by industry, at the national, State, and county levels. It provides a virtual census of nonagricultural employees and their wages. In addition, about 44 percent of all workers in agricultural industries are covered (*BLS Handbook of Methods* 1997)." This information will be gathered online via the Bureau of Labor Statistics and the Massachusetts Division of Employment and Training.

This data will help us to create our economic profile. It will also give us a good sense for how Worcester's economy is composed. This will not only help us with the profile, but once we have completed the preliminary section of the project, this data will provide us with a better view of the city from which we can make suggestions for future development.

### 3.1.3 County Business Patterns

County business patterns consist of data covering most of the economic divisions of the economy; i.e., agricultural services, mining, construction, manufacturing, transportation, public utilities, wholesale trade, retail trade, finance, insurance, real estate, and services. Summary data are provided on number of employees for the mid-March pay period, first quarter total payroll, total annual payroll, number of establishments, and the number of establishments by employment-size class. Data are tabulated by detailed kinds of businesses based on SIC codes. Geographical areas: U.S., state, county ("Other major federal …" 2003).

This data is produced by the Census Bureau, so if we can not obtain the data online, we will attempt to contact the census bureau, and get the data from them. As with the ES-202 data, we will be able to use this to put together the economic profile for the City.

### 3.1.4 Regional Economic Information System

The Bureau of Economic Analysis (BEA) organizes data collected by the Bureau of Labor Statistics and the Census Bureau into what is known as the Regional Economic Information System. The data dates back to 1969. This information consists of estimates of state income, personal income for local areas, and gross state product. The income estimates indicate the amount of spending money available in the specified area, which is

usually a state or a city, and thus, the comfort level of the residents that live there. Gross state product (GSP), considered the state counterpart of GDP, measures the value added to the Nation's production by the labor and property in the state. These estimates provide a basis for analyzing the regional impacts of national economic trends. The BEA also prepares regional economic multipliers for areas specified by users. The multipliers estimate the changes in the output of one or more industries in an area on the output, employment, and labor earnings in other industries in that area. These multipliers will be useful in determining the effects of changing the businesses or industries found in Worcester. All data are downloadable from the BEA's web site (BEA's *Regional Accounts* 2003).

### 3.1.5 Buildout Analysis

The Massachusetts Executive Office of Environmental Affairs contracted with CMRPC to perform build-out analyses for the communities in Massachusetts. The final series include four maps. One shows land that is already developed or absolutely constrained, as well as the proportion of land zoned for housing and for commercial uses. Another map highlights areas that are partially constrained and available for development. This map is accompanied by a spreadsheet analyzing how many additional housing units and how much commercial and industrial space could be constructed based on current zoning. A third map summarizes the previous two and shows where recent development is occurring. The fourth map is an aerial photograph of the city of Worcester. Analyzing these maps will give us an idea of where businesses and industries currently are, and where new businesses and industries could go. These maps show the composition of Worcester under maximum development, based on current zoning. These buildout maps are available on the CMRPC's web site (Building Vibrant Communities Handbook 2000).

## 3.2 Profile of Worcester's Economy

Once all the data has been collected and the data sources have been evaluated, the next step is analyzing the data. The following sections will explain the different types of procedures we will use to develop an economic profile of Worcester.

### 3.2.1 Quotient Analysis

In order to compile a location quotient analysis for Worcester we will use the 2002 ES-202 data from the Massachusetts's Division of Employment and Training's website. We will download the data sheets for the city of Worcester and the state of Massachusetts that contain total employment numbers for all NAICS industries (including all subcategories) for all ownership types into Microsoft Excel. We will use the charts to calculate the location quotient ratio:

$$location\_quotient\_ratio = \frac{city\_emp_{ind} / city\_emp_{tot}}{state\_emp_{ind} / state\_emp_{tot}}$$

In the above equation, *emp* stands for employment, and the subscripts indicated whether that is employment in a particular industry (*ind*) or total employment (*tot*). The quotient ratio simply compares the proportion of the city's employment in a particular industry with the proportion of the state's employment in that same industry. Location quotient ratios greater than one indicate which industries or industry clusters Worcester contributes to the state economy. All major industry clusters will be highlighted on a Geographic Information Systems map of the city. In this way, the locations of major industries can be shown. After identifying prominent industries and industry clusters, a next step is to translate this ratio into exported jobs. In order to make this translation, the following expression is used:

$$\text{exp}orted\_jobs = (city\_emp_{ind} / state\_emp_{ind} - city\_emp_{tot} / state\_emp_{tot}) * city\_emp_{ind}$$

To get an idea of what the quotient ratios and exported job values mean, location quotient ratios will be calculated for Lowell, Springfield, Cambridge, and Providence. The exported job values of Lowell, Springfield, and Cambridge can be compared at face value with those of Worcester since the exported work for each of those cities is, in essence, going to the economy of Massachusetts. For Providence, the process is a little different. The data must be obtained from Rhode Island's Labor Market Information website instead of the Massachusetts's of Employment and Training. Also, Providence's ratios must include the state of Rhode Island instead of the state of Massachusetts. Therefore, these values for exported jobs cannot be directly compared with the Massachusetts cities. The major industries of Providence, however, as indicated by their location quotient ratios will be useful when comparing the composition of Providence's economy with those of the Massachusetts cities.

A slightly different version of the quotient analysis will also be conducted. Instead of comparing Worcester to the state of Massachusetts, Worcester will be compared to Boston's Consolidated Metropolitan Area. In this way, Worcester's contribution to that area will also be defined and not just Worcester's contribution to Massachusetts.

In comparing Worcester to the various cities and keeping in mind the City's objectives, the quotient analysis can provide an idea of which industries should be strengthened. In knowing which industries are already strong, strengthening complementary industries is a beneficial strategy in boosting the City's economy.

### 3.2.2 Comparison with Similarly Sized Cities

Comparing Worcester's economy to the economies of cities with similar employment opportunities will give us an idea of what the comparative strengths and weaknesses of the City are. We will examine major sources of employment, total employment, median household incomes, per capita income, income distribution, and education distribution. We will also examine the community development plans of cities that have them available to get an idea of what would work for Worcester. We will be using quotient analysis as one of the methods of directly comparing our target cities. The

BEA does a comprehensive job organizing SIC and NAICS data for many small regions located within the United States. This information will be useful when comparing statistics such as per capita personal income, labor force and proprietors' earnings by place of work. These statistics can indicate the well being of the residents and the activity of businesses and industries within an area respectively. It is important to note however that all differences between the cities are not necessarily strengths or weaknesses. Different cities are all different shapes and sizes. Once we have our comparison data we will draw conclusions based on which differences are strengths, which are weaknesses, and which are merely differences.

### 3.2.3 Worcester's Role in the Boston Consolidated Metropolitan Area

Boston's Consolidated Metropolitan Area consists of 228 different communities ranging from York, Maine to Thomas, Connecticut and from Milton, New Hampshire to Dartmouth, Massachusetts. This larger area consists of ten smaller Primary Metropolitan Areas (PMAs): Boston, Brockton, Fitchburg-Leominster, Lawrence, Lowell, Manchester, Nashua, New Bedford, Portsmouth-Rochester, and Worcester. In defining Worcester's role, we will compare the City's population, employment opportunities, and contribution to GSP with that of the larger CMA and with those of the other smaller PMAs. We also plan on conducting a quotient analysis for Worcester versus the Boston CMA (not including Worcester). REIS will facilitate these comparisons, since it organizes data on city, state, and other regional levels ("Boston's influence …" 2002).

## 3.3 Time Series

In completing a time series analysis for Worcester County, employment changes in each SIC industry cluster for the county and the state of Massachusetts will be graphed. These SIC industry clusters will be equivalent to the corresponding 2-digit NAICS sectors. The available data allows employment from 1969 to be included in the analysis. Charts of REIS data that show employment numbers in each industry cluster by year will be constructed in excel for both Worcester County and Massachusetts. Then, the following graphs will be constructed for total employment and employment by SIC industry cluster: 1) employment per industry versus the year for Worcester County and Massachusetts and 2) the percent change in employment from the previous year for Worcester County and Massachusetts versus the year. The graphs showing percent change in employment only consider employment changes in the state after the county's employment has been subtracted.

After constructing the graphs, employment trends for Worcester County will be noted and any significant deviations from Massachusetts's employment in an industry sector or during a particular year will be examined. The graphs will help to predict trends in future employment or industrial composition. Particular attention will be placed on the corresponding SIC major and minor industry sectors identified in the quotient analysis.

Less detailed city-level ES-202 data dating back to 1985 is available on the Massachusetts Division of Employment and Training's website. Additional graphs of employment versus time will be constructed for the cities of Worcester, Springfield, Lowell, and Cambridge. Using REIS data, graphs of employment versus time will be

constructed for Worcester County and Boston's New England Consolidated Metropolitan Area. As for the percent change in employment graphs for Worcester County and Massachusetts, the percent change in employment for Boston's New England Consolidated Metropolitan area will be calculated after employment in Worcester County has been subtracted from the regions total employment in each industry sector. These graphs will help compare employment trends in Worcester with those of other similar cities in Massachusetts. These graphs will also help identify the role of Worcester County in Boston's New England Consolidated Metropolitan Area (and eventually, to identify the city of Worcester's role in that area).

### 3.4 Suitability analysis based on economic profile

The next part of our project is the suitability analysis. In order to complete a suitability matrix, we must first establish a framework for analyzing suitability. Determining what areas are suitable for development is a relatively uniform process. We will first construct the suitability matrix outlined in the technical assistance bulletin #3. We will also analyze any EO418 information we can obtain from other cities. It is important to keep in mind that most other cities in the Massachusetts are working on completing the EO418 requirements just as Worcester is, which makes it challenging to obtain an abundance of information regarding suitability. We will use whatever information we can obtain in order to create a comprehensive and accurate suitability matrix. As a preliminary step, we must develop criteria that will be used to determine whether or not a specific area is suitable for a specific NAICS industry. These criteria are then compiled into a matrix along with the different industry groups, which should match Worcester's available resources. Table 3.2 is a sample suitability matrix provided by EO418 Technical Assistance Bulletin #3:

**Table 3.2**

| **Non Element Specific Land Use Suitability Matrix** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Land Use Options | | | | | | | | | | | |
| Land Attributes | Medium/High Density Residential | Very Low/Low Density Residential | Multifamily Residential/ Townhouse/Condo | Mixed Use | Village Center | Commercial | Industrial | Office | Recreation | Public Facilities | Other | Protected Open Space |
| Agriculture | | | | | | | | | | | | |
| Redevelopment Sites | | | | | | | | | | | | |
| Brownfield Sites | | | | | | | | | | | | |

We will assign rankings to each of the rows and columns for each land use option. We will then apply our rankings to a GIS map. Using several different layers, we will depict the available space for development. From there we will examine the available areas on a case-by-case basis to determine if economic development is feasible or desirable in that location. We will make recommendations based on our suitability matrices, and will suggest possible solutions for the city to pursue.

### 3.4.1 Identifying Information Gaps and Recommendations

The city of Worcester is currently in the preliminary stages of the community development planning process. Our project involves gathering and organizing information so that the City can make informed decisions regarding which projects would improve the quality of life for its residents. Successful projects would create needed employment opportunities while enhancing the culture and the character of the City. In laying the basis for the planning process, we must identify which information is necessary for the City to create a community development plan as well as what steps they must take. The information will allow us to conduct the analyses we need: quotient, time series, and suitability, and will allow us to make necessary comparisons: those between Worcester and other similarly sized cities and those between Worcester and the Boston Consolidated Metropolitan Area. The *Building Vibrant Communities* handbook will show us exactly where we are in the planning process as well as what needs to be accomplished next.

## 3.5 Maps

The final requirement for our project is to deliver a series of maps that will be used by the city for future economic development. Creating these maps is especially useful for the city since they do not have this information available to them. The map depicting the areas most suitable will be generated as a result of our suitability analysis and will include a layer with our final recommendations. Another map we need to create will show the major employers and commercial sites. A printed packet of the top 100 business in Worcester County has been provided to us from Joel Fontane. We will enter this data into Microsoft Access and then use the geocode feature of MapInfo to correlate the address of the business to locations on the map. We can then add layers to the map, such as zoning information, to give the data meaning. The third map that we will create will display employment data, household income, industry concentrations, and other economic data. Ideally, we would plot this data at census track or census block level depending on which breakdowns are available. This map will create a visual representation of Worcester's current economy.

## Chapter 4: Evaluation of Data Sources

### 4.1 NAICS

During the 1930's, the Standard Industrial Classification (SIC) was developed so that there would be a uniform method for carrying out statistical analysis between all industries. This system remained in place largely unchanged for many years. As a result of the NAFTA agreement, the North American Industry Classification System (NAICS) was adopted in 1997 as a replacement of the SIC system for organizing statistical data concerning business establishments.

The NAICS system is superior to the SIC system of classification in that the system is established across Canada, Mexico, and the United States. This system is useful to statisticians and economic analysts who want to compare economies across North America. The NAICS system better reflects our current economy since the industries listed in the classification system are modified every 5 years. New industries are added and any industries that have died out are either removed or grouped into broader categories.

The NAICS system is comprised of a 6 digit code that ranges from very general or broad categories to very specific. Table 4.1 shows the number of significant digits and the section of industry they represent.

**Table 4.1**

| **NAICS** | |
|---|---|
| 2-digit | Sector |
| 3-digit | Sub sector |
| 4-digit | Industry Group |
| 5-digit | NAICS Industry |
| 6-digit | National |

Here are two examples of the NAICS classification system for the manufacturing and information industries.

**Table 4.2**

| Examples of NAICS Hierarchy | | | | |
|---|---|---|---|---|
| **NAICS level** | **Example #1** | | **Example #2** | |
| | **NAICS code** | **Description** | **NAICS code** | **Description** |
| Sector | 31-33 | Manufacturing | 51 | Information |
| Sub sector | 334 | Computer and electronic product manufacturing | 513 | Broadcasting and telecommunications |
| Industry group | 3346 | Manufacturing and reproduction of magnetic and optical media | 5133 | Telecommunications |
| Industry | 33461 | Manufacturing and reproduction of magnetic and optical media | 51332 | Wireless telecommunications carriers, except satellite |
| U.S. Industry | 334611 | Reproduction of software | 513321 | Paging |

Several organizations use the NAICS system of classification of organization, such as Bureau of Economic Analysis, the Census Bureau, and the Bureau of Labor Statistics ("North American Industry …", 2003).

### 4.2 Data Sources

The United States Census Bureau is a major source of data that utilizes the NAICS system of classification. The most recent economic survey was conducted in 1997 and provides the number of establishments, value of business done, annual payroll, and number of paid employees.

> The Census Bureau defines the number of establishments as
> "… a single physical location at which business is conducted and/or services are provided. It is not necessarily identical with a company or enterprise, which may consist of one establishment or more. Economic census figures represent a summary of reports for individual establishments rather than companies. For cases where a census report was received, separate information was obtained for each location where business was conducted. When administrative records of other Federal agencies were used instead of a census report, no information was available on the number of locations operated. Each economic census

establishment was tabulated according to the physical location at which the business was conducted. The count of establishments represents those in business at any time during 1997 ("Geographic Area Series", 2003)."

It defines the value of sales, shipments, receipts, revenue, or business done as the total amount of money brought in by the specific business or industry over the given year. This is listed in terms of thousands of dollars. The Census Bureau defines what it considers revenue for each sector of the NAICS system.

The census bureau defines annual payroll as

"Payroll includes all forms of compensation, such as salaries, wages, commissions, dismissal pay, bonuses, vacation allowances, sick-leave pay, and employee contributions to qualified pension plans paid during the year to all employees. For corporations, payroll includes amounts paid to officers and executives; for unincorporated businesses, it does not include profit or other compensation of proprietors or partners. Payroll is reported before deductions for social security, income tax, insurance, union dues, etc. This definition of payroll is the same as that used by the Internal Revenue Service (IRS) on Form 941 ("Geographic Area Series", 2003)."

Annual payroll is defined by the Census Bureau in the following quote:

"Paid employees consists of full-time and part-time employees, including salaried officers and executives of corporations, who (for all sectors except Construction and Manufacturing) were on the payroll during the pay period including March 12. Included are employees on paid sick leave, paid holidays, and paid vacations; not included are proprietors and partners of unincorporated businesses. The definition of paid employees is the same as that used on IRS Form 941 ("Geographic Area Series", 2003)."

Table 4.3 shows the geographic scope of the survey.

**Table 4.3**
**Geographic Areas in the 1997 Economic Census**

**Statistics are shown for the United States, the states, the District of Columbia, and, depending on the sector, as shown below, for counties and metropolitan areas (MAs).**

"t" indicates data are not available for tax-exempt firms at this level.

| Sector | States | MA's | Coun-ties | Places 2500+ | ZIP Codes |
|---|---|---|---|---|---|
| Mining | X | | | | |
| Utilities | X | X | | | |
| Construction | X | | | | |
| Manufacturing | X | X | X | X | X |
| Wholesale Trade | X | X | X | X | |
| Retail Trade | X | X | X | X | X |
| Transportation and Warehousing | X | X | | | |
| Information | X | X | X | X | |
| Finance and Insurance | X | X | | | |
| Real Estate and Rental and Leasing | X | X | X | X | |
| Professional, Scientific, and Technical Services | X | X | t | T | t |
| Management of Companies and Enterprises | X | | | | |
| Administrative and Support and Waste Management and Remediation Services | X | X | X | X | X |
| Educational Services | X | X | t | T | t |
| Health Care and Social Assistance | X | X | t | T | t |
| Arts, Entertainment and Recreation | X | X | t | T | t |
| Accommodation and Food Services | X | X | X | X | X |
| Other Services (Except Public Administration) | X | X | t | T | t |

("Summary Statistics for United States", 2003)

The complete data can be found online at http://www.census.gov/epcd/ec97/us/US000.HTM and the data specifically for Worcester County can be found at http://www.census.gov/epcd/ec97/ma/MA027.HTM.

The data provided by the United States Census Bureau is quite reliable, but there are limitations that should be noted. In terms of our project the data is somewhat limited. The data is from 1997 which is from the pre dot-com and pre 9/11 economy. The much more relevant data from the year 2002 will not be available until mid 2004 which is outside the scope of our project. The data is also limiting in the fact that our project's focus is the city of Worcester and the data is only available for the entire county of

Worcester. The data provided in the census survey is useful in the fact that it provides data for industries as specific as the six digit level. The Census Bureau provides cautions in terms of the reliability of the data. It states that:

> "Most data compiled in this report originated from either census questionnaires or administrative records of other Federal agencies and, therefore, are not subject to sampling errors. However, all of the data are subject to nonsampling errors. Nonsampling errors can be attributed to many sources: inability to identify all cases in the actual universe; definition and classification difficulties; differences in the interpretation of questions; errors in recording or coding the data obtained; and other errors of collection, response, coverage, and estimation for missing or misreported data. Data for the Construction sector are subject to sampling errors, as these data originate from a survey which included all large employers and a sample of the smaller ones ("Geographic Area Series", 2003)."

### 4.2.2 County Business Patterns

"Business Patterns" is developed by the United States Census Bureau. The system utilizes both NAICS and SIC data, and so is subject to any limitations that those classification systems include. The business patterns are available at three different levels of specificity. Those include County Business Patterns, Zip Code Business Patterns, and Metro Business Patterns.

The first level of specificity is County Business Patterns. "County Business Patterns provides data on the total number of establishments, mid-March employment, first quarter annual payroll, and number of establishments by nine employment-size classes…" The data is organized first by 2-digit NAICS code but is easily expanded to include 4, 5, and 6-digit NAICS code. Each individual industry in a county can be compared with that industry in all of the other counties in Massachusetts. The following is an abbreviated table from the U.S. Census Bureau website. This chart was obtained by going to the website associated with the reference below Table 4.4, selecting Massachusetts in the County Business Patterns section, and then selecting Worcester on the following webpage.

**Table 4.4**
**Worcester County Business Patterns**

| | | | | | Payroll ($1,000) | | |
|---|---|---|---|---|---|---|---|
| | | Industry Code | Industry Code Description | Number of Employees for week including March 12 | 1st Quarter | Annual | Total Establishments |
| | Compare | ------ | Total | 299,548 | 2,603,695 | 10,392,242 | 18,129 |
| Detail | Compare | 11---- | Forestry, fishing, hunting, and agriculture support | 95 | 614 | 2,940 | 31 |
| Detail | Compare | 21---- | Mining | 187 | 1,880 | 13,218 | 16 |
| Detail | Compare | 22---- | Utilities | 2,796 | 52,980 | 197,028 | 46 |
| Detail | Compare | 23---- | Construction | 12,939 | 127,110 | 576,475 | 1,906 |

* Table continues for all Industry Codes through 99----
("County Business Patterns …", 2003)

The next level of specificity is the most specific for our purpose. "Zip Code Business Patterns presents data on the total number of establishments, employment and payroll for more than 40,000 ZIP Code areas nationwide. In addition, the number of establishments for nine employment-size categories is provided by detailed industry for each ZIP Code." The organization of this data is similar to that of the County Business Patterns data. It begins with 2-digit NAICS code, but can be expanded to give detailed information (up to 6-digit NAICS) for all of the subsets of a particular 2-digit industry code. The data for a specific industry can then be compared to that of several ZIP Codes areas that surround the specified ZIP Code. The ZIP Codes for Worcester include 01601-01615, excluding 01611 and 01612.

**Table 4.5**
**Worcester ZIP Code Business Patterns for 01609**

| Total for ZIP Code 01609 | |
|---|---|
| Number of establishments: 541 | First quarter payroll in $1,000: 60,988 |
| Number of employees: 9,618 | Annual payroll in $1,000: 253,073 |

| | | | | Number of Establishments by Employment-size class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Industry Code | Industry Code Description | Total Estabs | 1-4 | 5-9 | 10-19 | 20-49 | 50-99 | 100-249 | 250-499 | 500-999 | 1000 or more |
| | ------ | Total | 541 | 309 | 102 | 68 | 36 | 11 | 9 | 3 | 2 | 1 |
| Detail | 23---- | Construction | 16 | 9 | 2 | 2 | 1 | 0 | 1 | 1 | 0 | 0 |
| Detail | 31---- | Manufacturing | 9 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Detail | 42---- | Wholesale trade | 13 | 10 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Detail | 44---- | Retail trade | 59 | 33 | 13 | 9 | 3 | 0 | 1 | 0 | 0 | 0 |
| Detail | 48---- | Transportation & warehousing | 7 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Detail | 51---- | Information | 7 | 4 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

("County Business Patterns …", 2003)

Metro Business Patterns is the third level of specificity that is available through the Census Bureau. "Metro Business Patterns provides data on total number of establishments, mid-March employment, first quarter and annual payroll, and number of establishments by employment-size classes by detailed industry for all Metropolitan Statistical Areas (MSAs) and New England County Metropolitan Areas (NECMAs). As defined by the United States Office of Management and Budget (OMB), an MSA is made up of at least one large city (50,000 population or more), and includes the county or counties in which it is located. Adjacent and other nearby counties meeting certain criteria are also included in the MSA. NECMAs are used in this data series as a county-based alternative to the usual city- and town-based New England MSA classifications ("County Business Patterns …", 2003)." This data follows the same organization of the previously mentioned data sources. The data can be expanded from 2 to 6-digit NAICS code, and can be compared with that of other metropolitan areas.

**Table 4.6**
**Worcester Metro Business Patterns**

| | | | | | Payroll ($1,000) | | |
|---|---|---|---|---|---|---|---|
| | | Industry Code | Industry Code Description | Number of Employees for week including March 12 | 1st Quarter | Annual | Total Establishments |
| | Compare | ------ | Total | 3,075,331 | 34,812,737 | 134,923,869 | 167,963 |
| Detail | Compare | 11---- | Forestry, fishing, hunting, and agriculture support | 1,000-2,499 | 0 | 0 | 368 |
| Detail | Compare | 21---- | Mining | 1,000-2,499 | 0 | 0 | 90 |
| Detail | Compare | 22---- | Utilities | 10,000-24,999 | 0 | 0 | 251 |
| Detail | Compare | 23---- | Construction | 129,149 | 1,411,743 | 6,542,916 | 15,744 |
| Detail | Compare | 31---- | Manufacturing | 397,310 | 5,058,544 | 19,510,977 | 8,838 |
| Detail | Compare | 42---- | Wholesale trade | 165,195 | 2,440,348 | 9,556,947 | 9,932 |

("2001 MSA Business …", 2003)

The data that is available via the United States Census Bureau website covers the years from 1994 to 2001. The data from 1994 to 1997 uses SIC code, and the data from 1998 to 2001 uses NAICS code. The different industry codes can make it challenging to compare earlier data with later data, but comparisons within the same code are straight forward. There are some other limitations as well. Though the data can be collected by ZIP Code, it cannot be collected from the Census Bureau website at the citywide level. Also, since the data is collected by the Census Bureau, any limitations that apply to this source include those of the Census.

### 4.2.3 Regional Economic Information Systems

REIS provides detailed information classified by annual state personal income, quarterly state personal income, local area personal income, gross state product, and regional input-output multipliers. These data classify industries according to their corresponding SIC or NAICS code. The limitation of REIS data is that it is extremely general, often not including information as detailed as the city level.

#### 4.2.3.1 Annual State Personal Income

The data associated with annual state personal income include summaries of personal income estimates and detailed income and employment tables by NAICS industry (2001-2002) or by SIC industry (1958-2001). Older data include detailed income information but not employment information (1929-1957). Personal income estimates are categorized by personal income, personal income per capita, population, disposable income, and disposable personal income per capita. Detailed income and employment tables include personal income by major source and earnings by industry, wage and salary disbursements by industry, state economic profiles (SIC only), transfer payments (SIC only), farm income and expenses (SIC only), personal tax and non-tax

payments (SIC only), total full-time and part time employment by industry (2001 only), and full-time and part time wage and salary employment by industry (2001 only). The information is as detailed as the 2-digit NAICS or the 2-digit SIC classifications allow. A few of the major 4-digit NAICS and 3-digit SIC industries are included as well. All data are categorized by state or region. The available data range from 1929 to 2002. Below is a portion of a detailed employment table constructed with 2001 NAICS data. The chart is organized by industry.

**Table 4.7**
**Annual State Personal Income for Massachusetts**

**SA25 Total full-time and part-time employment by industry -- Massachusetts**
**(number of jobs)**

| Code | Item | 2001 |
|---|---|---|
| 0010 | Total employment | 4,117,820 |
| 0020 | Wage and salary employment | 3,496,271 |
| 0040 | Proprietors employment | 621,549 |
| 0050 | Farm proprietors employment | 5,708 |
| 0060 | Nonfarm proprietors employment 2/ | 615,841 |
| 0070 | Farm employment | 10,888 |
| 0080 | Nonfarm employment | 4,106,932 |
| 0090 | Private employment | 3,648,485 |
| 0100 | Forestry, fishing, related activities, and other 3/ | 11,439 |
| 0101 | Forestry and logging | 808 |
| 0102 | Fishing, hunting, and trapping | 6,935 |
| 0103 | Agriculture and forestry support activities | 3,696 |
| 0104 | Other 3/ | 0 |
| 0200 | Mining | 2,379 |
| 0201 | Oil and gas extraction | 706 |
| 0202 | Mining (except oil and gas) | **(D)** |
| 0203 | Support activities for mining | **(D)** |

("Annual State Personal …", 2003)

### 4.2.3.2 State Quarterly Personal Income

The data collected for state quarterly personal income can be displayed as personal income by major source and earnings by major industry or as wage and salary disbursements by major industry. The format of the data depends on the time period during which that data was collected. The most recent data are formatted according to NAICS and cover the years 2001 to 2003. All earlier data are formatted according to SIC

and cover the years 1958 to 2001. Earlier data are also available and are formatted according to SIC, although these data were collected before SIC existed. These data cover the years 1948 to 1957. All data include information as detailed as the 2-digit NAICS or 2-digit SIC codes allow. A few of the larger 4-digit NAICS and 3-digit SIC industries are included as well. All data are classified by region or state. The information is displayed by year. State quarterly personal income measurements are also available. This information is displayed as one large chart and shows person income estimates by state according to the years specified. The years that can be displayed range from 1948 to 2003. Below is a portion of a chart depicting personal income by major source and earnings by major industry with 2002 NAICS data.

**Table 4.8**
**State Quarterly Personal Income for Massachusetts**

**SQ5N Personal income by major source and earnings by major industry — Massachusetts**
**(Millions of dollars, seasonally adjusted at annual rates)**

| Code | Item | 2002.1 | 2002.2 | 2002.3 | 2002.4 |
|---|---|---|---|---|---|
| | *Income by place of residence* | | | | |
| 0010 | Personal income | 247,765 | 252,257 | 251,714 | 252,127 |
| 0011 | Nonfarm personal income | 247,654 | 252,173 | 251,613 | 252,022 |
| 0012 | Farm income | 111 | 84 | 100 | 106 |
| | Derivation of personal income | | | | |
| 0040 | Earnings by place of work | 184,487 | 187,004 | 186,074 | 186,492 |
| | *Earnings by place of work* | | | | |
| | Components of earnings | | | | |
| 0050 | Wage and salary disbursements | 149,500 | 151,282 | 149,959 | 149,742 |
| 0060 | Other labor income | 16,240 | 16,659 | 16,849 | 17,080 |
| 0070 | Proprietors' income 5/ | 18,747 | 19,064 | 19,267 | 19,669 |
| 0071 | Farm proprietors' income | -6 | -33 | -19 | -15 |
| 0072 | Nonfarm proprietors' income | 18,753 | 19,097 | 19,286 | 19,684 |
| | *Earnings by industry* | | | | |
| 0081 | Farm earnings | 111 | 84 | 100 | 106 |
| 0082 | Nonfarm earnings | 184,376 | 186,920 | 185,974 | 186,386 |
| 0090 | Private earnings | 161,859 | 164,072 | 162,940 | 163,466 |
| 0100 | Forestry, fishing, related activities, and other 6/ | 254 | 254 | 273 | 278 |
| 0200 | Mining | 270 | 272 | 274 | 277 |

("State Quarterly Personal …", 2003)

### 4.2.3.3 Local Area Personal Income

The data for local area personal income include personal income and population summary estimates, wage and salary estimates, and detailed county annual income and employment tables by NAICS industry (2001) or by SIC industry (1969-2000). Information on personal income and population summary estimates can be displayed as personal income, percent change of personal income, population, per capita personal income, and per capita personal income as a percent of the U.S. Detailed county annual income and employment tables are displayed as personal income by major source and earnings by industry, total full-time and part-time employment by industry, regional economic profiles (SIC only), transfer payments (SIC only), and farm income and expenses (SIC only). The information is as detailed as 2-digit NAICS and 2-digit SIC allow with certain 4-digit NAICS and 3-digit SIC industries included. Wage and salary estimates are displayed as wage and salary disbursements, wage and salary employment, and average wage per job. The information is classified by state, Metropolitan Statistical Areas, BEA Economic Areas, and State Metro/Non-metro portions. For detailed county annual income and employment tables, the information can go down to the county level. The information is displayed by the year. Below is a portion of a chart depicting total full-time and part-time employment by industry for Worcester County using 2001 NAICS data.

**Table 4.9**
**Local Area Personal Income for Worcester County**

**CA25N Total full-time and part-time employment by industry -- Worcester, MA**
**(number of jobs)**

| Code | Item | 2001 |
|---|---|---|
| 0010 | Total employment | 406,992 |
| 0020 | Wage and salary employment | 346,055 |
| 0040 | Proprietors employment | 60,937 |
| 0050 | Farm proprietors employment | 999 |
| 0060 | Nonfarm proprietors employment 2/ | 59,938 |
| 0070 | Farm employment | 1,612 |
| 0080 | Nonfarm employment | 405,380 |
| 0090 | Private employment | 353,379 |
| 0100 | Forestry, fishing, related activities, and other 3/ | 676 |
| 0200 | Mining | 328 |
| 0300 | Utilities | 2,216 |
| 0400 | Construction | 22,658 |
| 0500 | Manufacturing | 52,286 |

("Local Area Personal …", 2003)

### 4.2.3.4 Gross State Product

This information can be broken down by GSP component, which include employee compensation, indirect business taxes, property-type income, and chain-type quantity indexes. A quantity index is an index number that measures the change in the level of a quantity from a base year (which in our case in 1996), apart from any changes in relative prices. The value of the quantity index is 100 for the base year. The information for all components of GSP can be displayed in current dollars or chained (1996) dollars. The information is classified by state or region. The information can also be broken down by industry according to its SIC code. The information includes the years 1977 to 2001 and is displayed by year. Below is a portion of a chart depicting GSP for the state of Massachusetts in the year 2001 in current dollars.

**Table 4.10**
**Gross State Product for Massachusetts**

**Gross State Product (millions of current dollars)**

| State | Industry | 2001 |
|---|---|---|
| Massachusetts | Total Gross State Product | 287,802 |
| Massachusetts | Private industries | 261,806 |
| Massachusetts | Agriculture, forestry, and fishing | 1,683 |
| Massachusetts | Farms | 221 |
| Massachusetts | Ag. services, forestry, and fishing | 1,462 |
| Massachusetts | Mining | 99 |
| Massachusetts | Metal mining | (L) |
| Massachusetts | Coal mining | 0 |
| Massachusetts | Oil and gas extraction | 2 |
| Massachusetts | Nonmetallic minerals, except fuels | 97 |
| Massachusetts | Construction | 13,512 |
| Massachusetts | Manufacturing | 34,427 |

("Gross State Product", 2003)

### 4.2.3.5 Regional Input-Output Modeling System (RIMSII)

The regional input-output modeling system includes a series of input-output (I-O) multipliers that account for the relationships among industries within a region. These multipliers help determine the economic impact of introducing a project or program into a region. In order to use these multipliers, geographically and industrially detailed information must be provided on the initial changes in output, earnings, or employment that are associated with the project or program under study. The multipliers can then be used to estimate the total impact of the project or program on regional output, earnings, and employment. The industries for which the regional multipliers are available are classified by the 1987 SIC codes. Multipliers are available for 490 detailed industries

and 38 industry aggregations. This information is not available online and must be purchased from the Bureau of Economic Analysis. Information on how to use these multipliers, the data and sources for estimating these multipliers, and lists of industries represented by the multipliers are available in the most recent publication of the RIMSII handbook ("RIMS II Regional …", 2003).

### 4.2.4 ES-202

"Employment and Wage (ES-202) data are derived from reports filed by all employers subject to unemployment compensation laws, both state and federal. Industry employment and payroll information is produced both quarterly and annually for the state, labor market areas, workforce investment areas, cities and towns, and counties. NAICS based employment and wage data are available beginning with the first quarter of 2001." ("Employment and Wages …", 2003) This data is located online through the Massachusetts Division of Employment and Training website.

The data is well organized and requires the user to specify geography (city, state, labor market, county, etc.), specific geographic area (if city is chosen: Worcester, Newhaven, Miami, etc.), year, time period (quarter), ownership (private, federal government, state government), and industry. The website can give you listings of total values, totals by industry sector NAICS code, or values for individual industries by NAICS code.

The website displays a table that contains selection criteria, number of establishments, number of employees for each month within the selected quarter, total wages, average monthly employment, and average weekly wages. The industries are specified using both NAICS code and a written description of the specific industry sector.

**Table 4.11**
**ES-202 Worcester Mass**

| **Selection Criteria:** | |
|---|---|
| Area Type : **City or Town** | Area : **Worcester** |
| Year : **2001** | Period : **First Quarter** |
| Ownership Type : **Private** | Industry : **Totals by 2-Digit NAICS Code** |

| Description | No. of Establish-ments | Number of Employees | | | Total Wages | Average Monthly Employment | Average Weekly Wages |
|---|---|---|---|---|---|---|---|
| | | Jan | Feb | Mar | | | |
| **Total, All Industries** | 4,228 | 86,834 | 86,802 | 87,027 | $795,112,878 | 86,888 | $704 |
| 11 - Agriculture, Forestry, Fishing & Hunting | 3 | 15 | 18 | 18 | $62,208 | 17 | $281 |
| 23 – Construction | 259 | 3,104 | 3,079 | 3,091 | $37,178,019 | 3,091 | $925 |
| 31-33 - Manufacturing | 275 | 11,300 | 11,139 | 11,001 | $128,974,919 | 11,147 | $890 |
| DUR - Durable Goods Manufacturing | 179 | 8,515 | 8,339 | 8,221 | $105,254,918 | 8,358 | $969 |
| NONDUR - Non-Durable Goods Manufacturing | 96 | 2,785 | 2,800 | 2,780 | $23,720,002 | 2,788 | $654 |
| 22 – Utilities | 5 | 388 | 385 | 387 | $6,102,163 | 387 | $1,214 |
| 42 - Wholesale Trade | 233 | 3,155 | 3,193 | 3,174 | $29,933,310 | 3,174 | $725 |

* Table continues for all applicable NAICS values
("Employment and Wages …", 2003)

In general, the data provided by ES-202 are very accurate. The data can be displayed by individual industry at the 4-digit NAICS level. This level of detail is adequate for most applications. However, ES-202 employment data do have limitations. The major limitation of this data is that the release of the data is not very timely. Currently, the most recent data available on the Massachusetts Department of Employment and Training's website was collected for 2001, which the snapshot picture of Worcester's economy a little out of date.

**Table 4.12**
**Data Source Strength and Weakness**

| Evaluation of Data Sources | | |
|---|---|---|
| **Data Source** | **Strengths** | **Weaknesses** |
| **NAICS (Economic Census)** | •Accurately portrays current economy<br>•Detailed down to 6-digits | •Most recent is 1997<br>•Updated only every 5 years<br>•Not possible for use with time series |
| **SIC** | •Collected as far back as 1970<br>•Ideal for time series analysis | •Does not accurately portray current economy<br>•Categories not detailed or irrelevant |
| **REIS** | •Wide variety of information<br>•Detailed time series data using SIC<br>•Can predict impacts of future economic projects | •Information is general<br>•Only goes down to county level<br>•Prediction multipliers expensive |
| **ES-202** | •Specific to city level<br>•4-digit specificity<br>•Ideal for quotient analysis | •First available in 2001<br>•Not available for use with time series analysis |
| **Business Patterns** | •Organized by ZIP Code, Metro area and County<br>•Easy to make comparisons<br>•Specific to 6-digits | •Not available at city level<br>•Some employment data is displayed as a range rather than a specific number |

## Chapter 5: Comparison with Similar Sized Cities

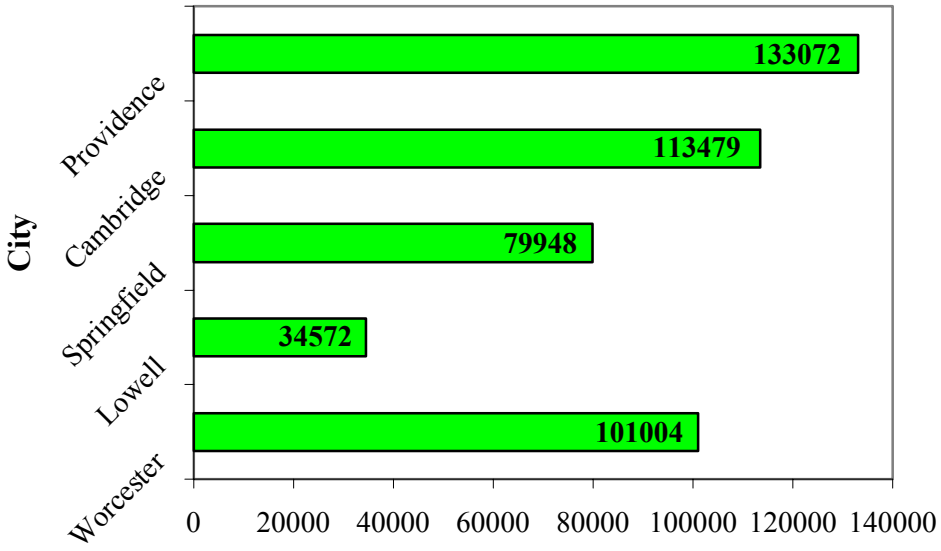
The cities of Providence, Cambridge, Springfield, and Lowell were chosen as our target cities for comparison because of their similarities in terms of population and employment. However, after examining the data collected from various government websites we were able to draw comparisons across several categories. We compared the cities with respect to total employment, median household income, per capita income, income and education distribution, and unemployment rate.

Originally, the target cities' EO-418 plans were going to be included in this section as a criterion for analysis. In the target cities however, EO-418 is still in the intermediate stages of completion. This is the case throughout most of the state, but that fact does not help the situation. It is exceedingly difficult and in many cases impossible to attain economic EO-418 data for any city. Economic development seems to be lower on the target cities' priority lists than any other section of EO-418. None of the target cities currently have any economic development information that would be useful for this comparison.

The two graphs below contain information that applies to all of the target cities, as well as Worcester. These graphs will be referenced throughout this section. Graph 5.1 below shows the total employment of each of the five target cities.

**Graph 5.1**

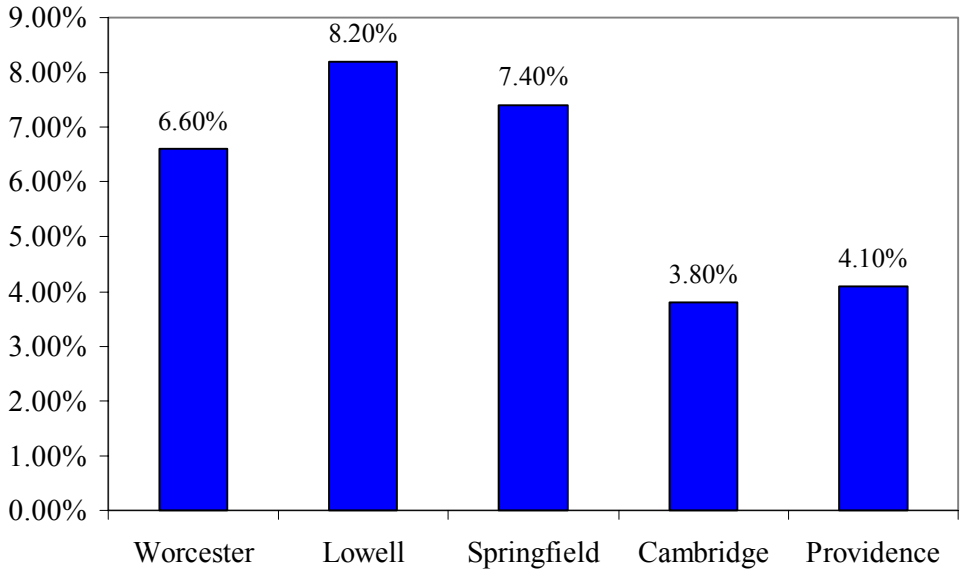
**Total Employment**




Graph 5.2 "Unemployment Rate (Metro Areas)" shows the unemployment rate for the five target cities including their surrounding metropolitan areas.

**Graph 5.2**

**Unemployment Rate (Metro Areas)**




### 5.1.1 Data Comparison: Worcester vs. Lowell

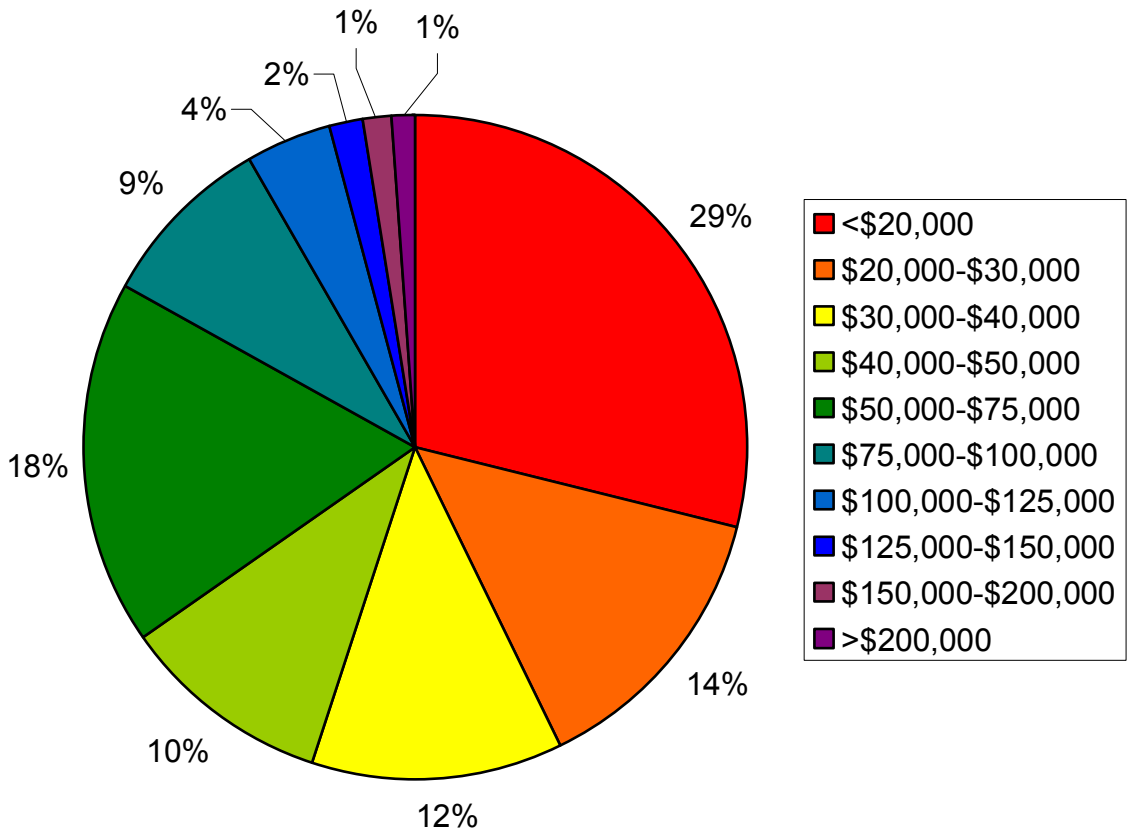
One of the most staggering economic differences between Worcester and Lowell is the total employment. Worcester has close to three times the number of employees that Lowell has. This is most likely because Worcester's population (172,648 in 2000) is significantly larger than that of Lowell (105,167 in 2000).

Lowell has a slight edge in median household income ($39,192 vs. $35,623), but Worcester's per capita income ($18,614) is slightly larger than that of Lowell ($17,557). This could indicate that in Worcester, the average household is composed of fewer sources of income.

The next point of comparison is the income distribution for both Worcester and Lowell. Graphs 5.3 and 5.4 below show this distribution.

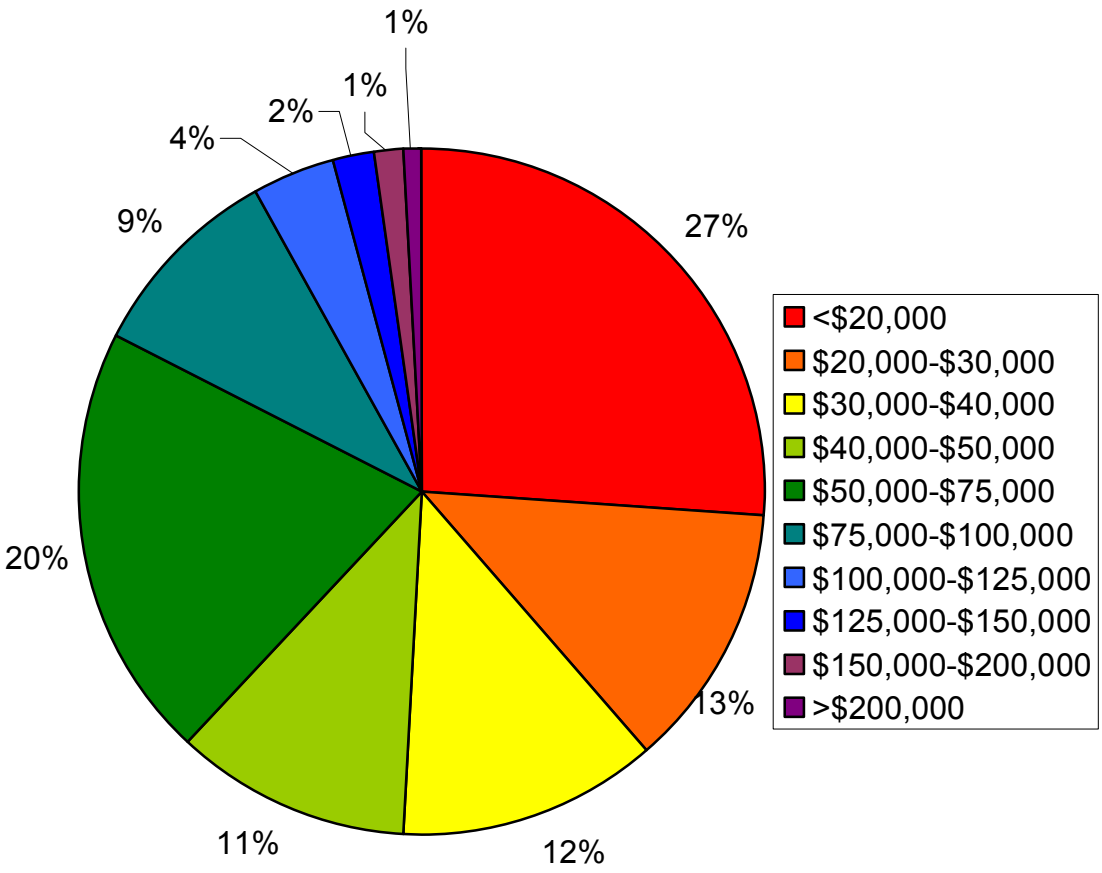
**Graph 5.3**

**Worcester Household Income Distribution**



**Graph 5.4**

**Lowell Household Income Distribution**

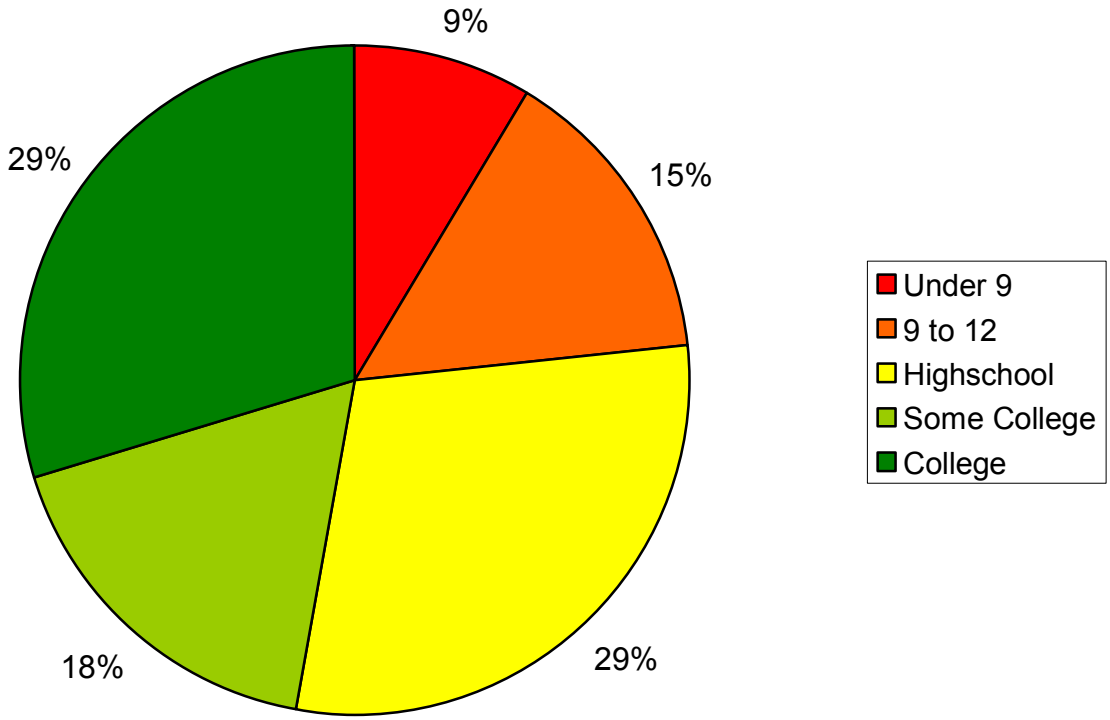



After examining these two graphs side-by-side, one should notice that there are very few differences between the two cities in this respect. The only difference that stands out is the 2% difference at both the <$20,000 and the $50,000-$75,000 level. A smaller percentage (27%) of Lowell's workforce falls in the <$20,000 range than Worcester (29%). Lowell also has a 2% advantage in the $50,000-$75,000 range (20% versus 18% in Worcester). From this data, one can conclude that the average household in Lowell has a larger income than the average household in Worcester. This agrees with the information provided by the median household income graph. A possible reason for this falls within the next area of comparison.

Comparing the education distribution between these two cities gives us a good idea of the composition of the workforce. This information will not only help us to compare Worcester to Lowell, but will also help later to inform any suggestions dealing with what types of businesses to bring in to the city. The two graphs below show the education distribution for both Lowell and for Worcester.

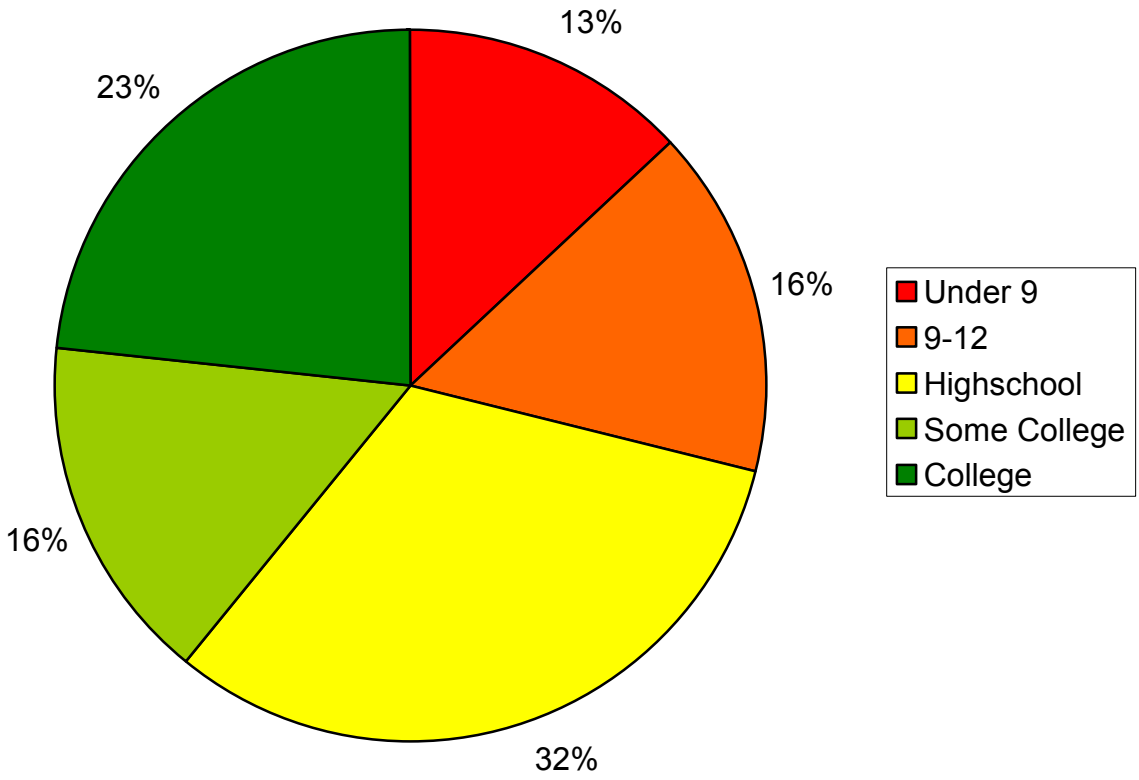
**Graph 5.5**

**Worcester Education Distribution 2000 (Count)**



**Graph 5.6**

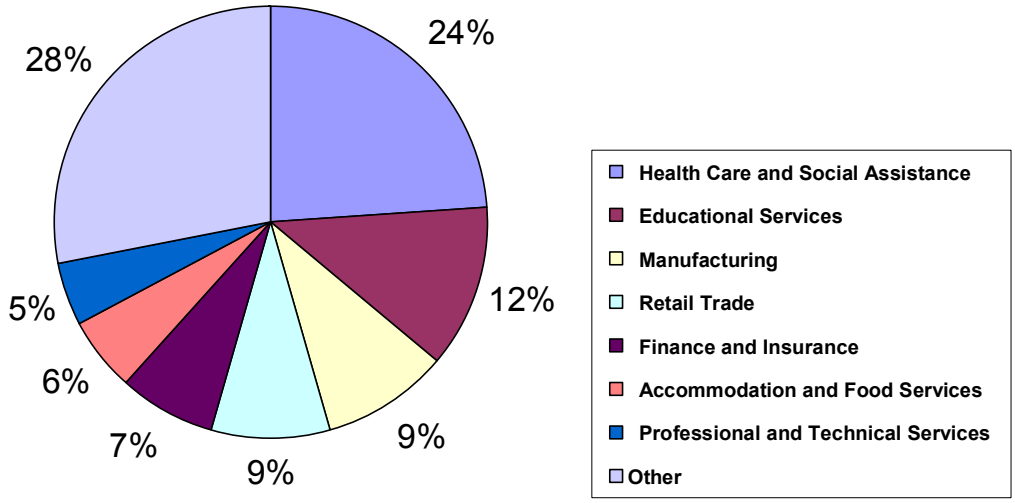
**Lowell Education Distribution 2000 (Count)**




Compared to Lowell, Worcester has a more educated population. Worcester has higher percentages in both the "College" and "Some College" levels, as well as smaller percentages in the "Under 9", "9 to 12" and "High school" levels. This would seem to support the fact that Worcester's income per capita is higher than that of Lowell. This is because in general, more educated people make higher salaries.

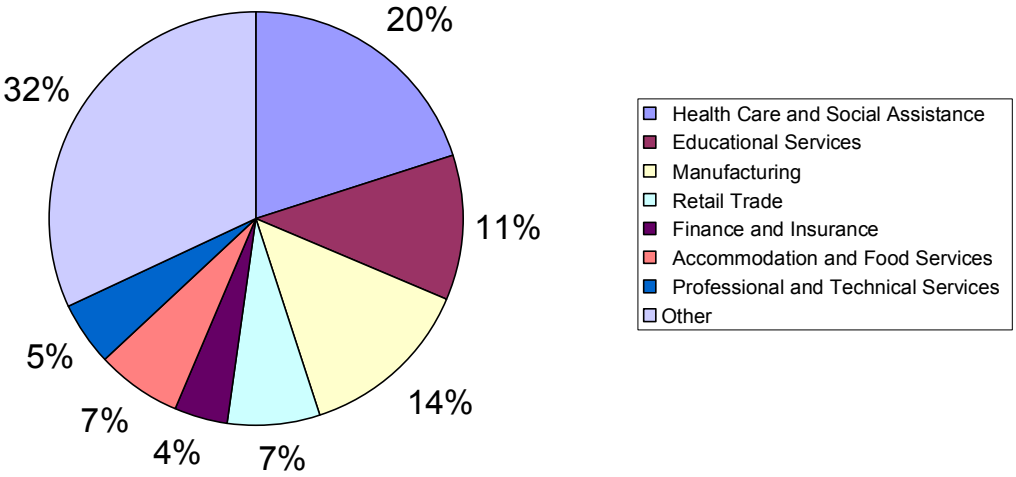
**Graph 5.7**

**Worcester Economic Distribution**




**Graph 5.8**

**Lowell Economic Distribution**



When examining the economic breakdown of both Lowell and Worcester's, one can see that the two economies are very similar. Worcester's economy is slightly more focused on health care and social Assistance, while Lowell's economy is more focused on manufacturing. Worcester's economy is more focused on finance and insurance as well.

The final point of comparison is the unemployment rate. Worcester has an unemployment rate of 6.6%, while Lowell has an unemployment rate of 8.2%. The difference between these two values is 1.6%. One possible reason for these differences could be that the composition of industries are more diverse in Worcester than in Lowell and because of this Worcester is less effected by outside economic factors such as changes in the national economy.

### 5.1.2 Conclusions: Worcester vs. Lowell

One of the major differences between these two cities is the total employment. Worcester is a larger city than Lowell, and consequently its total employment is significantly higher. Since Worcester is larger, the city has more residents, and more needs. Because of this, it would not be accurate to assume that this difference in employment is a strength or a weakness. It is simply a difference that can be attributed to the comparatively large population that Worcester has.

The discrepancy between median household income and per capita income tell us little about the comparative strengths and weaknesses of Worcester. What can be taken from these two comparisons is that the average person in Worcester has a slightly higher salary than that of the average person in Lowell. The education distribution charts provide some support to this conclusion, as well as some other conclusions.

Worcester has a larger concentration of its employees in the higher-education areas than Lowell. With some exceptions, one can assume that people with higher levels of education are given higher salaries. Worcester's education distribution can also be an advantage when attracting businesses. Businesses tend to seek out talent to some extent, and knowing that Worcester has a favorable distribution of education can easily be seen as one of the strengths of the City.

The unemployment rate in Worcester is also a comparative strength. Having a low unemployment rate is a good sign of economic prosperity. Worcester has a lower unemployment rate than Lowell, so this is most definitely a relative strength.

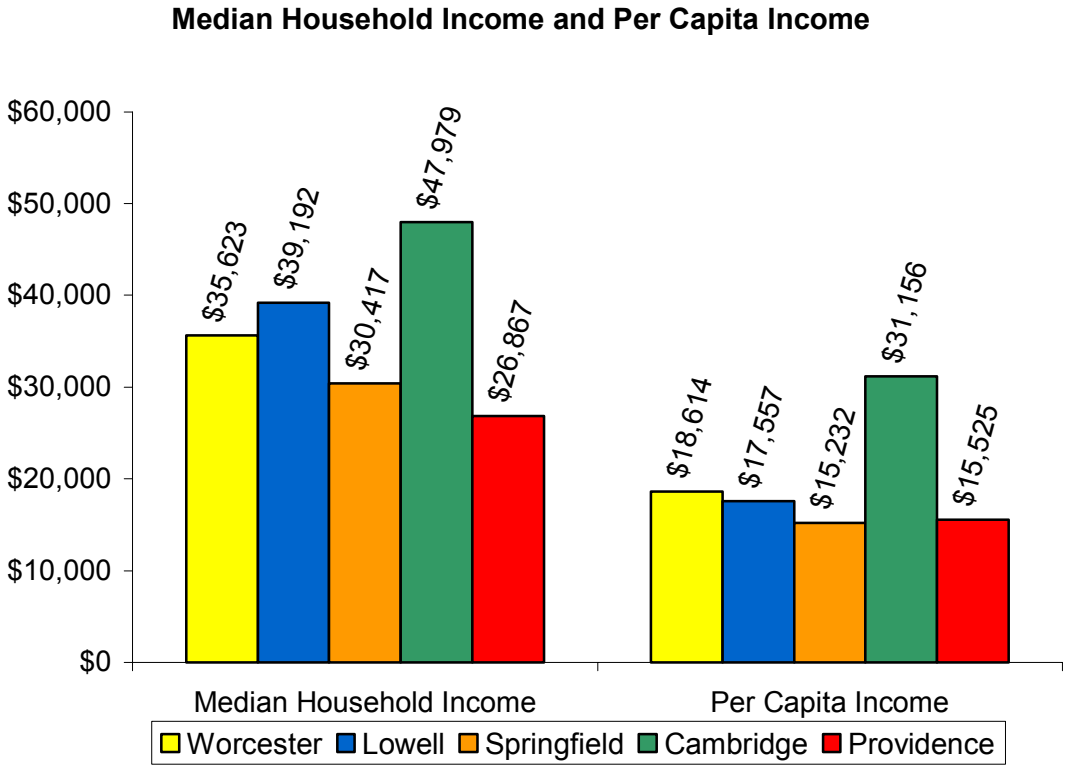
### 5.2.1 Data Comparison: Worcester vs. Springfield

Graph 5.1 shows that Worcester's total employment (101004) is significantly larger than that of Springfield (79948). As with Lowell, this employment difference is most likely due to the difference in population between Worcester and Springfield.

Unlike Lowell, Graph 5.9 shows that Worcester has both a greater median household income and a greater per capita income than Springfield. According to Graph 5.9, the difference in median household income is approximately $5,000 favoring Worcester. The difference in per capita income is about $3,400 in favor of Worcester. Unlike with Lowell, there is no ambiguity in this case. One can confidently say that by

analyzing the data given, the average salary of a job in Worcester is higher than that of a job in Springfield.

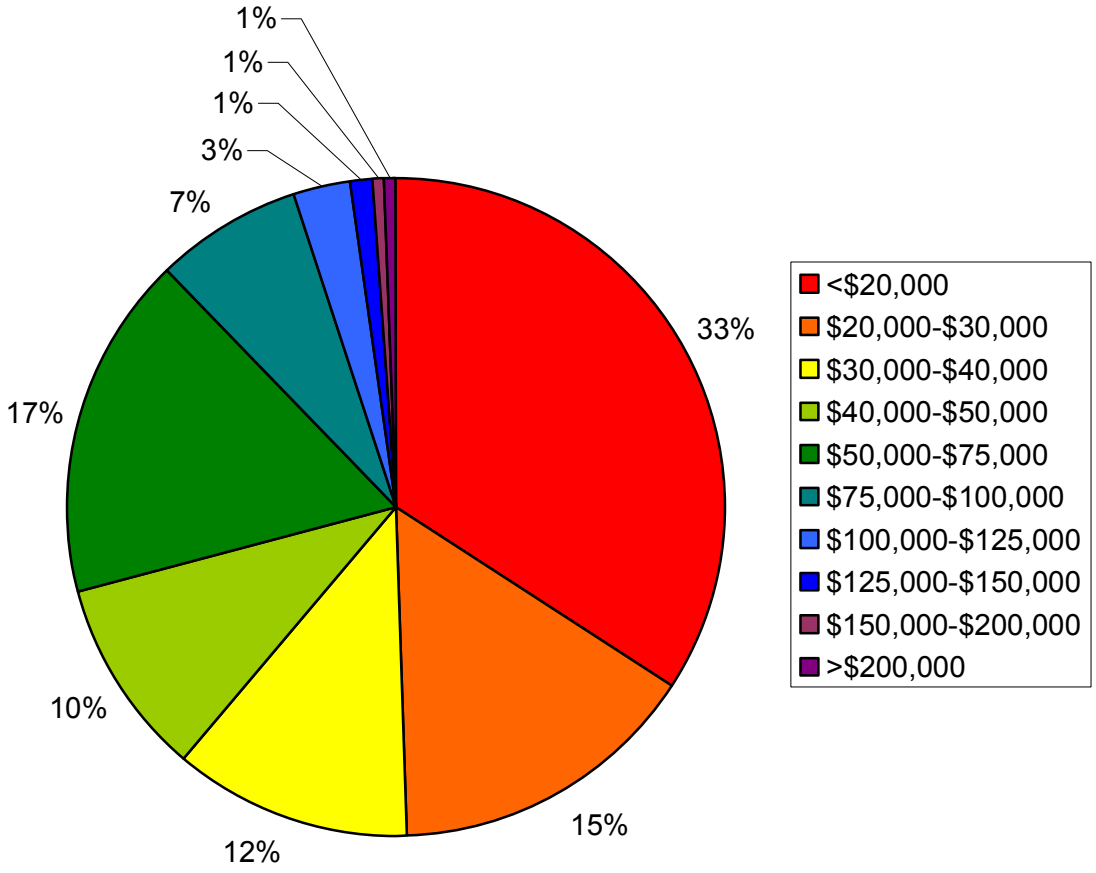
**Graph 5.9**




The next criterion that will be examined is the house income distribution. Graph 5.10 below shows the household income distribution for Springfield. Please see Graph 5.3 for Worcester's household income distribution.

**Graph 5.10**

**Springfield Household Income Distribution**

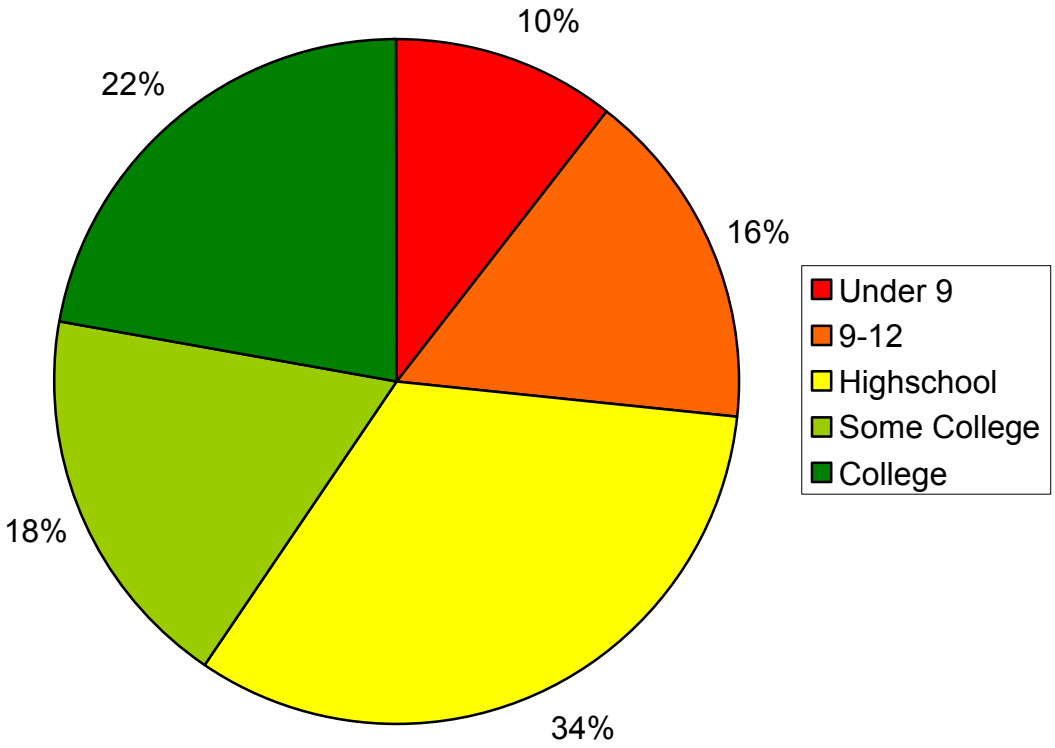



After examining and comparing the two graphs, one can see that nearly 50% of Springfield's households have an income that falls in the two bottom categories of the chart (Less than $30,000). Worcester, on the other hand has either an equal or a larger value for every section greater than $40,000. These differences seem to fall in line with the edge that Worcester possesses in both median household income and per capita income.

The next comparison area is education distribution. The Graph 5.11 below shows the education distribution for Springfield.

**Graph 5.11**

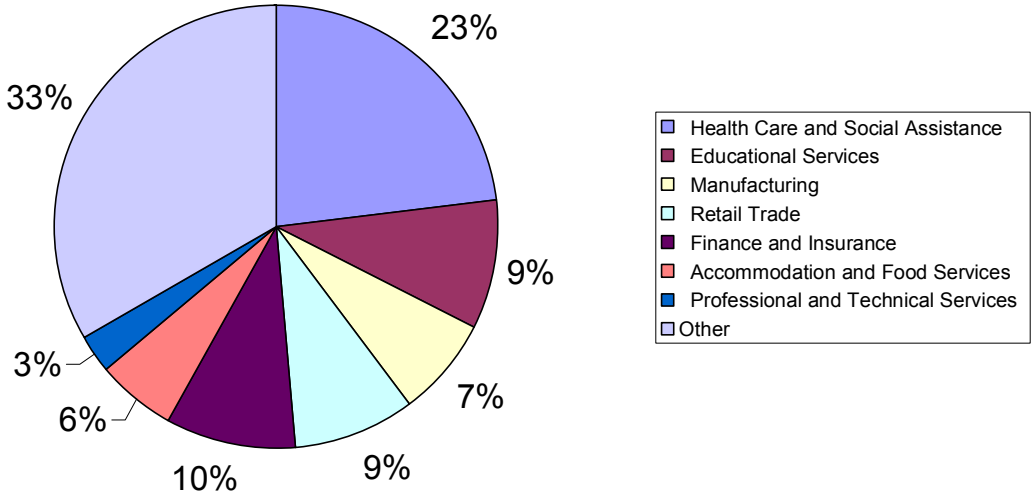
**Springfield Education Distribution 2000 (Count)**




Graph 5.5 shows Worcester's Education Distribution. The largest differences lie in the "College" and "Highschool" levels. Worcester has a value of 29% for the "College" level. This value is 7% higher than the corresponding value for Springfield. In the "Highschool" level Springfield has a value of 34%, while Worcester is at 29%. Worcester has a numerical advantage in this area with a higher percentage of the population having completed college, and a smaller percentage having completed only high school.

**Graph 5.12**

**Springfield Economic Distribution**




In comparing the compositions of Worcester's and Springfield's economies, there do not appear to be many differences, besides the other category of Springfield being significantly larger than that of Worcester's. Even when examining the other category more specifically, Springfield and Worcester have very similar breakdowns. Worcester happens to be slightly more focused on educational services, manufacturing, and professional and technical services and slightly less focused on finance and insurance than Springfield.

Springfield's unemployment rate of 7.4% is 1.2% higher than that of Worcester (6.6%). This difference cannot be overlooked. One must give Worcester the statistical edge in this category.

### 5.2.2 Conclusion: Worcester vs. Springfield

With respect to the data used in this section, Worcester had the advantage in every category. Worcester had a larger per capita and median household income, more favorable income and education distributions, and a lower unemployment rate. With respect to Springfield, all of these categories can be viewed as comparative strengths. As with Lowell, the only piece of information that provides no real comparative information is the total employment. This is because the two cities have significantly differing populations.

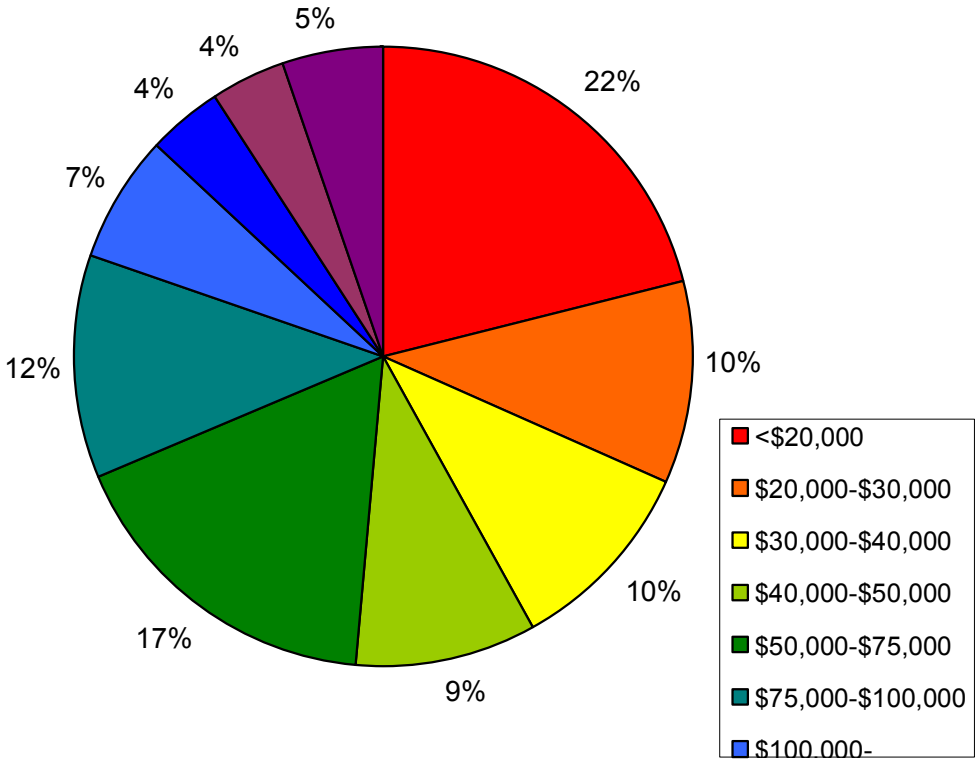
### 5.3.1 Data Comparison: Worcester vs. Cambridge

If one refers back to the graph of total employment (Graph 5.1), one can see that the total employment for Cambridge is larger than that of Worcester. With a total employment value of 113,479, Cambridge employs approximately 12,000 more people than Worcester. As with the previous cities, the difference in population makes this statistic less informative than the actual unemployment rate.

The median household income and per capita income graph (Graph 5.9) provides a good sense of where Worcester stands in comparison to Cambridge with respect to these two categories. In terms of median household income, Cambridge has a value of $47,979 while Worcester has a value of $35,623. The difference between these two values is approximately $12,000 in favor of Cambridge. When one looks at per capita income, the difference is nearly the same. Worcester has a per capita income of $18,614, while Cambridge has a significantly larger value of $31,156. There is no gray area here. The average person living in Cambridge has a much higher salary than the average person living in Worcester.

**Graph 5.13**

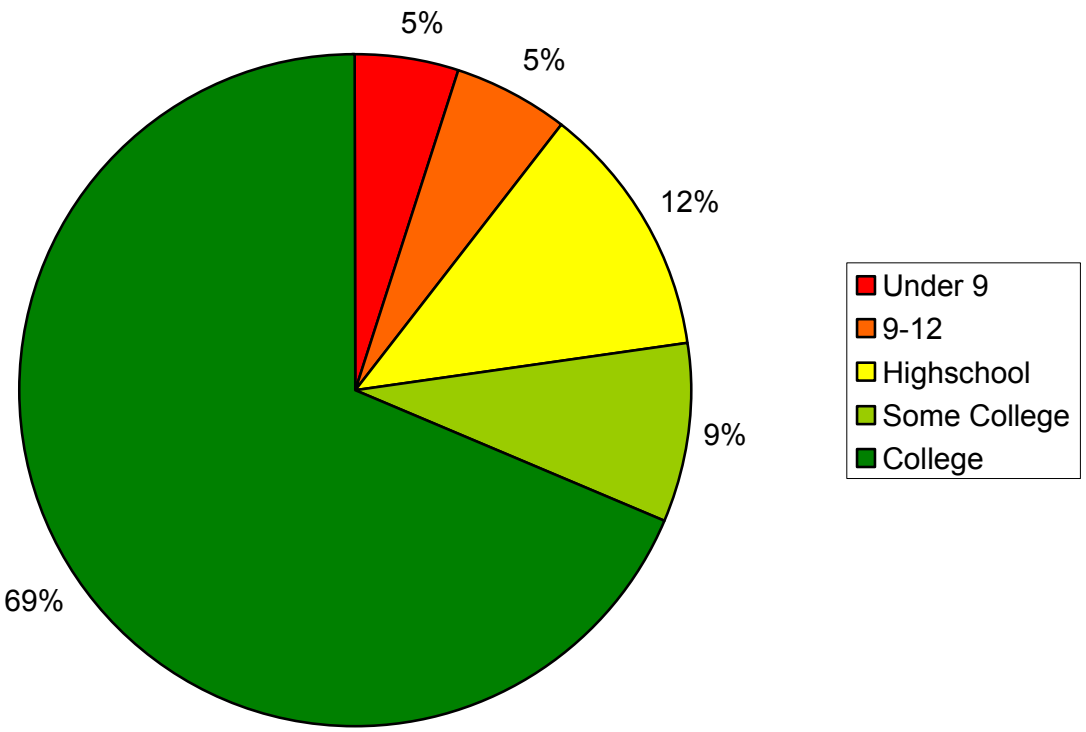
**Cambridge Household Income Distribution**



When one compares Graph 5.12 above with the graph of Worcester's Household income distribution, the most apparent difference is that the very high-income sections in the Cambridge graph occupy larger percentages than the corresponding sections of the Worcester graph (Graph 5.3). In fact, the top four sections of Graph X.X (>$100,000) take up 20% of the total household income distribution. This is significantly larger than the 8% that the same sections occupy for Worcester. Another notable difference between the two cities lies in the lower sections of household income distribution graph. The bottom two sections of Worcester's household income distribution (<$30,000) compose 43% of Worcester's household income distribution. These same two sections compose only 32% of Cambridge's household income distribution. It is, therefore a logical conclusion that Cambridge has the edge in the area of household income distribution.

**Graph 5.14**

**Cambridge Education Distribution 2000 (Count)**

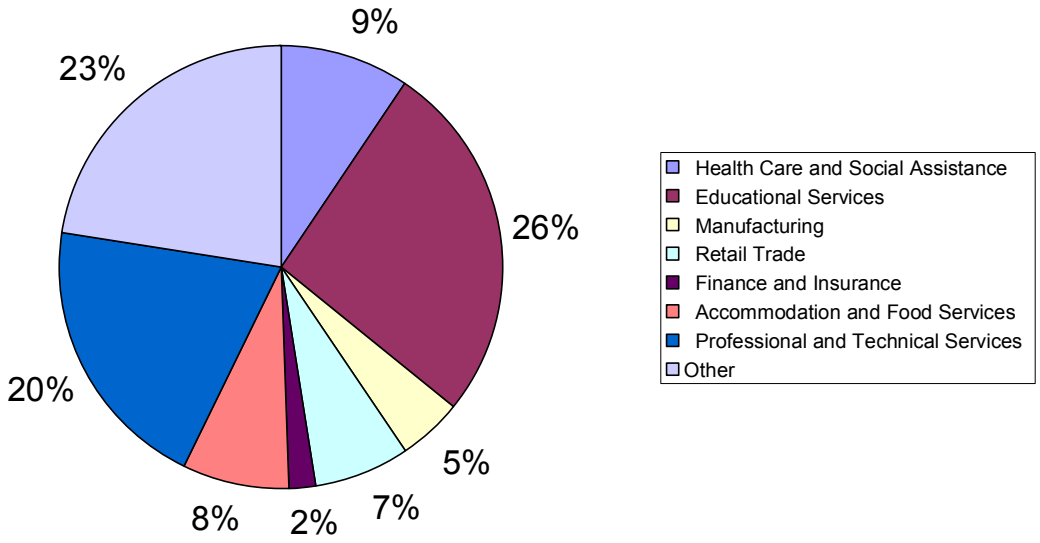



After close examination of Graph 5.13 above, one can analyze this graph with regard to Worcester's education distribution graph (Graph 5.5). Overwhelmingly, the most apparent difference is the "College" category. 69% of Cambridge's education distribution falls into this category. This is more than twice the value for Worcester

(29%). This dramatic difference is enough to be able to draw the conclusion that the Cambridge has the statistical edge in this comparison with respect to education distribution.

**Graph 5.15**

**Cambridge Economic Distribution**




The breakdowns of Cambridge's and Worcester's economies are very different in some ways. Cambridge's educational services sector composes over one quarter of its total economy and its professional and technical services sector composes one fifth of its total economy. Educational services makes up only twelve percent of Worcester's economy and professional and technical services makes up only five percent. Worcester's economy proportionally contains more manufacturing, finance and insurance, and retail trade, where Cambridge's economy contains more accommodation and food services. Cambridge's economy is more focused than Worcester's, mainly employing its population in its two largest sectors: educational services and professional and technical services.

Cambridge has an unemployment rate of 3.8%. This value is 2.8% smaller than that of Worcester (6.6%). This difference is quite significant, and thusly gives Cambridge a solid statistical edge with respect to this criterion.

### 5.3.2 Conclusion: Worcester vs. Cambridge

In general, the differences between these two cities are numerous and dramatic. Cambridge has the statistical edge in every comparison category. Probably the most notable of these is the difference in education distribution. This phenomenon is, in all likelihood a very large reason for Cambridge's other strengths. As mentioned earlier,

higher education for the most part can be translated into higher salaries. Another reason for such a dramatic difference in prices could be the cost of living. We were unable to locate any general dollar-value cost of living calculations, but the cost of property in Cambridge are much higher than those in Worcester, thereby necessitating a higher average salary. Though there are other influences not looked at directly in this section, education and cost of living are most certainly two of them.

It is difficult to determine the relative strengths and weaknesses of Worcester versus Cambridge without a comprehensive understanding of the cost of living differences between the two cities. However, median household income, per capita income, household income distribution, education distribution, and unemployment can all be viewed as relative weaknesses when comparing Worcester to Cambridge.

### 5.4.1 Data Comparison: Worcester vs. Providence

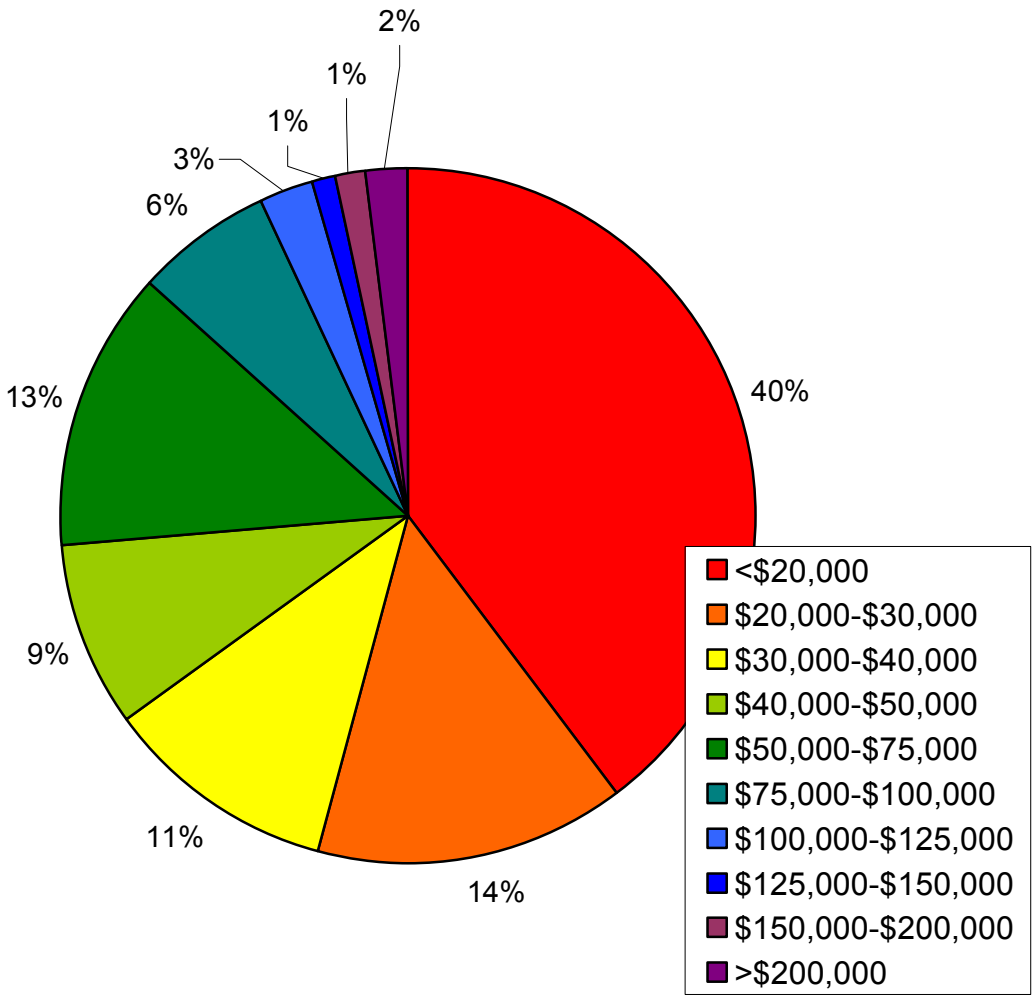
There is a fairly substantial difference in total employment between Worcester and Providence, Rhode Island. Providence employs 133,072 people, while Worcester employs 101,004. The difference between these two is approximately 32,000. Given that the total employment of Lowell, Massachusetts is 34,572, one can see that this is not an insignificant difference in population. Though the actual numbers mean little in regard to direct analysis, one must take into account (even if only internally) the drastic size differences between these two cities when making comparisons.

As stated previously, Worcester has a median household income of $35,623, and a per capita income of $18,614. Providence has a median household income of $26,867, and a per capita income of $15,525. The difference in median household income is approximately $9,000. This is a fairly significant difference. The difference in per capita income is approximately $3,000. Though this number is not as large, it is important to realize that the values we are comparing for per capita income, are much less than those for median household income. From this data we can see that Worcester has the statistical edge in these two areas of comparison.

The next area of comparison involves the median household income distribution chart shown below. Please reference Graph 5.15 below for information regarding Providence, Rhode Island's median household income distribution.

**Graph 5.16**

**Providence Household Income Distribution**

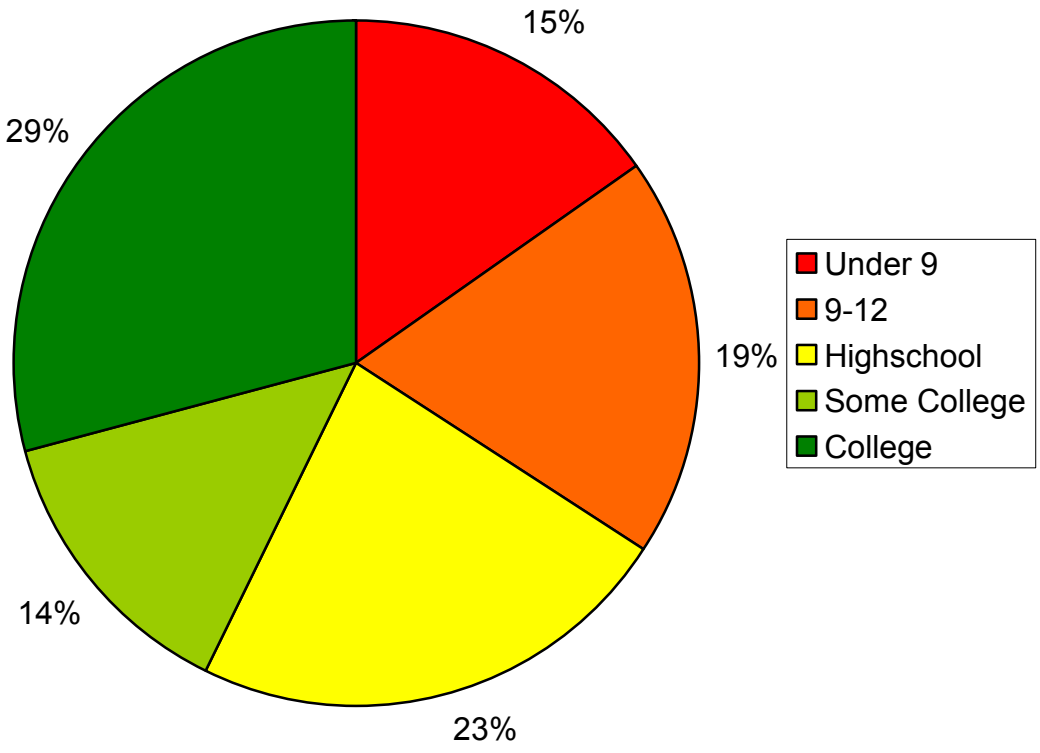



One of the most glaring things about this graph is the "<20,000" section. In Providence, this section makes up 40% of the total. That is a significantly larger portion of the city Worcester's 29%. Another useful thing to note is the percent of both Worcester and Providence that lie in the range of $50,000-$100,000 (green and blue-green on the graph). For Worcester the value is 27%, while the value for Providence is 19%. One interesting thing to note, however is that in the ">$200,000" section Providence has a value of 2%, while Worcester has a value of only 1%.

The education distribution for Worcester versus Providence is the next criterion that will be addressed. Graph 5.16 below shows the education distribution for Providence, Rhode Island.

**Graph 5.17**

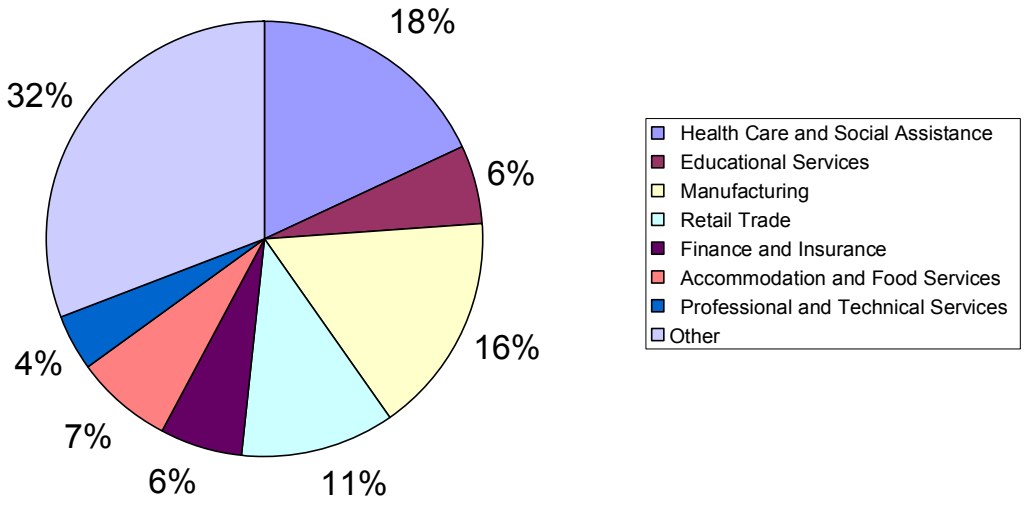
**Providence Education Distribution 2000 (Count)**




Unlike the other cities used in this comparison, Providence's education distribution map is quite similar to Worcester's education distribution map. There are a few differences however, that are worth noting. Firstly, there is a 6% difference in the "Under 9" category. Worcester has 9%, while Providence has 15%. Worcester also has 4% less in the 9-12 category (Worcester has 15%). Overall Worcester has the statistical edge. Disregarding the "College" section because the two values are the same, Worcester has a higher percentage of its distribution in both the "Some College" and "Highschool" sections. Providence on the other hand has a higher percentage of its distribution in both the "9-12" and "Under 9"sections.

**Graph 5.18**

**Providence Economic Distribution**




In comparing Worcester and Providence, employment in Providence is more concentrated in manufacturing and retail trade than Worcester and less concentrated in health care and social assistance and educational services. The other category for Providence is also larger than Worcester's. In examining the other category more closely, Providence is more focused in public administration, wholesale trade, and administrative and waste services than Worcester.

The unemployment rate in Providence is 4.10%. Compared to the 6.6% unemployment rate that Worcester has, that is a significantly lower value. Though Providence has a higher total employment, a smaller percent of its population is unemployed. This gives Providence a good statistical edge in this category.

### 5.4.2 Conclusion: Worcester vs. Providence

Overall, it is fair to say that Worcester is far better off with respect to nearly all of the criteria addressed in this section. The average person in Worcester has a higher salary than the average person in Providence. This is clearly a relative strength of Worcester as compared to Providence.

Income distribution can also be considered a relative strength. This strength lies specifically in the very-low income area (<$20,000). A significantly smaller percentage of Worcester's income distribution lies in this area compared to Providence.

Education distribution could be considered a marginal relative strength, but given the nature and size of the differences, education distribution will not be viewed as a strength for either city. The differences are small, and they are spread evenly about the

graph. It is adequate to assume that these differences have little effect on the other criteria compared in this section.

The unemployment rate in Providence (4.10%) is much smaller than the unemployment rate in Worcester (6.6%). One can conclude that this is a comparative weakness for Worcester. A low unemployment rate is a good indicator of economic growth, and having a comparatively high unemployment rate leads one to the conclusion that Worcester's economy is not growing as well as that of Providence.

**Table 5.1**

| Comparative Strengths and Weaknesses Summary | | | | | |
|---|---|---|---|---|---|
| | **Median HH Income** | **Per Capita Income** | **Income Distribution** | **Education Distribution** | **Unemploy. Rate** |
| **Worcester** | Greater than Springfield, Providence; Less than Cambridge, Lowell | Greater than Lowell, Springfield, Providence; Less than Cambridge | Average high income range; Small low income range | Small Under 9 range; Large Highschool, College ranges. | Average |
| **Lowell** | Greater than Worcester, Springfield, Providence; Less than Cambridge | Greater than Springfield, Providence; Less than Worcester, Cambridge | Average middle income range; Small low income range | Large Highschool range; Average College range | High |
| **Springfield** | Greater than Providence; Less than Cambridge, Worcester, Lowell | Less than Cambridge, Providence, Worcester, Lowell | Low-average medium income range; Larger low income range | Large Highschool range; Small-average Under 9 range | High |
| **Cambridge** | Greater than Providence, Springfield, Worcester, Lowell. | Greater than Lowell, Providence, Worcester, Springfield | Large medium/high income ranges; Small low income range | Overwhelming College range; Very small Under 9, 9-12 ranges | Low |
| **Providence** | Less than Cambridge, Worcester, Lowell, Springfield | Greater than Springfield; Less than Worcester, Lowell, Cambridge | Small medium/high income ranges; Very large low income range | Large Under 9 range; Average College range | Low |

*Note: Employment Distribution by Industry is not included in this table because it does not necessarily indicate a strength or weakness in the respective city*

## 5.5 Comparison with Target Cities Information Gaps

The only real information gap encountered when completing this section had to do with EO-418. There was no useful information available through the city offices, or through the regional planning agencies. The comparison would have been aimed at analyzing the data presented by the target cities. Since the target cities will be submitting information to their regional planning agency regarding each section of EO-418, it would have been useful to see what information the cities deemed relevant enough to use to

obtain equivalency in each of the different sections. This could provide a better sense of what types of data/plans it requires to receive full equivalency in economic development.

The other data used in this comparison was fairly easy to locate. The only difficulty came in trying to find a data source that contained all of the data for each city. We did not want to mix data sources for fear of using a source that was less reliable. However, it was not possible to find a single data source that contained all of the data that was required. The data sources were broken down as follows:

*Employment*
Worcester- http://www.detma.org/lmi/local/Worceste.html
Lowell- http://www.detma.org/lmi/local/Lowell.html
Springfield- http://www.detma.org/lmi/local/Springfi.html
Cambridge- http://www.detma.org/lmi/local/Cambridg.html
Providence- http://www.planning.ri.gov/census/pdfcomm/provemploy.pdf
*Median household income*
Worcester- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3221
Lowell- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3011
Springfield- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3146
Cambridge- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=2894
Providence- http://www.ersys.com/usa/44/4459000/income.htm
*Per capita income*
Worcester- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3221
Lowell- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3011
Springfield- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3146
Cambridge- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=2894
Providence- http://www.nationmaster.com/encyclopedia/Providence,-Rhode-Island
*Income distribution*
Worcester- http://www.ersys.com/usa/25/2582000/income.htm
Lowell- http://www.ersys.com/usa/25/2582000/income.htm
Springfield- http://www.ersys.com/usa/25/2567000/income.htm
Cambridge- http://www.ersys.com/usa/25/2511000/income.htm
Providence- http://www.ersys.com/usa/25/2582000/income.htm
*Education distribution*
Worcester- http://www.ersys.com/usa/25/2582000/educate.htm
Lowell- http://www.ersys.com/usa/25/2537000/educate.htm
Springfield- http://www.ersys.com/usa/25/2567000/educate.htm
Cambridge- http://www.ersys.com/usa/25/2511000/educate.htm
Providence- http://www.ersys.com/usa/44/4459000/educate.htm

As is evident from this list, it is difficult to find data for Providence from the same sources used for the Massachusetts cities. This is a minor problem because when the same data was found in more than one source that was used in the comparison, the numbers were checked with each other in order to verify that the values remain constant.

Other than the lack of EO-418 information, the information gaps in this section were small. The data was locatable, but it was a challenge to verify its accuracy. Overall, the process of locating data for this section was not as challenging as it was for some of the other sections.

## Chapter 6: Worcester v. Boston's Consolidated Metropolitan Area

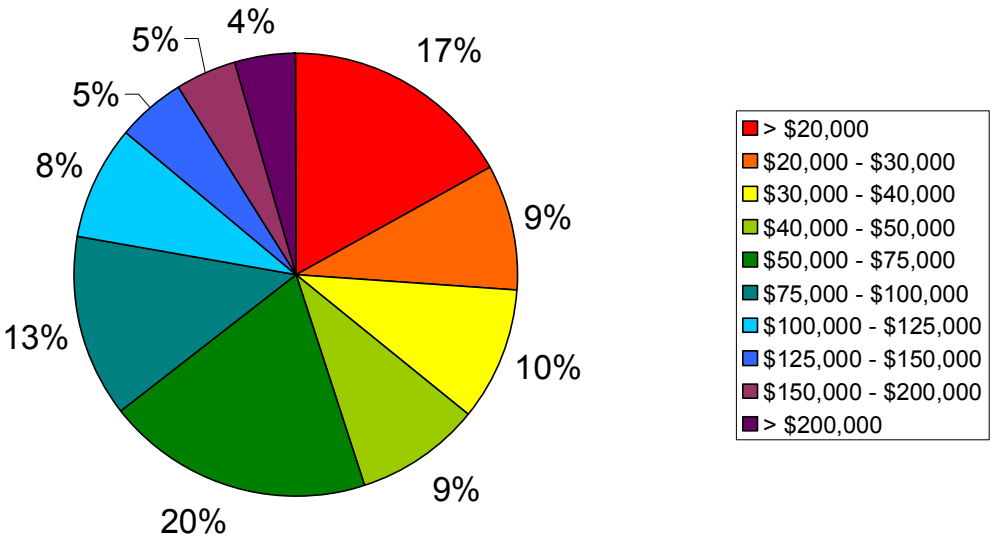
In defining Worcester's role in Boston's Consolidated Metropolitan Area (CMA), the same comparisons of Worcester with the similarly sized cities were used. In addition, quotient analyses were done for Worcester versus Worcester County and for Worcester County versus Boston's New England Consolidated Metropolitan Area (NECMA). A time series analysis comparing Worcester County with Boston's NECMA was completed in order to get an idea of how the metropolitan area's economy was changing in relation to Worcester's Economy.

### 6.1 Worcester v. Boston's Consolidated Metropolitan Area Analysis

Worcester's economy is not doing as well as the larger metropolitan area. Unemployment in Worcester is much higher than that of Boston's CMA. The unemployment rate in Worcester is 6.6% compared with 5.4% for Boston's CMA. Worcester's population is less wealthy than the metropolitan area. Median household income in Worcester is $35,623 as compared with the larger area's $56,481. Per capita income in Worcester is $18,614 as compared with $29,789 for the larger area.

**Graph 6.1**

**Income Distribution for Boston's CMA (2001)**




When comparing income distribution, a much larger portion of Worcester's households fall within the lowest income category of less than $20,000 than that of the larger metropolitan area (see Graph 5.3). Around 29% of Worcester's households fall within the lowest income category as compared to 17% of households in the larger

metropolitan area. Worcester and Boston's CMA have similar income breakdowns for households with incomes between $20,000 and $100,000. The metropolitan area, however, has a much higher fraction of households with incomes above $100,000 than Worcester. Around 22% for the metropolitan area as compared to 8% of Worcester's households generate incomes greater than $100,000. It is difficult to translate these values into the comfort level of the people living in the regions, because cost of living is not taken into account. It does seem that on average, the people living in the metropolitan area are doing better than those living in Worcester.

**Table 6.1**

**Exported Jobs: Worcester versus Boston New England Consolidated Metropolitan Area**

| NAICS Code | Industry Cluster | Exported Jobs: Worcester Cnty to Boston NECMA | Exported Jobs: Worcester Cty to Worcester Cnty |
|---|---|---|---|
| 11 | Forestry, Fishing, & Related Activities | -21.166 | -1.043 |
| 22 | Utilities | 179.752 | -1.179 |
| 23 | Construction | 151.015 | -51.272 |
| 31-33 | Manufacturing | 1302.877 | -28.857 |
| 42 | Wholesale trade | -53.724 | -28.154 |
| 44-45 | Retail trade | 470.678 | -45.775 |
| 48-49 | Transportation and warehousing | -16.826 | -17.949 |
| 51 | Information | -318.990 | -8.548 |
| 52 | Finance and insurance | -450.066 | -3.324 |
| 53 | Real Estate, Rental, & Leasing | -174.595 | -8.961 |
| 54 | Professional & Technical Services | -879.733 | -27.456 |
| 55 | Management of Companies & Enterprises | 103.521 | -0.521 |
| 56 | Administrative & Waste Services | -147.036 | -21.785 |
| 61 | Educational Services | -340.489 | -6.545 |
| **62** | **Health Care & Social Assistance** | **820.841** | **6.027** |
| 71 | Arts, Entertainment, & Recreation | -65.761 | -6.343 |
| 72 | Accommodation & Food Services | -102.155 | -20.869 |
| 81 | Other Services, ex Public Administration | 172.560 | -2.621 |

Due to data limitations, a quotient analysis comparing the city of Worcester directly with Boston's Consolidated Metropolitan Area was not possible. Therefore, two separate quotient analyses were completed at different levels: one quotient analysis calculating the jobs exported from the city of Worcester to Worcester County and another calculating the jobs exported from the county to Boston's Consolidated Metropolitan Area. The two analyses were placed side-by-side in Table 6.1. Industry sectors that displayed high values for "Exported Jobs: Worcester City to Worcester County" and "Exported Jobs: Worcester County to Metropolitan Area" were highlighted. Only one industry sector in Worcester meet this criteria, that of Health Care & Social Assistance.

A time series analysis could not be completed for Boston's Consolidated Metropolitan Area, because REIS data breaks down the New England region into New

England Consolidated Metropolitan Areas instead of the larger Consolidated Metropolitan Area. Two series of graphs were constructed. One series of graphs showed employment versus time for Worcester County and Boston's NECMA for each major SIC industry cluster. The next series showed percent changes in employment from year to year for Worcester County and Boston's NECMA (excluding employment from Worcester County). This second series of graphs was constructed to determine Worcester County's impact on the metropolitan area. What resulted from this analysis was that the employment of Worcester County seems to follow that of Boston's New England Consolidated Metropolitan Area almost as closely as it follows the state's employment. Some of the more apparent differences are noted. Mining employment showed the largest and most significant deviations between Worcester County and Boston's NECMA. Mining employment in the county is extremely low, meaning that small changes in mining employment cause significant percentage changes from year to year. Worcester County's employment changes in wholesale trade differed from that of the metropolitan area in 1976 and in 1996. In 1976, Worcester County showed a 10% increase in employment in wholesale trade as compared with a 1% decrease in wholesale trade for the rest of the metropolitan area. Retail trade differed in 1982 between the two areas, showing a 5% decrease in the county's employment and a 1% increase in employment for the rest of the metropolitan area. Federal, civilian employment showed a huge deviation from the county to the metropolitan area in 1977 when it experienced more than a 44% decrease on the county level and a 2% increase for the rest of the metropolitan area. Military employment differed slightly in 1991 when it increased by 4% for Worcester County and decreased 6% for Boston's NECMA.

### 6.2 Worcester's Role in Boston's Consolidated Metropolitan Area Information Gaps

As mentioned in the time series and quotient analyses sections, it is difficult to find data for Boston's Consolidated Metropolitan area. Massachusetts ES-202 data contains 7 primary metropolitan areas located within Boston's Consolidated Metropolitan area. The other three primary metropolitan areas are located in New Hampshire. This data could not be found for New Hampshire. REIS data provides data for New England Consolidated Metropolitan areas. Boston's New England Consolidated Metropolitan area does not cover certain portions of Maine and New Hampshire located within Boston's Consolidated Metropolitan areas. Time series and quotient analyses that were completed for this section of the paper dealt with Boston's New England Consolidated Metropolitan area instead of Boston's Consolidated Metropolitan area.

Many statistics could be found for Boston's Consolidated Metropolitan area. Unemployment rates found at the primary metropolitan area level were available on the Massachusetts Department of Employment and Training's website (http://lmi2.detma.org/lmi/lmi_lur_a.asp). This site only contained the primary metropolitan areas located in Massachusetts. Data for the three located in New Hampshire were found at a different site. Income distribution information was found on the Census Bureau's website (http://factfinder.census.gov/servlet/DatasetTableListServlet?_ds_name=DSS_2001_EST_G00_&_type=table&_program=DSS&_lang=en&_ts=87146114016). Data on education levels for Boston's Consolidated Metropolitan area could not be found.

## Chapter 7: Identification of Industry Clusters

In order to compile a location quotient analysis for Worcester we will use the 2002 ES-202 data from the Massachusetts's Division of Employment and Training's website. We will download the data sheets for the city of Worcester and the state of Massachusetts that contain total employment numbers for all NAICS industries (including all subcategories) for all ownership types into Microsoft Excel. We will use the charts to calculate the location quotient ratio:

A quotient ratio of less than one indicates that the level of employment for Worcester in a specific industry is less than the state's level and the city must bring in production to meet its needs. A quotient ratio equal to one indicates that the level of employment for a given industry matches the state's production level and that Worcester does not need to import production nor does it export production. Ratios greater than one indicate that the industry not only meets the city's need, extra production in that industry

$$location\_quotient\_ratio = \frac{city\_emp_{ind} / city\_emp_{tot}}{state\_emp_{ind} / state\_emp_{tot}}$$

can be exported, thus generating money for the city. After identifying prominent industries and industry clusters, a next step is to translate this ratio into exported jobs. In order to make this translation, the following expression is used:

$$\exp orted\_jobs = (city\_emp_{ind} / state\_emp_{ind} - city\_emp_{tot} / state\_emp_{tot}) * city\_emp_{ind}$$

The exported jobs equation gives us a method to bring meaning to the ratios. If we were to use the equation on an industry that has a ratio less than one, the value would tell us the number of jobs that Worcester needs to bring into the community. If the ratio is larger than one, the equation tells us the number of jobs in Worcester within the specified industry sector is sufficient to produce a product or service that other communities will use.

To get an idea of what the quotient ratios and exported job values mean, location quotient ratios will be calculated for Lowell, Springfield, Cambridge, and Providence. In comparing Worcester to the various cities and keeping in mind the City's objectives, the quotient analysis can provide an idea of which industries should be strengthened. In knowing which industries are already strong, strengthening complementary industries is a beneficial strategy in boosting the City's economy.

### 7.1 Worcester vs. Springfield

In order to compare the economic composition of two similarly sized cities based upon population, a quotient ratio can be used. The ratio determines if the employment in

a specific industry is meeting the needs of the city. By comparing the quotient ratios of the two cities the strengths and weaknesses of each individual city can be seen.

For the cities of Worcester and Springfield there are many similarities and differences in employment in specific industries. To illustrate these one can first look at the major employment industries in a city. The major industries of Worcester in descending order of number of exported jobs are the health care and social assistance industries, insurance carriers, hospitals, insurance carriers and related activities, and outpatient care industries. The major industries of Springfield in descending order of number of exported jobs are insurance carriers and related activities, health care and social assistance, ambulatory health care services, hospitals, and outpatient care services. By looking at where the most employment is in the two cities it is clear that both Worcester and Springfield have strong service industries, especially in the Health services. The major difference is in the number of exported jobs. The number of exported jobs for Worcester ranges between 300 and 600 employees for the top five industries. For the top five industries of Springfield, the number of employees ranges between 150 and 350. These differences can be attributed to the difference in population between the two cities, the greater number of hospitals in the city of Worcester and the physical locations of the cities. Since Worcester has a larger population (approx. 20,000 higher), it would have a larger share of the employment, and therefore the exported jobs value for a given quotient ratio would be higher. The same can be said for the level of service industries. Since Worcester is slightly larger one would expect the ratios to be slightly higher. However, Worcester has significantly higher quotient ratios and exported jobs, so one can conclude that Worcester is a leading city in Massachusetts in those areas. Similarities between Worcester and Springfield can be seen in the following table.

**Table 7.1**
**Top 5 NAICS industries by exported jobs for Worcester and Springfield**

**Top employment industries for Worcester and Springfield**

| Worcester | | | Springfield | | |
|---|---|---|---|---|---|
| **NAICS** | **Description** | **Exported Jobs** | **NAICS** | **Description** | **Exported Jobs** |
| 62 | Health Care and Social Assistance | 543.42 | 524 | Insurance Carriers & Related Activities | 357.81 |
| 5241 | Insurance Carriers | 415.44 | 62 | Health Care and Social Assistance | 306.38 |
| 622 | Hospitals | 394.48 | 621 | Ambulatory Health Care Services | 168.37 |
| 524 | Insurance Carriers & Related Activities | 338.65 | 622 | Hospitals | 156.34 |
| 6214 | Outpatient Care Centers | 271.02 | 6214 | Outpatient Care Centers | 136.11 |

A view of the two cities can also be drawn by looking at the industries that are the most deficient in employees. For Worcester, the industries with the greatest deficiency in employees are trade, transportation, utilities, the goods producing domain, professional and business services, and retail trade. For Springfield, the industries with the greatest

deficiency in employees are the goods producing domain, professional and business services, manufacturing, retail trade, and durable goods manufacturing. Again it is clear by looking at quotient ratios that both of the cities are deficient in the same industries. Also the same number difference occurs. Worcester has a much higher range of deficient jobs, -115 to -50 than Springfield, which had a range of -73 to -35. The large value for job deficiency in Worcester can be a sign that Worcester is not very diverse across multiple industries.

**Table 7.2**
**Lowest 5 NAICS industries by exported jobs for Worcester and Springfield**

| **Industries with lowest Employment** | | | | | |
|---|---|---|---|---|---|
| **Worcester** | | | **Springfield** | | |
| **NAICS** | **Description** | **Exported Jobs** | **NAICS** | **Description** | **Exported Jobs** |
| 541 | Professional and Technical Services | -50.01 | DUR | Durable Goods Manufacturing | -32.66 |
| 44-45 | Retail Trade | -55.58 | 44-45 | Retail Trade | -34.79 |
| N/A | **Professional and Business Services** | -59.69 | 31-33 | Manufacturing | -47.28 |
| N/A | **Goods-Producing Domain** | -70.93 | N/A | **Professional and Business Services** | -64.06 |
| N/A | **Trade, Transportation and Utilities** | -114.94 | N/A | **Goods-Producing Domain** | -72.05 |

### 7.2 Worcester vs. Lowell

Worcester's economy is lead by the education and healthcare sector with a value of 620.3 for exported jobs. Employment in this sector is visible all over the city. Worcester is home to close to a dozen colleges and universities including UMASS medical center, and Tufts Veterinary School. The City also contains several hospitals. In this aspect, Worcester greatly differs from the city of Lowell. Lowell's economic frontrunner is manufacturing. Textile mills and computer and electronic product manufacturing are at the top of the economy with exported job values of 80.6 and 15.5 respectively. Lowell's rich history of textile manufacturing can partially account for such an economic composition. There is a very noticeable difference in the number of exported jobs that make the top of each list. Lowell's exported job numbers are considerably lower than Worcester's numbers. One explanation is that Lowell's population is much smaller than Worcester's. Another potential reason for this phenomenon would be that the distribution of industries is very even, and so no one industry has a very large edge over another. However, looking at the data from the quotient analysis reveals that Lowell's economy is not particularly diverse.

**Table 7.3**
**Top NAICS industries by exported jobs for Worcester and Lowell**

| Worcester | | | Lowell | | |
|---|---|---|---|---|---|
| **NAICS** | **Description** | **Exported Jobs** | **NAICS** | **Description** | **Exported Jobs** |
| | | | | | |
| N/A | Education and Health Services | 620.30 | 3344 | Semiconductor and Electronic Components | 85.53 |
| 62 | Health Care and Social Assistance | 543.42 | 313 | Textile Mills | 80.62 |
| 5241 | Insurance Carriers | 415.44 | 3133 | Textile and Fabric Finishing and Fabric | 43.59 |

Toward the bottom of list in Worcester's economy with a value of –32.4 is the food services and drinking places category. This deficiency is fairly evident in everyday life. If one looks closely, there are few dining establishments downtown or anywhere near the heart of the city.

Lowell also faces a negative number in this category (-1.0). These values are not all too surprising as neither city is generally regarded as a place to go for fine dining. However, being that Worcester is home to so many colleges and universities, one would expect that restaurants would be drawn to the downtown area so as to create a nightlife befitting a "college town" such as Worcester.

**Table 7.4**
**Lowest NAICS industries by exported jobs for Worcester and Lowell**

| | | **Worcester** | **Lowell** |
|---|---|---|---|
| **NAICS** | **Description** | **Exported Jobs** | **Exported Jobs** |
| 72 | Accommodation and Food Services | -42.55 | -2.87 |
| 722 | Food Services and Drinking Places | -32.42 | -0.93 |
| 7221 | Full-Service Restaurants | -23.01 | -2.84 |

### 7.3 Worcester vs. Cambridge

By taking a look at the top industries of Cambridge as compared to Worcester one can see there are many differences. The top five industries of Worcester in terms of employment are the health care and social assistance industries, insurance carriers, hospitals, insurance carriers and related activities, and outpatient care industries. These industries are mainly service and health care related. The top industries of Cambridge are college and universities, scientific research and development service, educational services, professional and technical services, and pharmaceutical and medicine manufacturing. These industries are all focused on higher education and technical

services. These sectors would stem from the world renowned colleges located in Cambridge. There is also a large difference in the number of jobs exported for the top industries of Worcester and Cambridge. The number of exported jobs for Worcester range in between 600 to 300 employees for the top five industries. For Cambridge the range is from 5700 to 700. This shows that the city of Cambridge is very dominant in these sectors as compared to the state. Worcester's exported jobs in the industries that Cambridge excels in are also surprising. This chart shows the top five industries in Cambridge versus the levels of the same industries in Worcester.

**Table 7.5**
**Top 5 NAICS industries by exported jobs for Cambridge compared to Worcester**

| NAICS | Description | Cambridge Exported Jobs | Worcester Exported Jobs |
|---|---|---|---|
| 6113 | Colleges and Universities | 5658.03 | 173.76 |
| 5417 | Scientific Research and Development Svc | 2502.86 | -6.56 |
| 61 | Educational Services | 1647.20 | 110.67 |
| 541 | Professional and Technical Services | 1267.89 | -50.01 |
| 3254 | Pharmaceutical & Medicine Manufacturing | 631.77 | No data |

As one can see the employment levels of these industries in Worcester are far behind Cambridge, which is especially surprising since Worcester has more than 10 universities. The most probable answer for this is that the universities in Cambridge are larger than those in Worcester.

A view of the two cities can also be drawn by looking at the industries that are the most deficient in employees. For Worcester, the industries with the greatest deficiency in employees are trade, transportation, and utilities, goods producing domain, professional and business services, and retail trade. The lowest producing industries for Cambridge are trade, transportation, and utilities, goods producing domain, health care and social assistance, manufacturing, and retail trade. The two cities have employment deficiencies in similar categories such as retail trade, trade, transportation, and utilities, and the goods producing domain. A comparison of Worcester's top industries versus Cambridge's lowest can be made

**Table 7.6**
**Employment in health service industries of Cambridge and Worcester**

| NAICS | Description | Worcester Exported Jobs | Cambridge Exported Jobs |
|---|---|---|---|
| 62 | Health Care and Social Assistance | 543.42 | -102.75 |
| 622 | Hospitals | 394.48 | -37.21 |
| 6214 | Outpatient Care Centers | 271.02 | -3.73 |
| 621 | Ambulatory Health Care Services | 113.73 | -31.96 |
| 6231 | Nursing Care Facilities | 59.49 | -11.19 |

What is noteworthy is how Cambridge is deficient in the health care industry, a specialty of Worcester.

### 7.4 Worcester vs. Providence

Providence and Worcester have some similarities in major industries. Both cities have the healthcare and social assistance industries near the top of their respective leading industry lists. Providence has a much higher value than Worcester for that industry (6391.4 versus 543.4), which is most likely due to the fact that because Rhode Island is much smaller than Massachusetts, Providence makes up a larger percentage of the total industry in Rhode Island than Worcester does in Massachusetts. This phenomenon is actually the same for all of the industries in Providence. All of the exported job values are much larger than those for Worcester. Because Providence's exported job values consider exported production into Rhode Island and not Massachusetts, the exported job values for Providence cannot be directly compared with those of the Massachusetts cities.

**Table 7.7**

**Worcester Top Industries versus Providence Top Industries**

| Worcester | | | Providence | | |
|---|---|---|---|---|---|
| **NAICS** | **Description** | **Exported Jobs** | **NAICS** | **Description** | **Exported Jobs** |
| N/A | Education and Health Services | 620.30 | 62 | Healthcare and Social assistance | 6391.39 |
| 62 | Health Care and Social Assistance | 543.42 | 31 | Manufacturing | 6327.62 |
| 5241 | Insurance Carriers | 415.44 | 61 | Educational services | 5444.83 |

Providence's lowest industry according to the quotient analysis is accommodation & food services (-1559.8). This is similar to Worcester, as that same industry appears near the bottom of the list for Worcester as well (-42.55).

### 7.5 Quotient Analysis Information Gaps

To complete a quotient analysis comparing Worcester to Massachusetts, detailed ES-202 data was used (http://lmi2.detma.org/lmi/lmi_es_a.asp). This data is broken down at the city, county, and primary metropolitan area levels. The data is available for major and more detailed NAICS industries (up to the 4-digit level). In comparing Worcester to similarly sized cities, quotient analyses for Springfield, Lowell, and Cambridge were completed with this data. A quotient analysis comparing Providence to Rhode Island was completed with another data set that only contained 2-digit NAICS industries.

Since the ES-202 data available for Massachusetts only included primary metropolitan areas containing all or parts of Massachusetts, three primary metropolitan areas that are contained within Boston's Consolidated Metropolitan area were not represented on the ES-202 site for Massachusetts. A comparison between Worcester and Boston's Consolidated Metropolitan area could not be made directly. Instead, a quotient analysis comparing Worcester to Worcester County was completed from ES-202 data. Another quotient analysis using REIS data (http://www.bea.gov/bea/regional/reis/) was completed for Worcester County versus Boston's New England Consolidated Metropolitan area.

## Chapter 8: Time Series Analysis

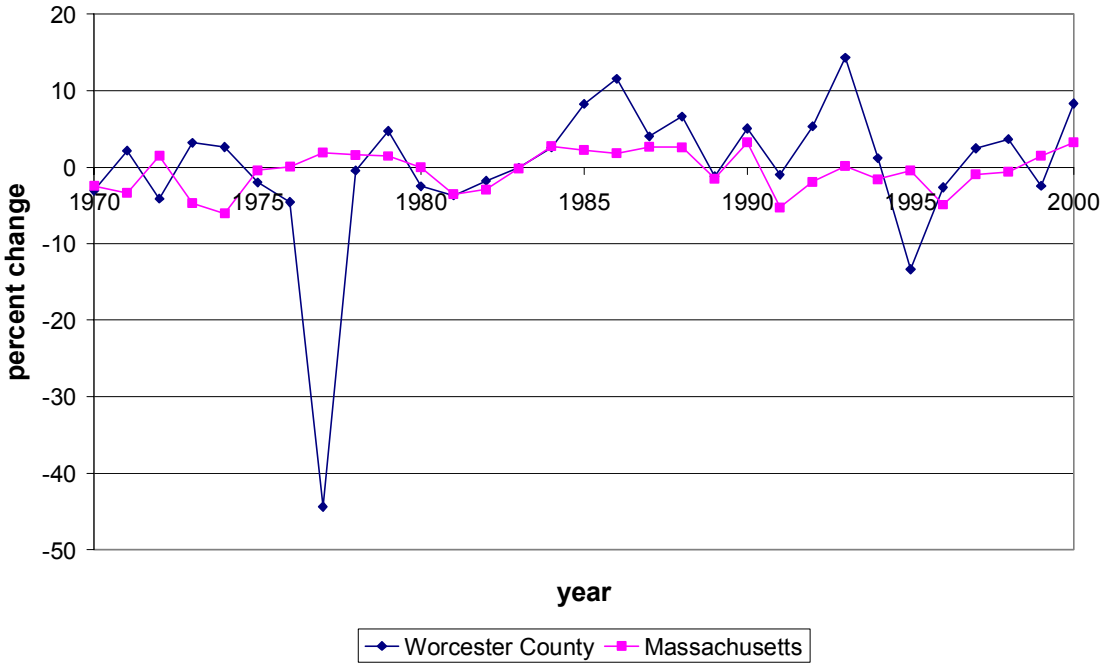
A time series analysis was done using the older SIC data from 1969 to 2000. This data was gathered from REIS. In doing the time series analysis, two series of graphs were constructed. One series depicted changes in the number of employees for each SIC industry cluster for Worcester County and Massachusetts. The other series depicted percentage changes in employment for each SIC industry cluster for Worcester County and Massachusetts (excluding the county's employment). The second series of graphs was meant to show the county's effect on the state. Another time series analysis, using data from the Massachusetts Division of Employment and Training's website was used to construct a smaller time series from 1985 to 2001 at the city level. This data is broken down by major SIC industry, although the clusters of wholesale trade and retail trade were combined into one larger trade cluster. This series of graphs shows percent employment changes from the previous year for Worcester, Springfield, Lowell, Cambridge, and Massachusetts on a whole. Additional graphs showing employment versus the year for the city of Worcester were examined as well.

### 8.1 Analysis of Time Series Data

Regarding the detailed Worcester County time series analysis, Worcester County and Massachusetts had approximately the same percentage changes during the years 1970 to 2000. Worcester County's employment increased by a slightly lower percentage than the employment of Massachusetts. Worcester County's workforce increased from 271,452 to 407,485 between 1969 and 2000 (a 50% increase). For the state of Massachusetts, the workforce increased from 2,678,963 to 4,107,314 between 1969 and 2000 (a 53% increase). In examining the graphs of the various employment sectors, Worcester County's employment patterns typically follow the trends of the state on a whole. A few of the more distinct deviances from the state employment patterns can be seen in the drastic drop in federal, civilian employment in 1977 (around a 44% decrease from employment 1976), an increase in government and government enterprise employees in 1990 (a 4% increase from 1989) while the state's employment in that sector was decreasing, and then a drop in that sector during 1999 (a 3% decrease from 1998) while the rest of the state was experiencing increases.

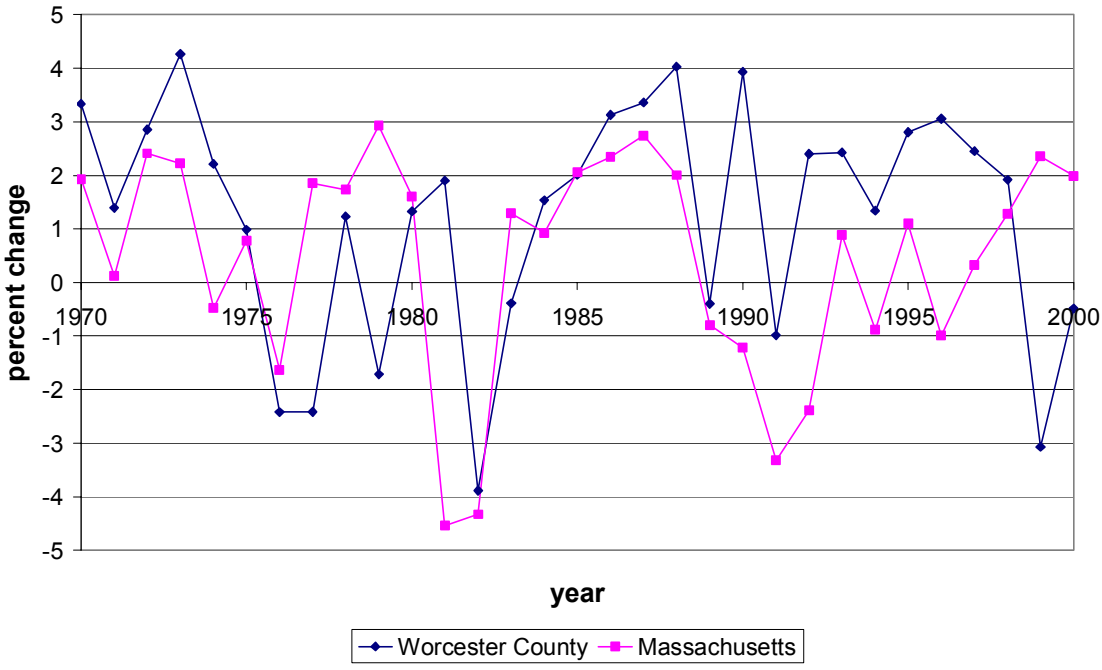
**Graph 8.1**

**Federal, Civilian Employment**




**Graph 8.2**

**Government and Government Enterprises Employment**

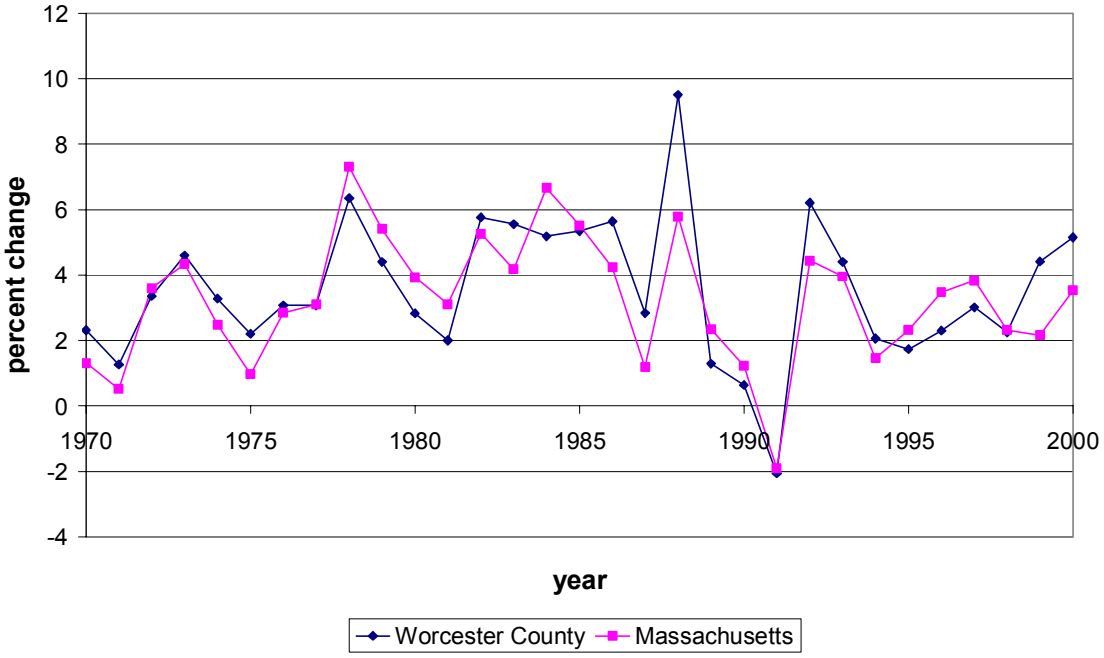


Although mining employment showed the largest and most numerous deviations, mining employment is so low on the county level that small changes in employment numbers cause large percent changes in employment from year to year.

According to the quotient analysis, Worcester's strongest sectors are health care and social assistance, educational services, and finance and insurance. The corresponding SIC clusters are services and finance, insurance, and real estate. Worcester County experienced employment increases in both of these sectors between 1970 and 2000. The only year the service sector experienced a drop was in 1991 for both Worcester County and the state of Massachusetts. In examining the finance, insurance, and real estate sector, there were a few drops in employment but huge increases were noted in the mid 1980's and the early 1990's. Worcester County closely followed the employment trends of Massachusetts in these two sectors of the economy.

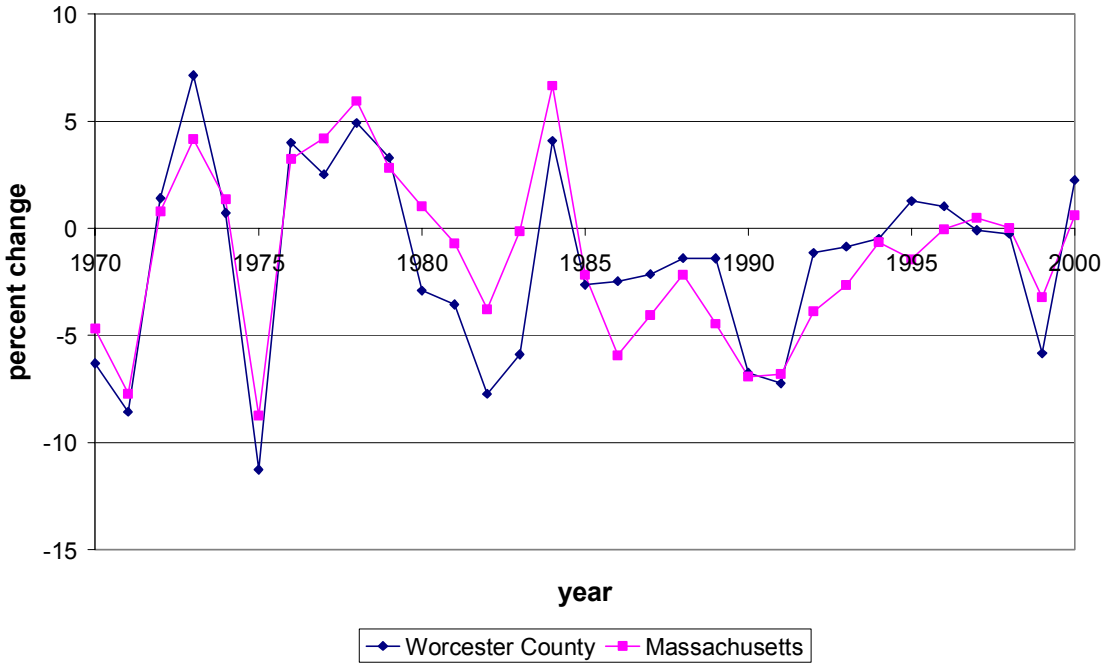
**Graph 8.3**

**Services Employment**



**Graph 8.4**

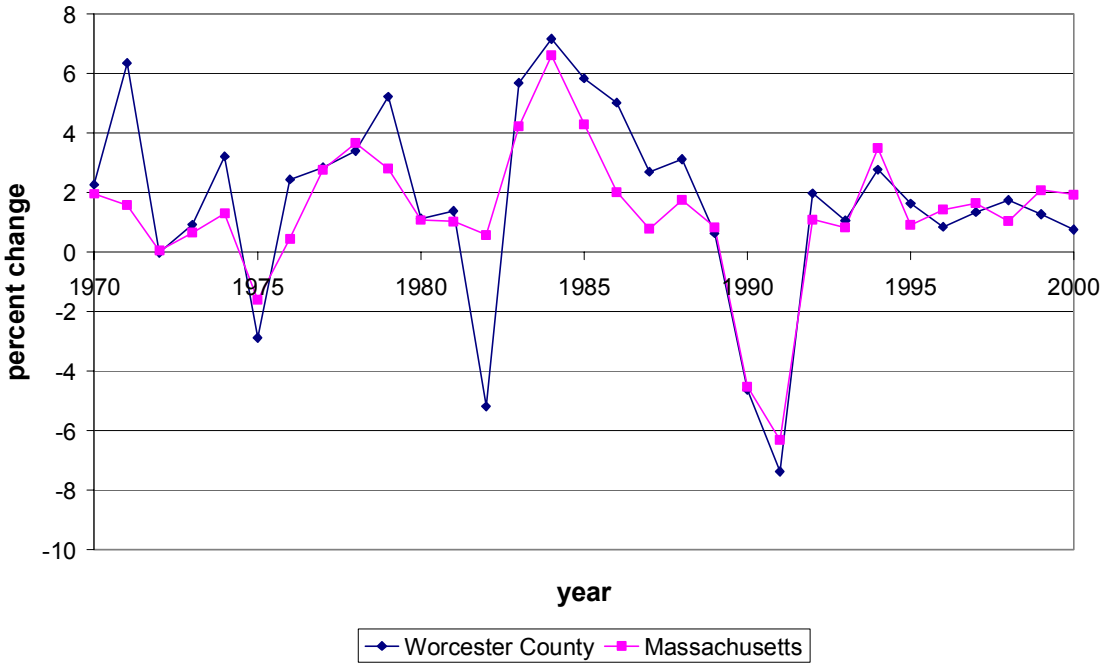
**Manufacturing Employment**




According to the quotient analysis, Worcester's weakest sectors include Retail trade, Professional and Technical Services, Accommodation and Food Services, and Manufacturing. These sectors fall under the corresponding SIC categories of Retail Trade, Transportation and Utilities, Services, and Manufacturing. Worcester County experienced many drops within these sectors with the exception of the Service sector. Since the Service sector includes many different NAICS industry clusters, it is impossible to determine how the specific Professional and Technical Services increased or decreased over time in the SIC time series. There were three significant drops in retail trade from 1970 to 2000. The first occurred in 1975 (3%), the second in 1982 (5%), and the third in 1991 (7%). The most notable drops in Transportation and Public Utilities for Worcester County could be seen from 1974 to 1975 (8%) and from 1994 to 1995 (6.5%). In Manufacturing, the most notable drops for Worcester County could be seen from 1974 to 1975 (11%), from 1981 to 1982 (8%), from 1990 to 1991 (7%), and from 1998 to 1999 (6%) (see Graph 8.4). All in all, where Massachusetts experienced employment decreases in these sectors, so did Worcester County.

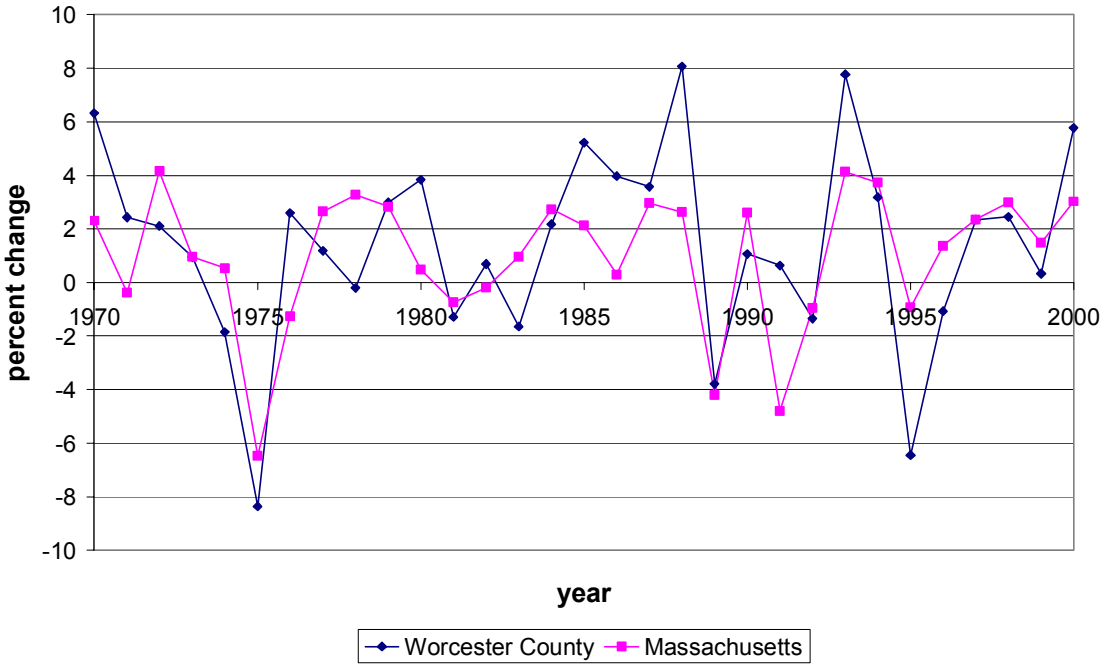
**Graph 8.5**

**Retail Trade Employment**




**Graph 8.6**

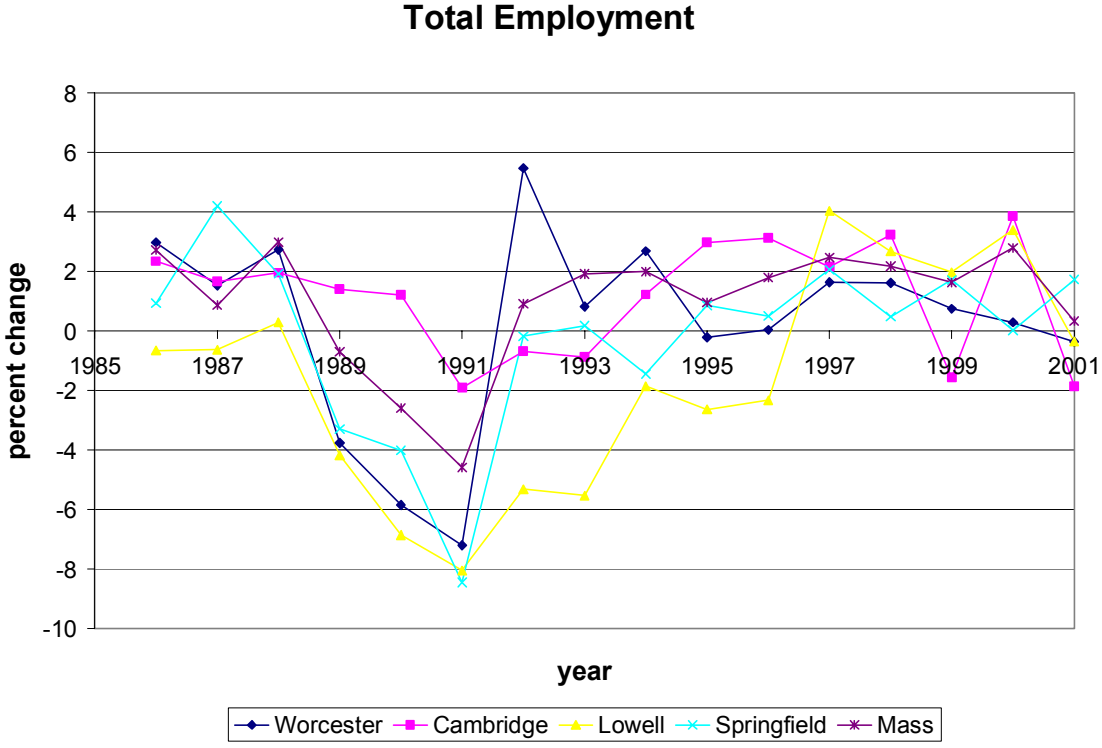
**Transportation and Public Utilites Employment**



The increase in service and the decrease in manufacturing trends are the most notable and began after World War II. After 1950, many manufacturing industries left the city to relocate elsewhere. At the same time, the Service-Providing businesses entered the city. The heavy concentration of medical and health-related services and industries can be attributed to the colleges and universities in the area. It is difficult to explain the decrease in the Transportation and Public Utilities sector as well as the increase in Finance, Insurance, and Real Estate. The city of Worcester may benefit from increasing the jobs in transportation, especially since parking and driving are difficult. The increase in real estate may mean positive things for the housing market in Worcester.

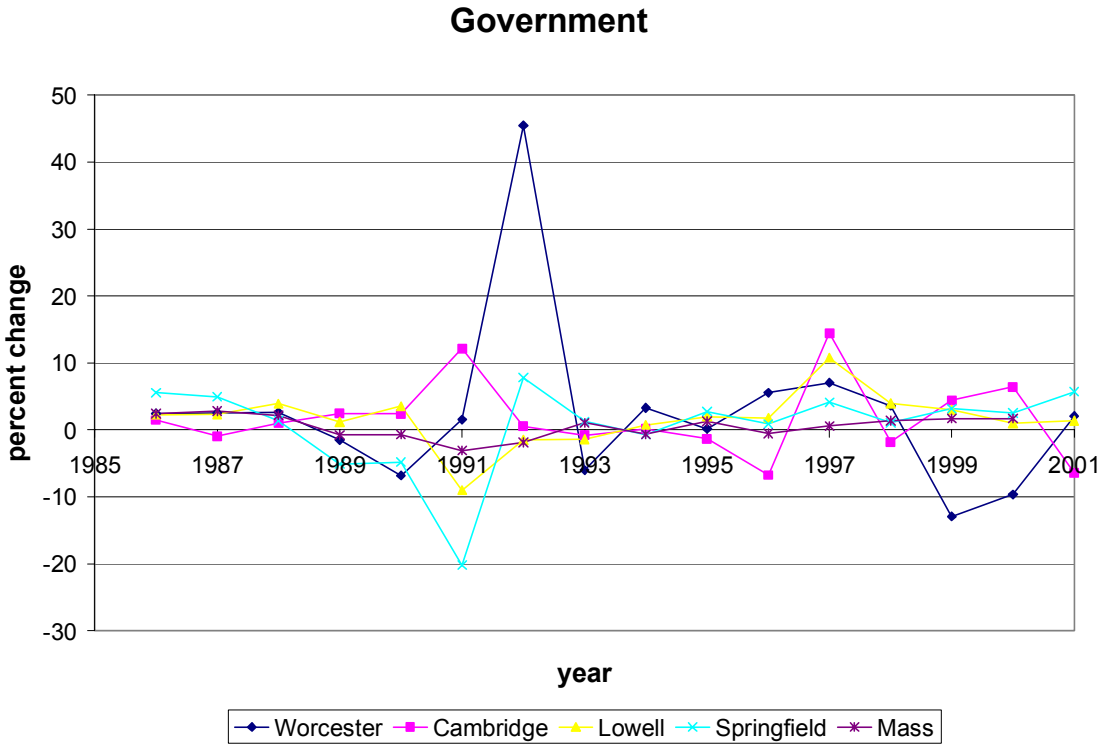
The time series analysis conducted at the city level shows how employment among the cities changes. For the most part, the cities change in similar ways. Some notable occurrences are described below. Employment in the construction sectors seems to be the most unstable. Total employment from 1991 to 1992 decreased more than usual for all cities in Massachusetts as well as the state on a whole. Lowell experienced the longest continuous period of decrease for total employment (from 1986 to 1996 with the exception of a 0.3% increase from 1987 to 1988).

**Graph 8.7**




Government employment changed very similarly in all the cities, except for a 45% in Worcester's government employment from 1991 to 1992. Government employment decreased 13% in 1999 and 10% in 2000 while the other cities were experiences increases in that sector.

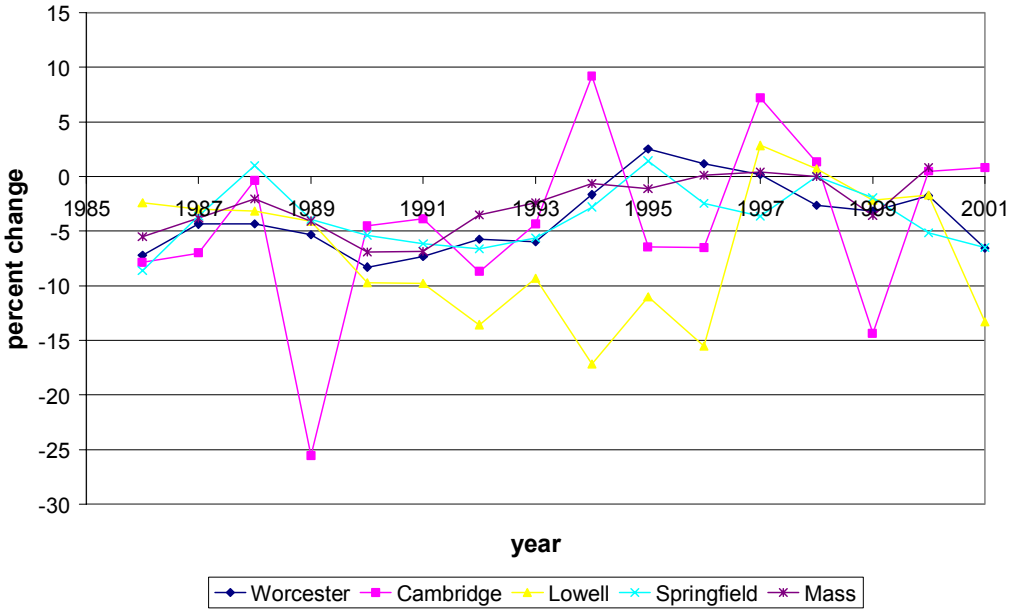
**Graph 8.8**




Construction employment in Cambridge experienced enormous increases in 1994, 1997, and 2000 when compared to the other cities. These increases were 77%, 46%, and 28% respectively. Manufacturing employment decreased the most in Lowell, however Cambridge did experience a large decrease in 1986 (26%) and 1999 (14%). Lowell experienced a particularly large drop in manufacturing in 2001 when employment in that sector dropped by 13%.

**Graph 8.9**

**Manufacturing**




Employment in trade decreased notably in 1991 for all cities, including the state on a whole. Employment in the financial, insurance, and real estate sector decreased 36% for Lowell in 1992. The largest and least variables sectors of the Massachusetts economy are those of trade, manufacturing, and service.

### 8.2 Time Series Information Gaps

The most specific and detailed time series data available online, REIS data (http://www.bea.gov/bea/regional/reis/), does not provide information at the city level. The data can be broken down to the county level, state level, and metropolitan area level. This time series data includes the years 1969 to 2000 and includes employment numbers for each major SIC industry sector. The metropolitan area for which time series data is available that includes Worcester is Boston's New England Consolidated Metropolitan area. This metropolitan area does not include certain portions of New Hampshire and Maine that were included in Boston's Consolidated Metropolitan area.

City level time series data is available on the Massachusetts Division of Employment and Training's website (http://www.detma.org/lmilocal.htm). This ES-202 data provides employment numbers for each major SIC industry sector except that the retail trade and wholesale trade sectors have been combined into one larger trade sector. The data ranges from 1985 to 2001. This data is only available at the city level. In comparing Worcester to similarly sized cities, data on Springfield, Cambridge, and Lowell was collected from this site to construct time series graphs containing all the cities and the state. Providence was not included in these graphs because corresponding data for Providence could not be located. Historical ES-202 data on the city level dating back to 1940 is available in paper form.

## Chapter 9: Suitability Analysis

In completing a suitability analysis for the city of Worcester, the first step was to determine criteria for analyzing suitability. These criteria were based on what we determined to be the most important criteria that a new business would require to succeed in the City. These criteria were then filtered to take into account the information gaps that we encountered. The criteria that could not be used in our analysis, but were still considered important will be noted in the recommendations section. Table 9.1 below shows the list of criteria that were both important for businesses and feasible to analyze given our data.

**Table 9.1**

| # | Suitability Criteria |
|---|---|
| 1 | Close to Rail |
| 2 | Close to Highway |
| 3 | Close to sewer |
| 4 | Zoning |
| 5 | Vacant parcel |
| 6 | Un-built parcel |
| 7 | Brownfield |
| 8 | Proximity to major industry (same NAICS code) |
| 9 | Proximity to complimentary industry |
| 10 | Close to fire dept |
| 11 | Close to police |
| 12 | Close to major road |

None of these criteria have the same importance to every different industry type. For instance, it is more important for a manufacturing company to be close to a railroad than it is for a business in the finance & insurance sector to be close to a railroad. With this in mind, it was necessary to develop a method of ranking the criteria in terms of their importance to a specific industry. The method that we chose was as follows: If the selected criterion is unimportant to the selected industry it receives a ranking of 0 for that industry; if it is somewhat important it receives a ranking of 1; if it is very important it receives a ranking of 2.

As an example of how the ranking system works we will use the industries mentioned earlier (Manufacturing and Finance & Insurance). Proximity to rail is very important to the manufacturing sector because it can ease shipment of manufactured goods. Since it is very important, "close to rail" received a 2 for manufacturing. On the other hand, proximity to rail is not important to businesses in the Finance & Insurance sector. It would provide little to no real benefit for a business in this sector to be close to a railroad. Since it is unimportant, "close to rail" received a 0 for Finance & Insurance. The table below shows the matrix containing all of the usable criteria and their rankings for each industry.

**Table 9.2**

| Weighting Values for Suitability Criteria | | Close to Rail | Close to Highway | Close to sewer | Zoning | Vacant parcel | Un-built parcel | Brownfield | Proximity to similar industry | Proximity to complimentary industry | Close to fire dept | Close to police | Close to major road |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NAICS** | **Industry Cluster** | | | | | | | | | | | | |
| 11---- | Forestry, fishing, hunting, and agriculture | 0 | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| 22---- | Utilities | 0 | 1 | 1 | 2 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 23---- | Construction | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 |
| 31---- | Manufacturing | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 |
| 42---- | Wholesale trade | 1 | 2 | 1 | 2 | 2 | 2 | 0 | 0 | 1 | 1 | 1 | 2 |
| 44---- | Retail trade | 0 | 2 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 2 |
| 48---- | Transportation & warehousing | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
| 51---- | Information | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 52---- | Finance & insurance | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 53---- | Real estate & rental & leasing | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 54---- | Professional, scientific & technical services | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 55---- | Management of companies & enterprises | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 56---- | Admin, support, waste mgt, remediation services | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 61---- | Educational services | 0 | 1 | 1 | 2 | 1 | 2 | 0 | 0 | 1 | 1 | 1 | 2 |
| 62---- | Health care and social assistance | 0 | 1 | 2 | 2 | 1 | 2 | 0 | 1 | 1 | 2 | 2 | 2 |
| 71---- | Arts, entertainment & recreation | 0 | 1 | 1 | 2 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 |
| 72---- | Accommodation & food services | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 2 |
| 81---- | Other services (except public administration | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 95---- | Auxiliaries (exec. corporate, subsidiary & regional managing offices) | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 99---- | Unclassified establishments | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | | | | | | | | |
| Ranking System: | | 0 = Unimportant | | 1 = Somewhat Important | | | | | 2 = Very Important | | | | |

## 9.1 Descriptions of industries

In order to get a better understanding of what rankings to assign to each of the industries, we consulted the Census Bureau website (http://www.census.gov/epcd/www/econ97.html). The website provided explanations of

each of the NAICS industries. Below is a collection of the information gathered from the website.

*22 Utilities:*

*The Utilities sector (sector 22) comprises establishments engaged in the provision of the following utility services: electric power, natural gas, steam supply, water supply, sewage removal. Within this sector, the specific activities assocated with the utility services provided vary by utility: electric power includes generation, transmission, and distribution; natural gas includes distribution; steam supply includes provision and/or distribution; water supply includes treatment and distribution; and sewage removal includes collection, treatment, and disposal of waste thrhough sewer systems and sewage treatment facilities.*

*Excluded from this sector are establishments primarily engaged in waste management services classified in Sub sector 562, Waste Management and Remediation Services. These establishments also collect, treat, and dispose of waste materials; however, they do not use sewer systems or sewage treatment facilities.*

*23 Construction:*

*The Construction sector comprises establishments primarily engaged in the construction of buildings and other structures, heavy construction (except buildings), additions, alterations, reconstruction, installation, and maintenance and repairs. Establishments engaged in demolition or wrecking of buildings and other structures, clearing of building sites, and sale of materials from demolished structures are also included. This sector also includes those establishments engaged in blasting, test drilling, landfill, leveling, earthmoving, excavating, land drainage, and other land preparation. The industries within this sector have been defined on the basis of their unique production processes. As with all industries, the production processes are distinguished by their use of specialized human resources and specialized physical capital. Construction activities are generally administered or managed at a relatively fixed place of business, but the actual construction work is performed at one or more different project sites.*

*31-33 Manufacturing:*

*The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. The assembling of component parts of manufactured products is considered manufacturing, except in cases where the activity is appropriately classified in Sector 23, Construction.*

*Establishments in the Manufacturing sector are often described as plants, factories, or mills and characteristically use power-driven machines and materials-handling equipment. However, establishments that transform materials or substances into new products by hand or in the worker's home and those engaged in selling to the general public products made on the same premises from which they are sold, such as bakeries, candy stores, and custom tailors, may also be included in this sector. Manufacturing establishments may process materials or may contract with other establishments to process their materials for them. Both types of establishments are included in manufacturing.*

*42 Wholesale Trade:*

*The Wholesale Trade sector (sector 42) comprises establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.*

*The wholesale sector includes: merchant wholesalers who buy and take title to the goods they sell, manufacturers sales branches and offices who sell products manufactured domestically by their own company, and agents and brokers who collect a commission or fee for arranging the sale of merchandise owned by others.*

*44-45 Retail Trade:*

*The Retail Trade sector (sector 44-45) comprises establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.*

*48-49 Transportation and Warehousing:*

*The Transportation and Warehousing sector includes industries providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation. Establishments in these industries use transportation equipment or transportation related facilities as a productive asset. The type of equipment depends on the mode of transportation. The modes of transportation are air, rail, water, road, and pipeline.*

*Many of the establishments in this sector often operate on networks, with physical facilities, labor forces, and equipment spread over an extensive geographic area.*

*Excluded from this sector are establishments primarily engaged in providing travel agent services that support transportation and other establishments, such as hotels, businesses, and government agencies. These establishments are classified in Sector 56, Administrative and Support, Waste Management, and Remediation Services. Also, establishments primarily engaged in providing rental*

*and leasing of transportation equipment without operator are classified in Sub sector 532, Rental and Leasing Services.*

*51 Information:*

*The Information sector (sector 51) of the 1997 Economic Census comprises establishments engaged in the following processes: (a) producing and distributing information and cultural products, (b) providing the means to transmit or distribute these products as well as data or communications, and (c) processing data.*

*The main components of this sector are the publishing industries, including software publishing, the motion picture and sound recording industries, the broadcasting and telecommunications industries, and the information services and data processing services industries.*

*52 Finance and Insurance:*

*The Finance and Insurance sector (sector 52) of the 1997 Economic Census comprises establishments of firms with payroll primarily engaged in financial transactions (transactions involving the creation, liquidation, or change in ownership of financial assets) and/or in facilitating financial transactions. Three principal types of activities are identified:*

1. *Raising funds by taking deposits and/or issuing securities and, in the process, incurring liabilities. Establishments engaged in this activity use raised funds to acquire financial assets by making loans and/or purchasing securities. Putting themselves at risk, they channel funds from lenders to borrowers and transform or repackage the funds with respect to maturity, scale and risk. This activity is known as financial intermediation.*
2. *Pooling of risk by under writing insurance and annuities. Establishments engaged in this activity collect fees, insurance premiums, or annuity considerations; build up reserves; invest those reserves; and make contractual payments. Fees are based on the expected incidence of the insured risk and the expected return on investment.*
3. *Providing specialized services facilitating or supporting financial intermediation, insurance, and employee benefit programs. In addition, monetary authorities charged with monetary control are included in this sector.*

*52 Real Estate and Rental and Leasing:*

*The Real Estate and Rental and Leasing sector (sector 53) comprises establishments of firms with payroll primarily engaged in renting, leasing, or otherwise allowing the use of tangible assets (e.g. real estate and equipment), intangible assets (e.g., patents and trademarks), and establishments providing*

*related services (e.g., establishments primarily engaged in managing real estate for others, selling, renting and/or buying real estate for others, and appraising real estate). Excluded from this sector are real estate investment trusts (REITs) and establishments primarily engaged in renting or leasing equipment with operators.*

*54 Professional, Scientific, and Technical Services*

*The Professional, Scientific, and Technical Services sector (sector 54) of the 1997 Economic Census covers establishments with payroll that specialize in performing professional, scientific, and technical activities for others. These activities require a high degree of expertise and training. The establishments in this sector specialize according to expertise and provide services to clients in a variety of industries and, in some cases, to households. Activities performed include: legal advice and representation; accounting, bookkeeping, and payroll services; architectural, engineering, and specialized design services; computer services; consulting services; research services; advertising services; photographic services; translation and interpretation services; veterinary services; and other professional, scientific, and technical services.*

*55 Management of Companies and Enterprises:*

*The Management of Companies and Enterprises sector comprises (1) Industries 551111 and 551112, Holding Companies, which include establishments that hold the securities of (or other equity interests in) companies and enterprises for the purpose of owning a controlling interest or influencing management decisions, and (2) Industry 551114, Corporate, Subsidiary, and Regional Managing Offices, which includes establishments (except government establishments) that administer, oversee, and manage establishments of the company or enterprise that normally undertake the strategic or organizational planning and decisionmaking role of the company or enterprise. Establishments that administer, oversee, and manage may hold the securities of the company or enterprise. Data for the two groups of industries are presented in separate reports. Establishments in this sector perform essential activities that are often undertaken, in-house, by establishments in many sectors of the economy. By consolidating the performance of these activities of the enterprise at one establishment, economies of scale are achieved.*

*Establishments primarily engaged in providing a range of day-to-day office administrative services, such as financial planning, billing, and recordkeeping, personnel, and physical distribution and logistics are classified in Industry 56111, Office Administrative Services.*

*56 Administrative Support and Waste Management and Remediation Services:*

*The Administrative and Support and Waste Management and Remediation Services sector (sector 56) of the 1997 Economic Census comprises establishments performing routine support activities for the day-to-day operations of other organizations. These essential activities are often undertaken in-house by establishments in many sectors of the economy. The establishments in this sector specialize in one or more of these support activities and provide these services to clients in a variety of industries and, in some cases, to households. Activities performed include: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.*

*61 Educational Services:*

*The Educational Services sector (sector 61) comprises establishments that provide instruction and training in a wide variety of subjects. This instruction and training is provided by specialized establishments, such as schools, colleges, universities, and training centers. These establishments may be privately owned and operated for profit or not for profit, or they may be publicly owned and operated. They may also offer food and accommodation services to their students. Educational services are usually delivered by teachers or instructors that explain, tell, demonstrate, supervise, and direct learning. Instruction is imparted in diverse settings, such as educational institutions, the workplace, or the home through correspondence, television, or other means. It can be adapted to the particular needs of the students, for example sign language can replace verbal language for teaching students with hearing impairments. All industries in the sector share this commonality of process, namely, labor inputs of instructors with the requisite subject matter expertise and teaching ability.*

*62 Health Care and Social Assistance:*

*The Health Care and Social Assistance sector (sector 62) of the 1997 Economic Census comprises establishments providing health care and social assistance for individuals. The services provided by establishments in this sector are delivered by trained professionals. All industries in the sector share this commonality of process, namely, labor inputs of health practitioners or social workers with the requisite expertise. Many of the industries in the sector are defined based on the educational degree held by the practitioners included in the industry.*

*71 Arts, Entertainment, and Recreation:*

*The Arts, Entertainment, and Recreation sector (sector 71) of the 1997 Economic Census includes a wide range of establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons. This sector comprises (1) establishments that are involved in producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; (2) establishments that preserve and exhibit objects and sites of*

*historical, cultural, or educational interest; and (3) establishments that operate facilities or provide services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure time interests.*

*72 Accommodation and Foodservices:*

*The Accommodation and Foodservices sector (sector 72) comprises establishments providing customers with lodging and/or prepared meals, snacks, and beverages for immediate consumption.*

*81 Other Services (Except Public Administration):*

*The Other Services (Except Public Administration) sector (sector 81) of the 1997 Economic Census covers establishments with payroll engaged in providing services not specifically provided for elsewhere in the North American Industry Classification System (NAICS). Establishments in this sector are primarily engaged in activities such as repair and maintenance of equipment and machinery, personal and laundry services, and religious, grant making, civic, professional, and similar organizations. Establishments providing death care services, pet care services, photofinishing services, temporary parking services, and dating services are also included. Private households that employ workers on or about the premises in activities primarily concerned with the operation of the household are included in this sector, but are not included in the scope of the census.*

http://www.census.gov/epcd/www/econ97.html

**9.2 Description of criteria and ranking system**

**Criterion 1: Close to Rail**

Some businesses find advantages in being near rail lines. Having a rail line nearby can facilitate product transportation, or can help to bring more customers within the area of a business. The GIS map layer of the rail lines in Worcester was given to us by Worcester Office of Neighborhood Services.

We used MapInfo to create a 100 foot buffer around the rail line. Any parcel that was within this buffer area was given a 1 in the "close to rail" column (This value is not to be confused with the ranking number. The ranking number is a weight that is applied to this value). At this point the ranking system is utilized. If the specified industry has a ranking weight of 0 the industry gets 0 points from that criterion. If the industry has a ranking of 1 it gets 1 point. If it has a ranking of 2 the industry gets 5 points. This point value is attached to the parcel and contributed to its overall suitability once all of the criteria are considered.

**Table 9.3**

| Close to Rail - Point Values Assigned | | | |
|---|---|---|---|
| **Distance from Rail** | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| Less than 100 ft. | 0 | 1 | 1 |
| Greater than 100 ft. | 0 | 1 | 5 |

**Criterion 2: Close to Highway**

Highways have a similar appeal to businesses as railroads do. They make transportation of both products and people easier. We obtained the highway layer from the transportation group.

In this case, we used a more graduated buffer system. We created buffers in half-mile increments from one half of a mile to two miles. The table below shows the point values that are assigned to businesses in each buffer zone.

**Table 9.4**

| Close to Highway- Point Values Assigned | | | |
|---|---|---|---|
| **Distance from Highway** | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| 0.5 miles | 0 | 3 | 6 |
| 1 mile | 0 | 2 | 5 |
| 1.5 miles | 0 | 1 | 4 |
| 2 miles | 0 | 0 | 3 |

This distribution in point values provides a better resolution for each industry. If an industry desires to be close to a highway, it is better for this industry to be 1 mile away than for it to be 2 miles away. This criterion is not an all-or-nothing type criterion.

**Criterion 3: Close to Sewer**

Most businesses need to be on a sewer line. Businesses hold many more people than the average house, and so mass waste disposal is a factor. The GIS map layer of Worcester's sewer network was given to us by Worcester Office of Neighborhood Services.

The buffer used for this criterion was 30 ft. If the parcel is within this buffer area, it is said to have sewer access. Parcels within this area are given a 1. The rankings are then applied. If the industry has a ranking of 0, it receives 0 points. A ranking of 1 receives 1 point and a ranking of 2 receives 5 points. All parcels outside this buffer area are given 0 points for every industry with respect to this criterion.

**Table 9.5**

| Close to Sewer - Point Values Assigned | | | |
|---|---|---|---|
| **Distance from Sewer** | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| Less than 30 ft. | 0 | 1 | 1 |
| Greater than 30 ft. | 0 | 1 | 5 |

**Criterion 4: Zoning**

The zoning criterion is treated differently from the other criteria. The zoning score for each industry does not contribute to the total suitability score for that industry directly. In the final suitability matrix for each industry there is a separate column that is either 0 or 10 depending on if the parcel is zoned properly for that industry. This table shows the ideal zones for each industry type.

**Table 9.6**

| Weighting Values for Zoning Criteria | | |
|---|---|---|
| **NAICS** | **Industry Cluster** | **Ideal Zone** |
| 11---- | Forestry, fishing, hunting, and agriculture | B |
| 22---- | Utilities | M |
| 23---- | Construction | B |
| 31---- | Manufacturing | M |
| 42---- | Wholesale trade | B |
| 44---- | Retail trade | B |
| 48---- | Transportation & warehousing | B |
| 51---- | Information | B |
| 52---- | Finance & insurance | B |
| 53---- | Real estate & rental & leasing | B |
| 54---- | Professional, scientific & technical services | B |
| 55---- | Management of companies & enterprises | B |
| 56---- | Admin, support, waste mgt, remediation services | B |
| 61---- | Educational services | I |
| 62---- | Health care and social assistance | I |
| 71---- | Arts, entertainment & recreation | B |
| 72---- | Accommodation & food services | B |
| 81---- | Other services (except public administration | B |
| 95---- | Auxiliaries (exec. corporate, subsidiary & regional managing offices) | B |
| 99--- | Unclassified establishments | B |
| | B=Business M=Manufacturing I=Industrial | |

For example, in the final suitability matrix there would be two columns for retail trade for each of the parcels. One column would contain the sum of the criterion and the other would have the zoning score. This is useful so that we can compile a final map that shows the industry that is most suitable for each parcel and take zoning into account. This will allow us to make recommendations on where industries can be brought into Worcester and if any zoning changes are required.

**Criterion 5: Vacant Parcel**

Vacant parcels are parcels that have a vacant building on them. Vacant buildings require very little construction and make it much less expensive to open a business. This criterion was mapped by point rather than with buffers. We obtained this map layer from the housing team.

Each parcel that contained a vacant parcel was given a 1. If the industry had a ranking of 0 for this criterion it was given 0 points. If it has a ranking of 1, the industry gets 1 point, and if the industry has a ranking of 2 it gets 5 points.

**Table 9.7**

| Close to Vacant Parcel - Point Values Assigned | | | |
|---|---|---|---|
| **Vacancy** | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| Is Vacant | 0 | 1 | 1 |
| Is not Vacant | 0 | 1 | 5 |

**Criterion 6: Un-built Parcel**

An un-built parcel is one that is free of any buildings. This is good for businesses that require a customized building or more space than others. The map for un-built parcels was obtained from the housing group. This criterion has the same scoring system as the vacant parcel criterion. If the parcel is un-built it receives a 1. With the weighting provided by the ranking system this translates into 0 points for industries with a ranking of 0, 1 point for those with ranking 1, and 5 points for those with ranking 2.

**Table 9.8**

| Close to Un-built Parcel - Point Values Assigned | | | |
|---|---|---|---|
| | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| Is un-built | 0 | 1 | 1 |
| Is not un-built | 0 | 1 | 5 |

**Criterion 7: Brownfield**

Brownfield sites are vacant buildings that may contain potentially hazardous materials or chemicals. These buildings are usually abandoned industrial buildings. Though it can be expensive to clean up these areas, there is the benefit of having a building that can house heavy industrial businesses. This map layer was given to us by The Worcester Office of Neighborhood Services. The scoring system is the same for this criterion as it was for the previous 2. If a parcel is located in a brownfield, it gets a 1. After weighting, this translates into 0, 1, or 5 points depending on the industry's ranking.

**Table 9.9**

| Brownfield - Point Values Assigned | | | |
|---|---|---|---|
| | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| Is Brownfield | 0 | 1 | 1 |
| Is not Brownfield | 0 | 1 | 5 |

**Criterion 8: Proximity to Major Industry (same NAICS code)**

Major businesses can attract a large customer/employee population. Similar businesses can benefit from this by locating near large similar businesses. The map layer used for this criterion was an original map of the top 50 businesses in Worcester by employment. This map was created from a list of the top 100 businesses in the Worcester area. This list was given to us by Joel Fontane.

We created a quarter mile buffer around each of the top industries. If a parcel lies within the buffer zone of one of the major industries, the parcel will indicate that particular industry. If it lies within multiple buffers, it will have an indicator for each of the industry buffers it is in. The ranking system then adjusts the weights. If the industry has a rank of 0, it receives 0 points. Industries with rank 1 receive 1 point, and those with rank 2 receive 5 points.

**Criterion 9: Proximity to Complimentary Industry**

Every industry has one or several complimentary industries. These are industries that produce products or services that help another industry operate. For instance a company that produces wire would compliment an electrical contractor. The map used for this was the same "top industry" map used in the major industry criterion. The ranking of this criterion was exactly the same as that of Criterion 8 with one exception. Instead of giving points to the industry sector with the same NAICS code as the major industry, points are awarded to those industries that are complemented by the major industry. The weighting system is also the same in this criterion as in criterion 8.

**Criterion 10: Close to Fire Department**

Companies like the comfort of knowing that wherever they choose to place their business will be safe from fire. Fire departments do make efforts to provide equal and adequate coverage to the entire city, but there are some areas that are better than others in this area. These maps were provided by the Worcester Office of Neighborhood Services.

In order to determine which parcels were covered, we created a 1 mile buffer around each fire station. Those parcels which fell within the buffer were given a value of 1. Those that did not were given a value of 0. With the weighting system, any parcel outside the area gets 0 points. For those parcels inside the buffer area, industries with a ranking of 0 get 0 points, those with a ranking of 1 get 1 point, and those with a ranking of 2 get 5 points.

**Table 9.10**

| Close to Fire department - Point Values Assigned | | | |
|---|---|---|---|
| **Distance from Fire Department** | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| Within 1 mile | 0 | 1 | 1 |
| Outside 1 mile | 0 | 1 | 5 |

**Criterion 11: Close to Police**

Police coverage is another important criterion. It is important to any business to know that their employees, products, and other assets will be secure. Though police coverage is not a huge issue in the City, we decided that exemplary police coverage should be looked at in a positive light. We contacted the Worcester Police Department to obtain addresses for each of the police stations in Worcester. We mapped these addresses and created a 1 mile buffer around each station. Parcels within this buffer area were given a point. The weighting system is the same as for fire station coverage. An industry with a ranking of 0 gets 0 points, an industry with a ranking of 1 gets 1 point, and an industry with a ranking of 2 gets 5 points.

**Table 9.11**

| Close to Police station - Point Values Assigned | | | |
|---|---|---|---|
| **Distance from Police Station** | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| Within 1 mile | 0 | 1 | 1 |
| Outside 1 mile | 0 | 1 | 5 |

**Criterion 12: Close to Major Road**

In order to get enough business to be profitable, most businesses prefer to be on or near a major road. Worcester has no shortage of major or high-traffic roads, but it is still a criterion that had to be considered. The map layer of major roads was given to us by the Worcester Office of Neighborhood Services. The table below shows the weighted point distribution.

**Table 9.12**

| Close to Major Roads- Point Values Assigned | | | |
|---|---|---|---|
| **Distance from Major Road** | **Ranking = 0** | **Ranking = 1** | **Ranking = 2** |
| 0.125 miles | 0 | 3 | 6 |
| 0.25 miles | 0 | 2 | 5 |
| 0.375 miles | 0 | 1 | 4 |
| 0.5 miles | 0 | 0 | 3 |

## 9.3 Results

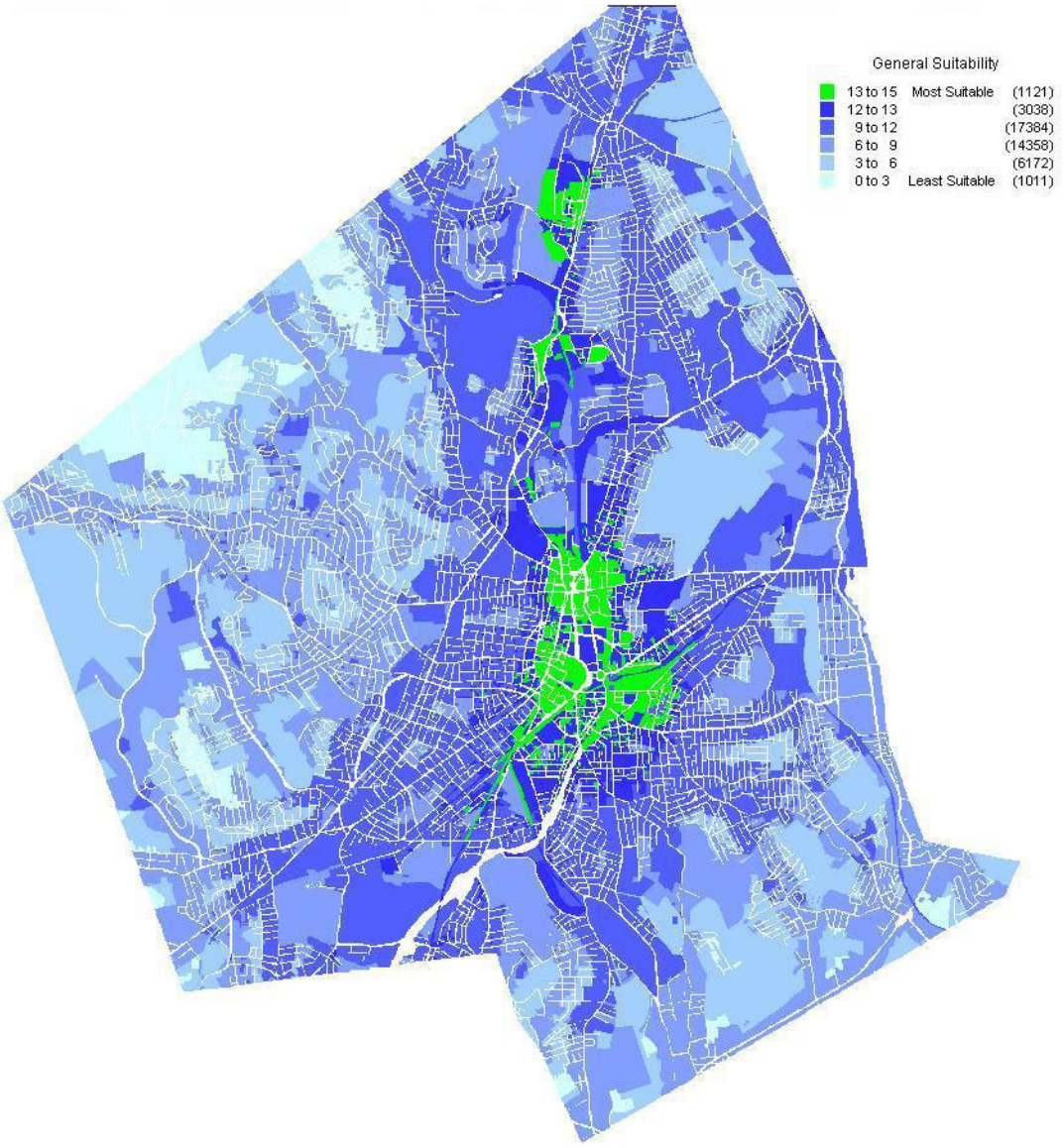
Upon examination of our suitability matrix it is clear that several industries have the same suitability requirements. They all have basic needs such as access to roads, highways, sewer, and proximity to fire and police departments. Economic needs such as proximity to similar and complimentary industries, zoning, and whether or not the parcel is vacant or un-built are also very similar. Therefore the maps for these industries are identical.

Table 9.13 below shows the industries that all have identical suitability maps.

**Table 9.13**

| **Industries with Identical Suitability Maps** | |
|---|---|
| **NAICS** | **Industry Cluster** |
| 11---- | Forestry, fishing, hunting, and agriculture |
| 22---- | Utilities |
| 51---- | Information |
| 52---- | Finance & insurance |
| 53---- | Real estate & rental & leasing |
| 54---- | Professional, scientific & technical services |
| 55---- | Management of companies & enterprises |
| 56---- | Admin, support, waste mgt, remediation services |
| 81---- | Other services (except public administration |
| 95---- | Auxiliaries (exec. corporate, subsidiary & regional managing offices) |
| 99---- | Unclassified establishments |

**Figure 9.1**
**General Suitability for Several Industries**



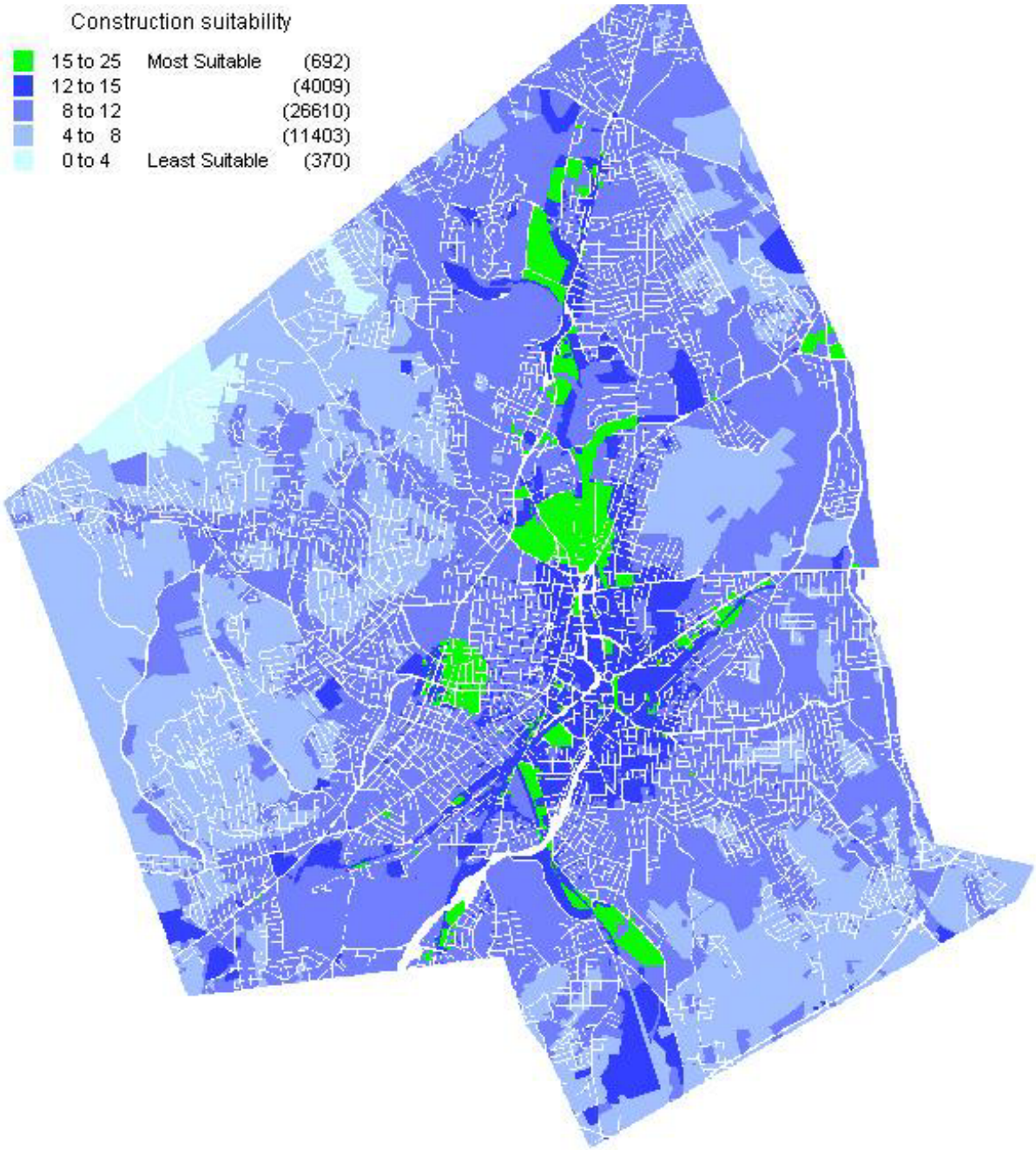

From looking at the map it is clear that the most suitable sections of Worcester are the downtown area and slightly south of downtown. This can be attributed to the fact all of these industries essentially need only office space and this section of Worcester has those amenities which are desirable by those industries.

### 9.3.1 Construction

The suitability map for construction is similar to the other maps in that it has the same downtown area highlighted as the most suitable location due to its central location.

However, there are also some differences worth noting. Since construction is more dependant on having an un-built or vacant parcel, sections outside the central and downtown sections of Worcester become especially suitable for the construction industry as can be seen in the following map.

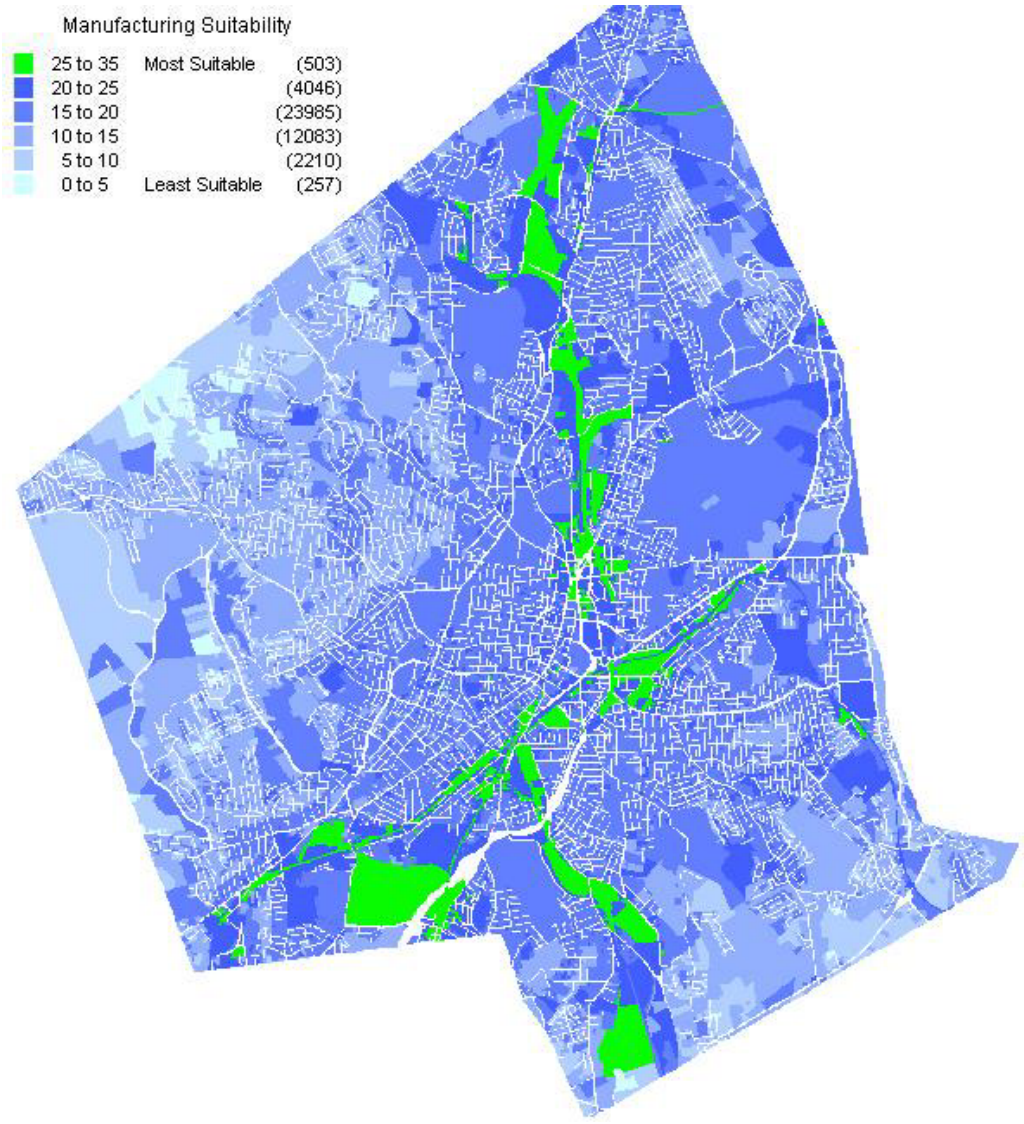
**Figure 9.2**
**Suitability Map for Construction Industries**



### 9.3.2 Manufacturing Suitability

The map for manufacturing suitability shows the ideal parcels more scattered around the edge of the city than the other maps. This can be attributed to the fact that manufacturing relies heavily on having an un-built parcel or a brownfield site since they would require large amounts of space to store heavy equipment. When examining the map in detail one can see that the large outlying parcels on the suitability map are in fact brownfields that are close to central roads and highways. These parcels would be especially valuable to manufacturing companies that wish to export their product outside the city.

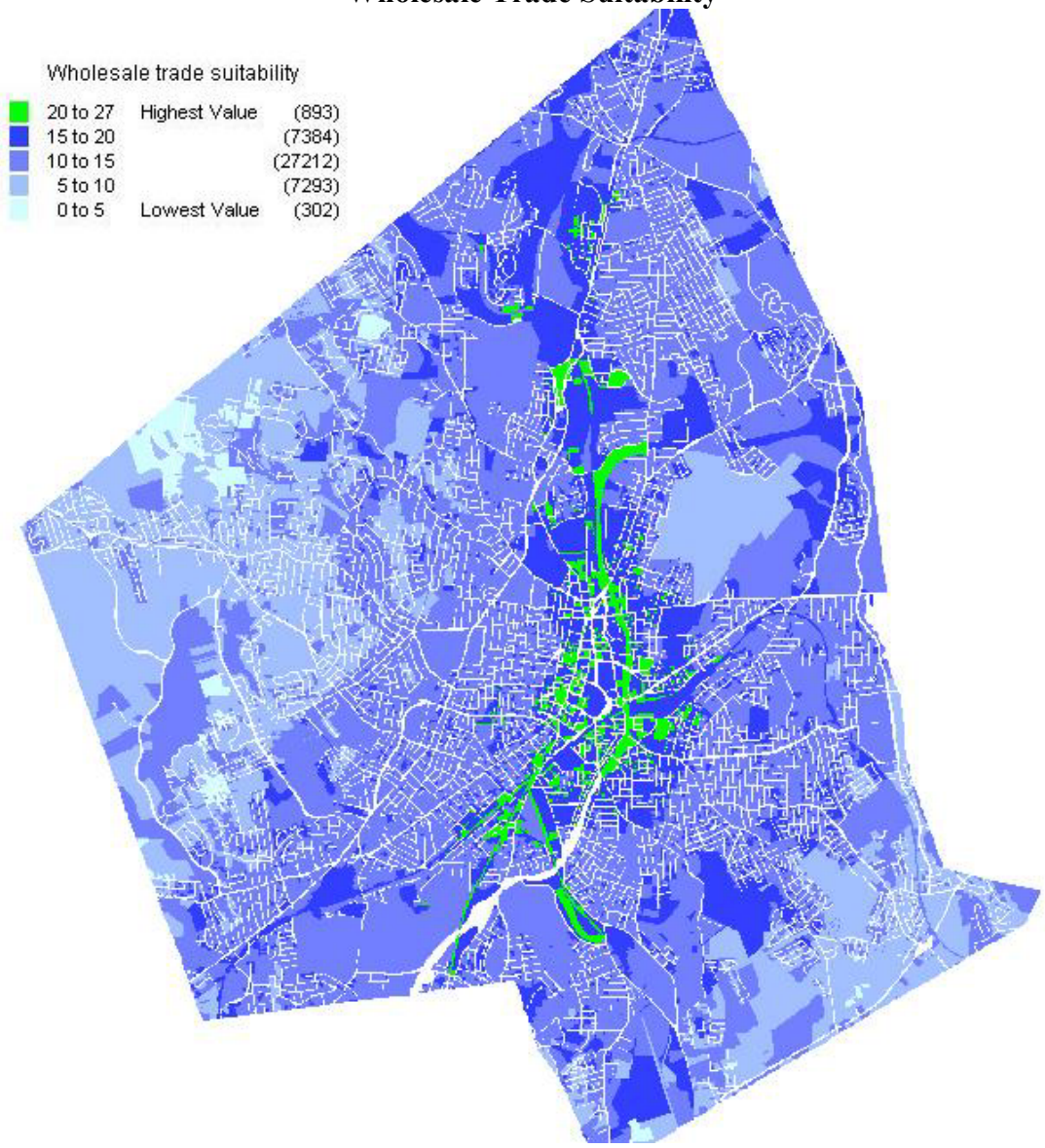
**Figure 9.3**
**Manufacturing Suitability Map**



### 9.3.3 Wholesale trade suitability

The suitability map for wholesale trade also does not have a centrally located cluster within the city. Instead the most suitable locations for a wholesale trade industry occur along major roads within the city that also happen to be close to major highways. This would give the industry easy access to have good shipped in as well as be accessible to consumers through major roads through the city. The following map shows the most suitable locations for a wholesale trade industry.

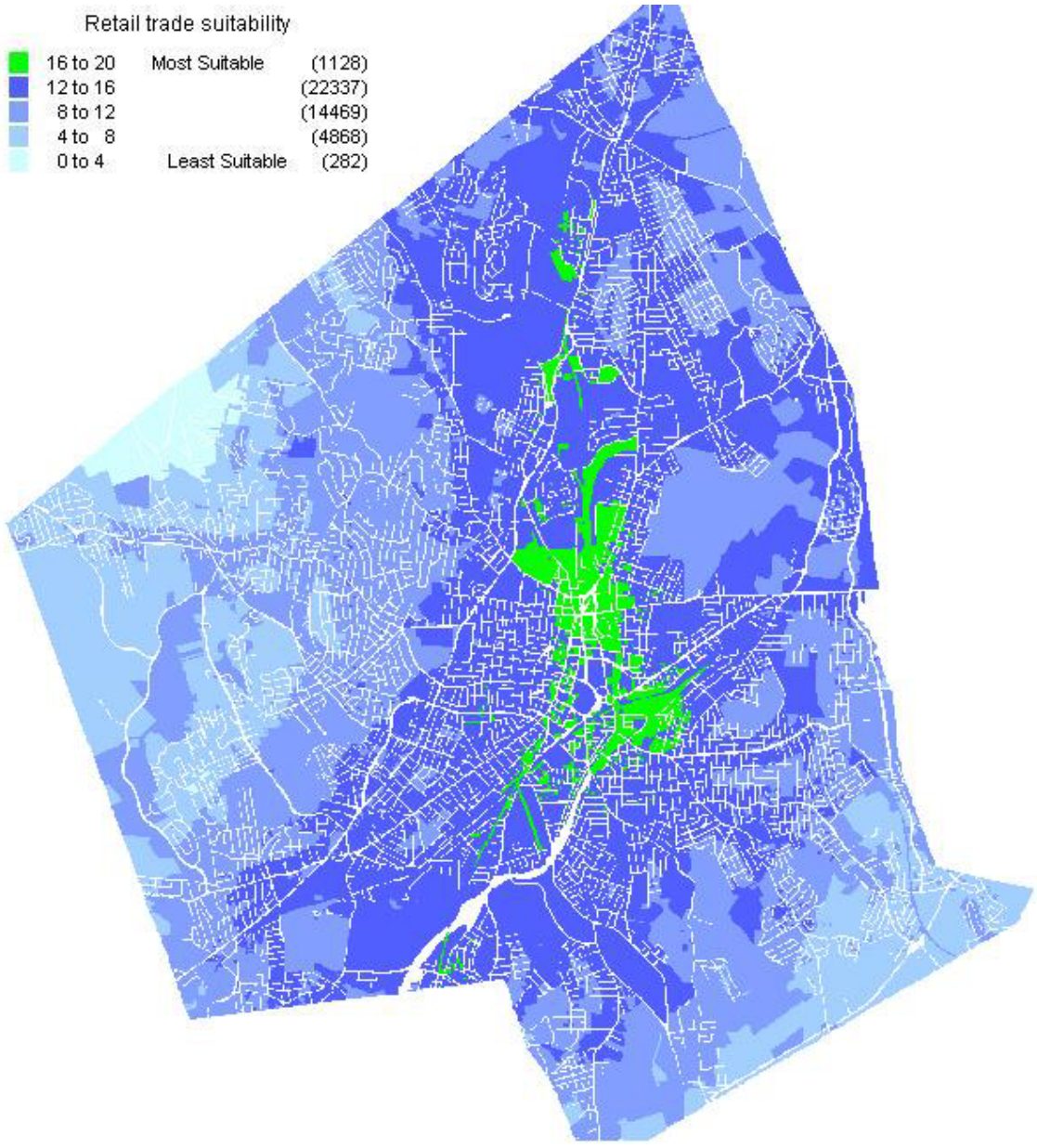
**Figure 9.4**
**Wholesale Trade Suitability**



### 9.3.4 Retail Trade Suitability

The suitability map for retail trade is similar to that of the general industry map in that there is a large concentration of the most suitable locations for retail trade in the northern downtown area. Since there is interest in revitalizing the downtown area this could be a major source of verification on what industries to bring in. The map shows theses areas as most suitable due to their central location to major roads, highways, and availability of open parcels. The following map shows the retail trade suitability map.

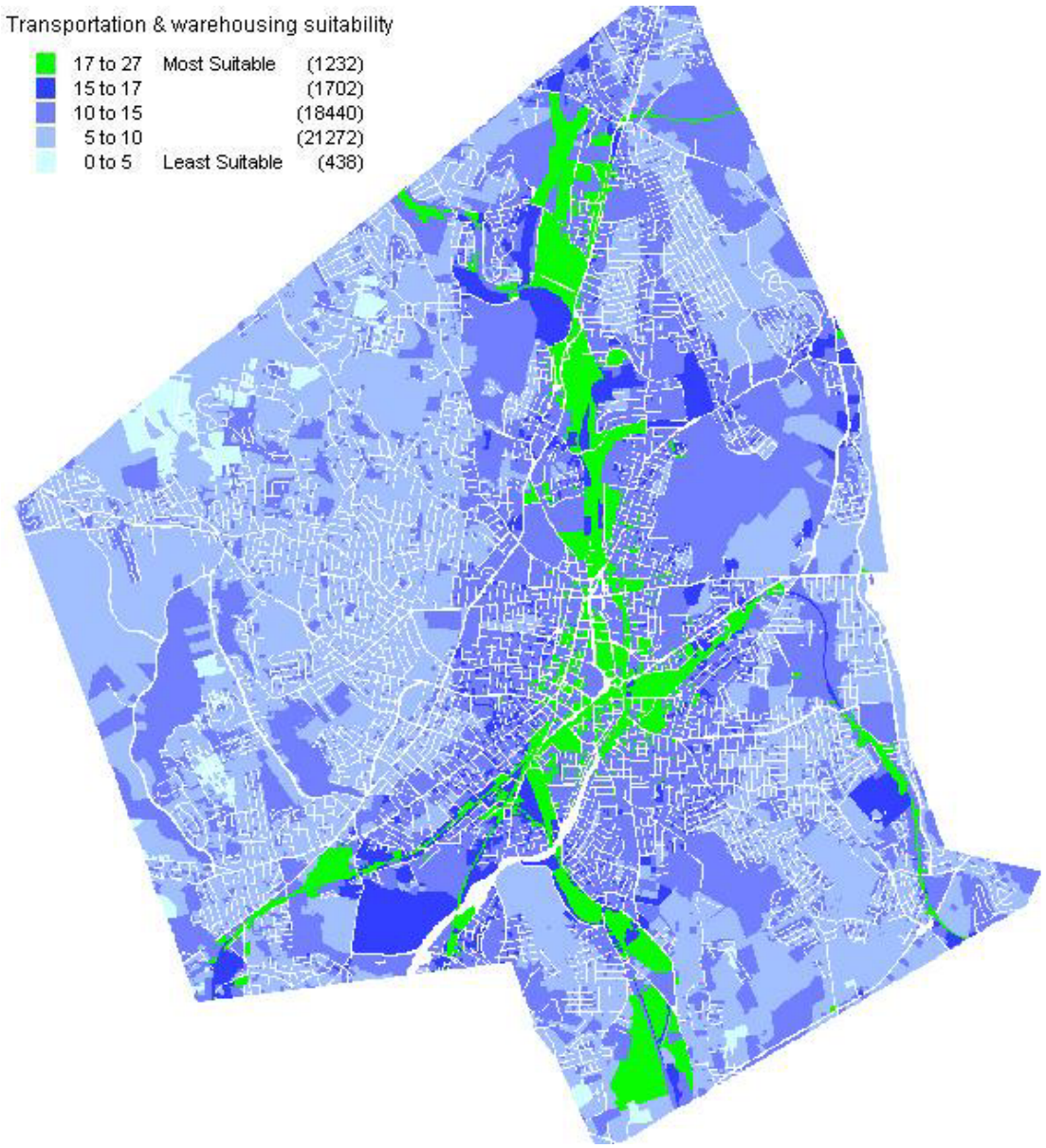
**Figure 9.5**
**Suitability Map for Retail Trade industries**



### 9.3.4 Transportation & warehousing

The map of transportation and warehousing is remarkably similar to other maps in that it the most suitable industries are located in the downtown area. However, rather than being concentrated in a cluster, the most suitable locations are mainly located along major roads and near highways.

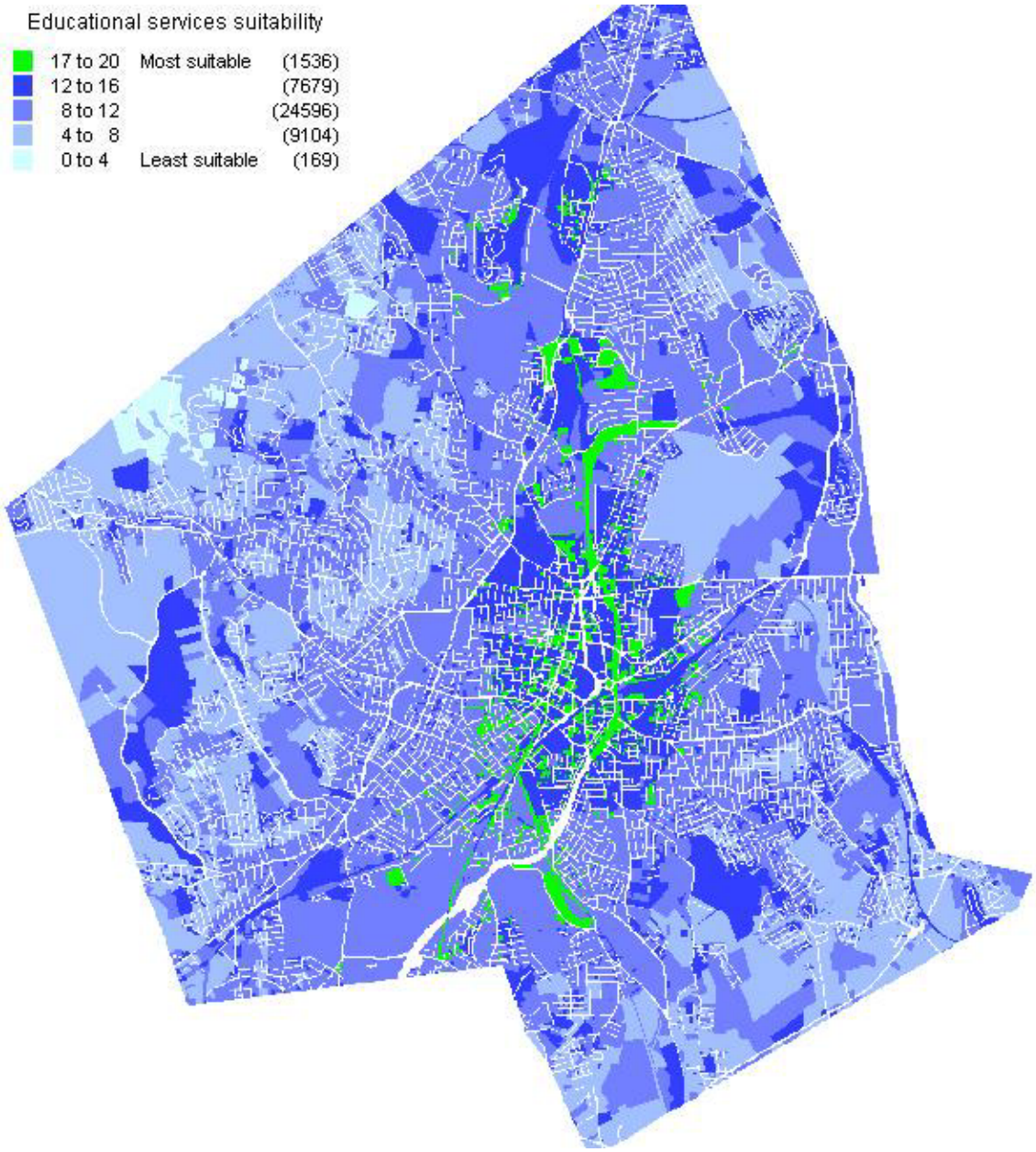
**Figure 9.6**
**Transportation & Warehousing Suitability**



### 9.3.5 Educational Services

The suitability map for educational services is particularly useful for the city considering that the education sector is a major industry for the city. The most suitable locations are spread throughout the downtown area in small pockets as well as along major roads outside of the downtown area.

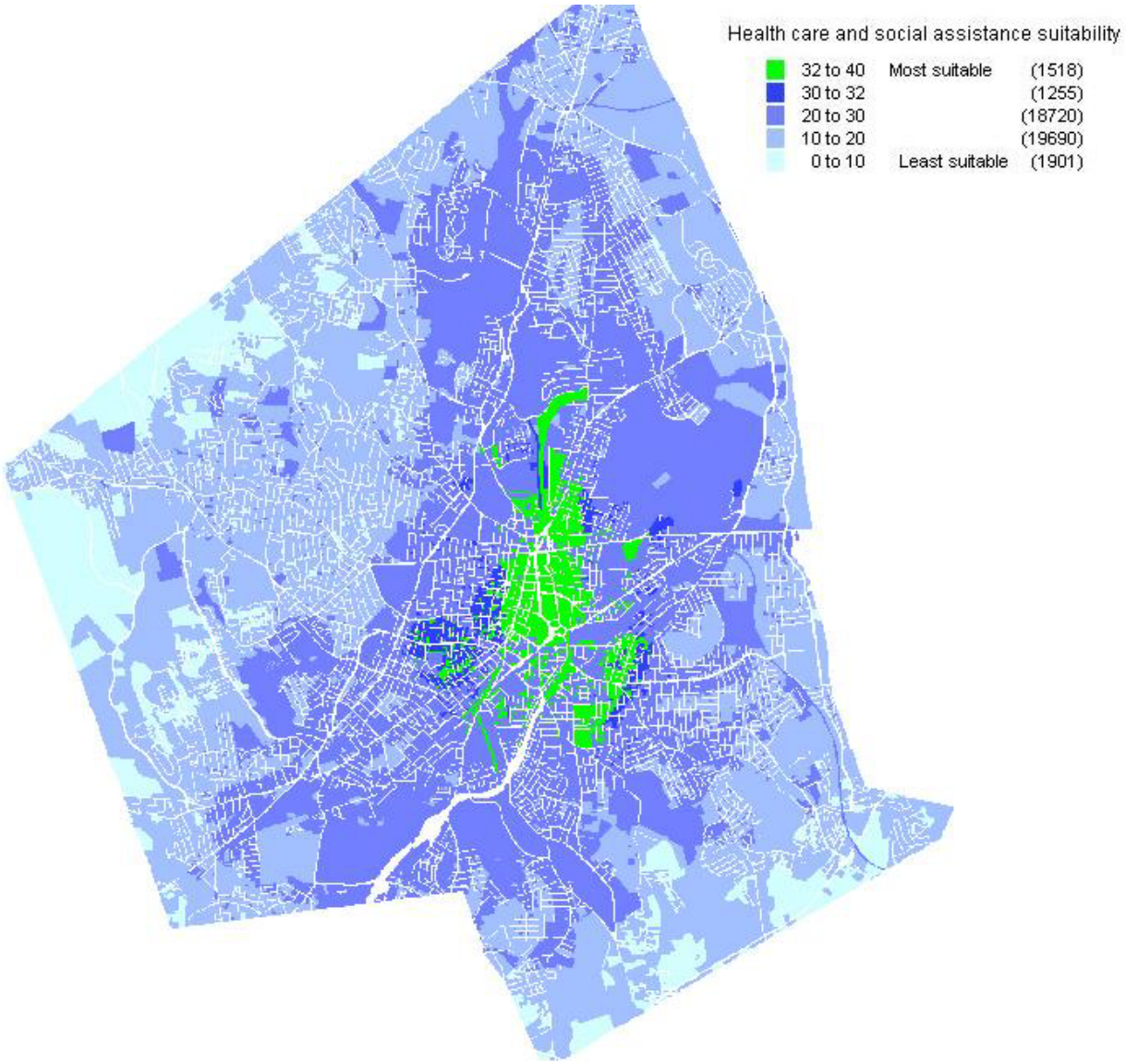
**Figure 9.7**
**Educational Services Suitability**



### 9.3.6 Health care and social assistance

The following map shows the most suitable parcels for Health care and social assistance. Again there is the strong concentration of industries in the downtown area. However for this suitability map there are a number of suitable parcels slightly southeast of the downtown area. These parcels could be utilized for additional healthcare for the elderly as needed.

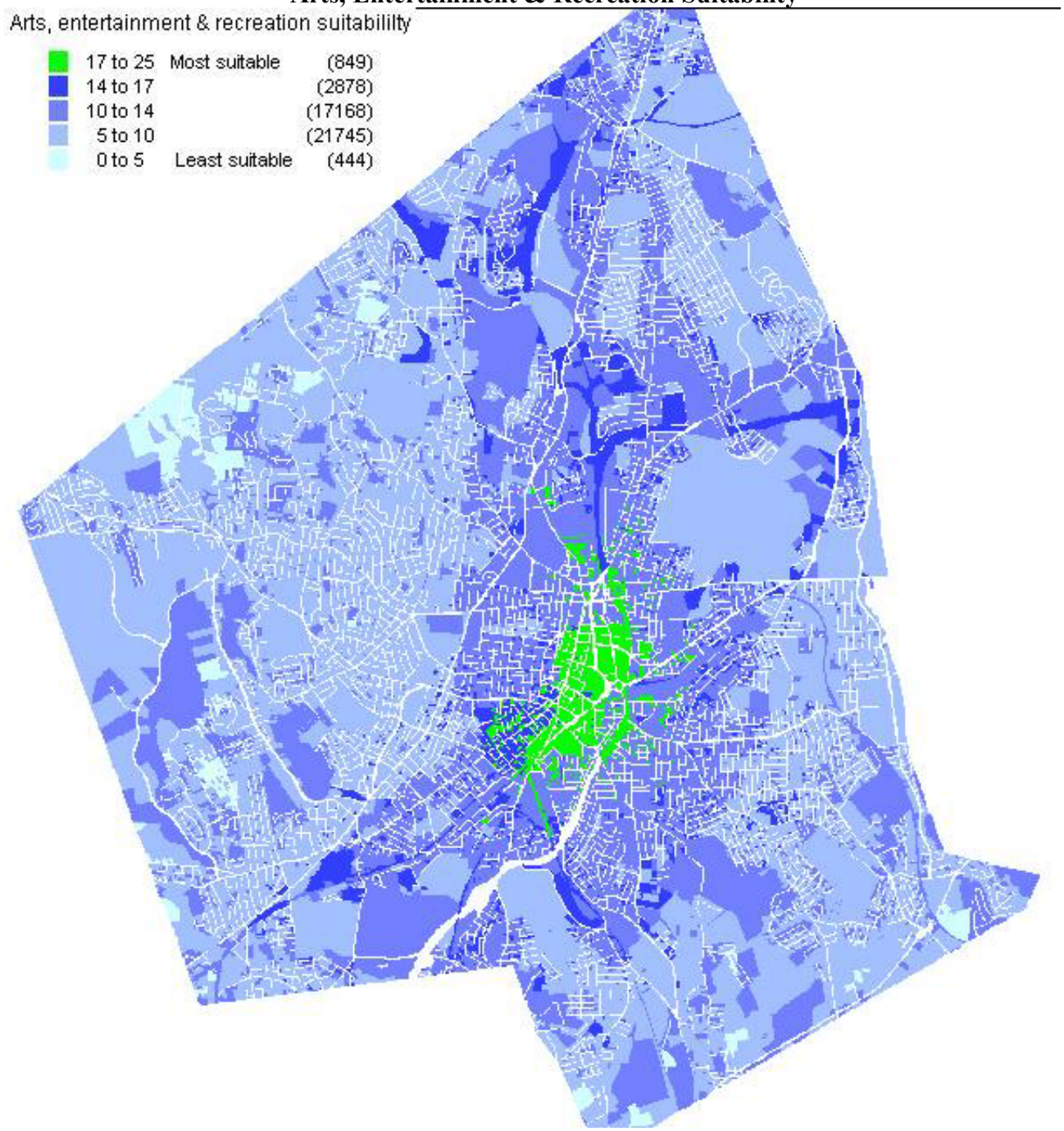
**Figure 9.8**
**Healthcare and Social Assistance Suitability**



### 9.3.7 Arts, entertainment & recreation

The suitability map for arts, entertainment & recreation shows that the majority of suitable locations for this sector are slightly south of downtown. This is interesting as there is already an arts district master plan that suggests this location for arts development.

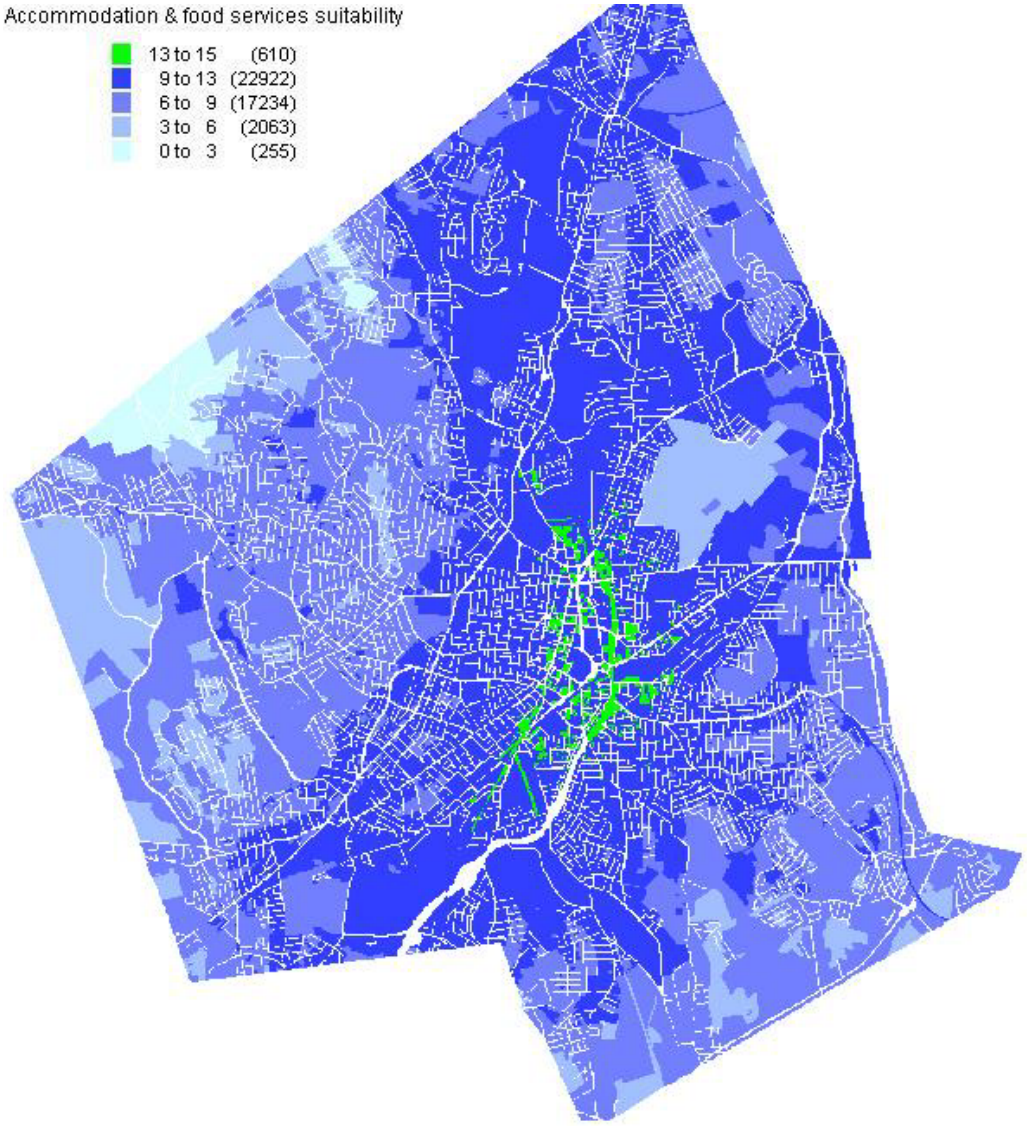
**Figure 9.9**
**Arts, Entertainment & Recreation Suitability**



### 9.3.8 Accommodation and Food Services

The most suitable locations for this sector are located in similar locations to those of the arts, entertainment & recreation sector. The difference is that for this sector, the suitability is along major roads. This sector could be easily integrated with the arts, entertainment & recreation sector.

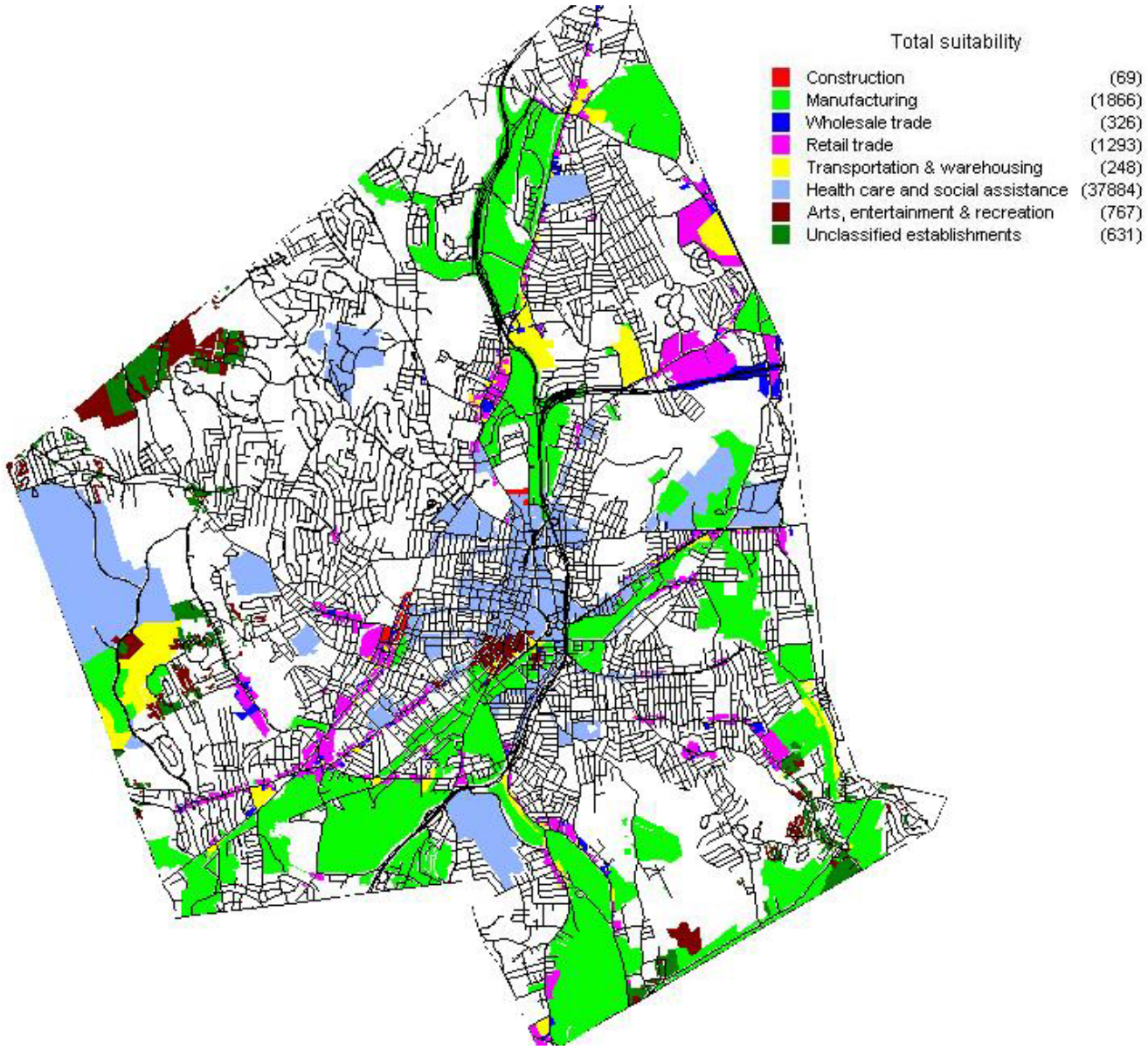
**Figure 9.10**
**Accommodation & Food Services Suitability**



### 9.3.9 Total Suitability

The total suitability map takes zoning into account. All areas zoned residential are colored white. As you can see, there are large sections of suitability for both manufacturing, and healthcare and social assistance spread throughout the city. There is still a section slightly south of downtown that is most suitable for arts, entertainment & recreation. This map can be useful for planners as it provides information about which types of industries would be most suitable for different locations.

**Figure 9.11**
**Total Suitability**



### 9.4 Suitability Analysis Information Gaps

The suitability analysis presented some of the most confining information gaps. We were unable to locate map layers for natural gas lines, telephone, power lines, and internet availability. When searching for a map of water mains, we found out that this map is not available without an act of Congress ever since the terrorist attacks. One can assume that the map of gas lines would also be under protection for this same reason. Though we were unable to locate these map layers, these are all criteria that would be useful to work with if the information becomes available.

Another problem that was encountered was a lack of information from the regional planning agencies. We contacted the CMRPC several times as well as MAPC and PVPC. With the exception of a telephone interview with Denis Superczynski of the PVPC, the planning agencies had no useful information regarding the economic development section of EO418. None of the cities within any of these planning agencies had completed economic suitability analyses that would be of any use to our project.

#### 9.4.1 GIS Map Layers

In order to complete our suitability analysis we required the use of many different map layers. Some layers however, were not available for usage. These layers will be discussed below.

A map layer containing major power lines would have been quite useful for determining areas suitable for certain types of development. This would have been particularly useful for the heavy industrial sections such as manufacturing and construction.

Another GIS layer that would have helped us in our analysis would have been a map containing gas mains. Many businesses require the use of natural gas for heat. Natural gas is also used as a fuel for production in some businesses. It would have been helpful to add this as a criterion for the suitability analysis so that such businesses would be aware of the availability of this utility.

Every industry uses water. Some use it more than others, but basic plumbing is a staple for any business. So naturally, we spent quite some time trying to obtain this layer. We did have a severe problem obtaining this information, however. Apparently it requires an act of congress to release this information ever since 9/11. Needless to say, we did not have the time to wait for this information. However, it would be quite useful to obtain this information so that it can be provided to incoming industries.

#### 9.4.2 Economic and Educational Distribution

We were able to locate both economic and educational distribution figures for the city of Worcester as well as for the other target cities we were comparing with Worcester. However, it would be extremely useful to have these numbers broken down to a finer resolution than just the city level (perhaps census tract or census block). This data would provide information about which areas have higher education levels, or which areas are

home to wealthier people. This knowledge can help with business placement. Businesses that require skilled workers would be better suited for an area near one of higher education levels. This way the businesses would be close to potential employees.

It would also be helpful to businesses (specifically for retail industries) to know which areas contain wealthier people. This would give businesses information on what types of customers they can expect based on spending.

Though this information would have been quite helpful in our suitability analysis, it was not available. We spent as much time searching for this information as we felt was appropriate, and were able to locate nothing with a finer level of aggregation than the city level. It would be helpful to have this information however, as it could provide much useful information.

## Chapter 10: Economic Mapping

There were several maps that were either included in the deliverables, or requested later during the course of the project that were not used to complete the suitability analysis. These maps include a map of industry concentration by ZIP-Code, a map of several different income categories at the census tract level, and a map of the top 100 businesses in Worcester County by employment.

### 10.1 Industry Concentrations Maps

The map of industry concentration shows the number of businesses within each 2-digit NAICS code that are present in each ZIP-Code in the City. This information can be displayed in several ways. One way is a thematic colored map that shows the top industry sector in each ZIP-Code. Another possible thematic map that can be used to show this data is a scaled map. One can show the number of businesses in a specific NAICS code that are located in each ZIP-Code. It is also possible to show a bar graph of each industry sector in a ZIP-Code. This information was not used for suitability because the ZIP-Codes are too large to draw any conclusions from the data in terms of suitability. However, this map can be useful to show a general distribution of the different employment types in the City. The following maps show some samples of the possible maps one can create from the data.

**Figure 10.1**
**Greatest Number of Industries per Zip Code**

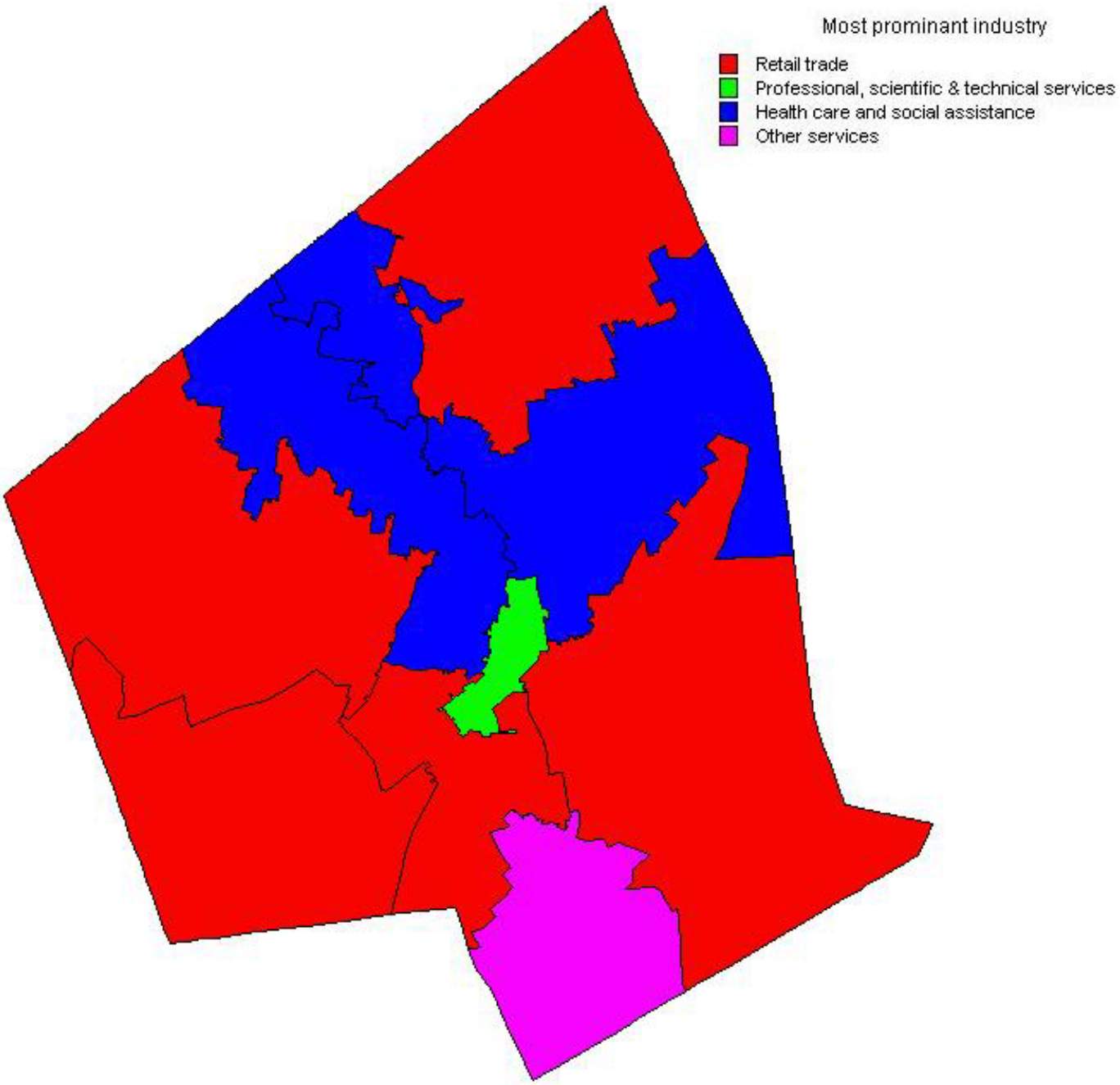


**Figure 10.2**
**Retail Industry Concentration per Zip Code**

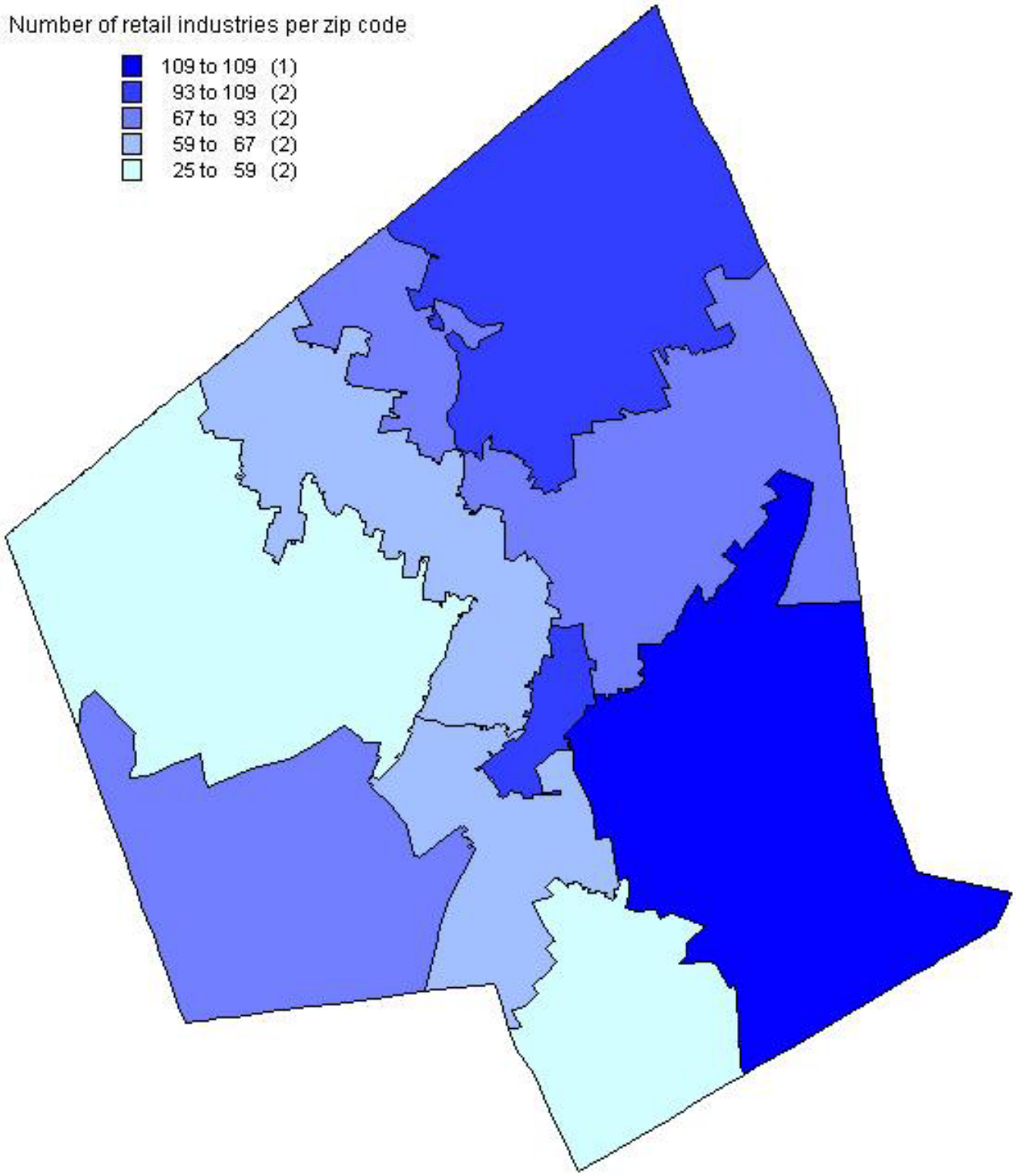
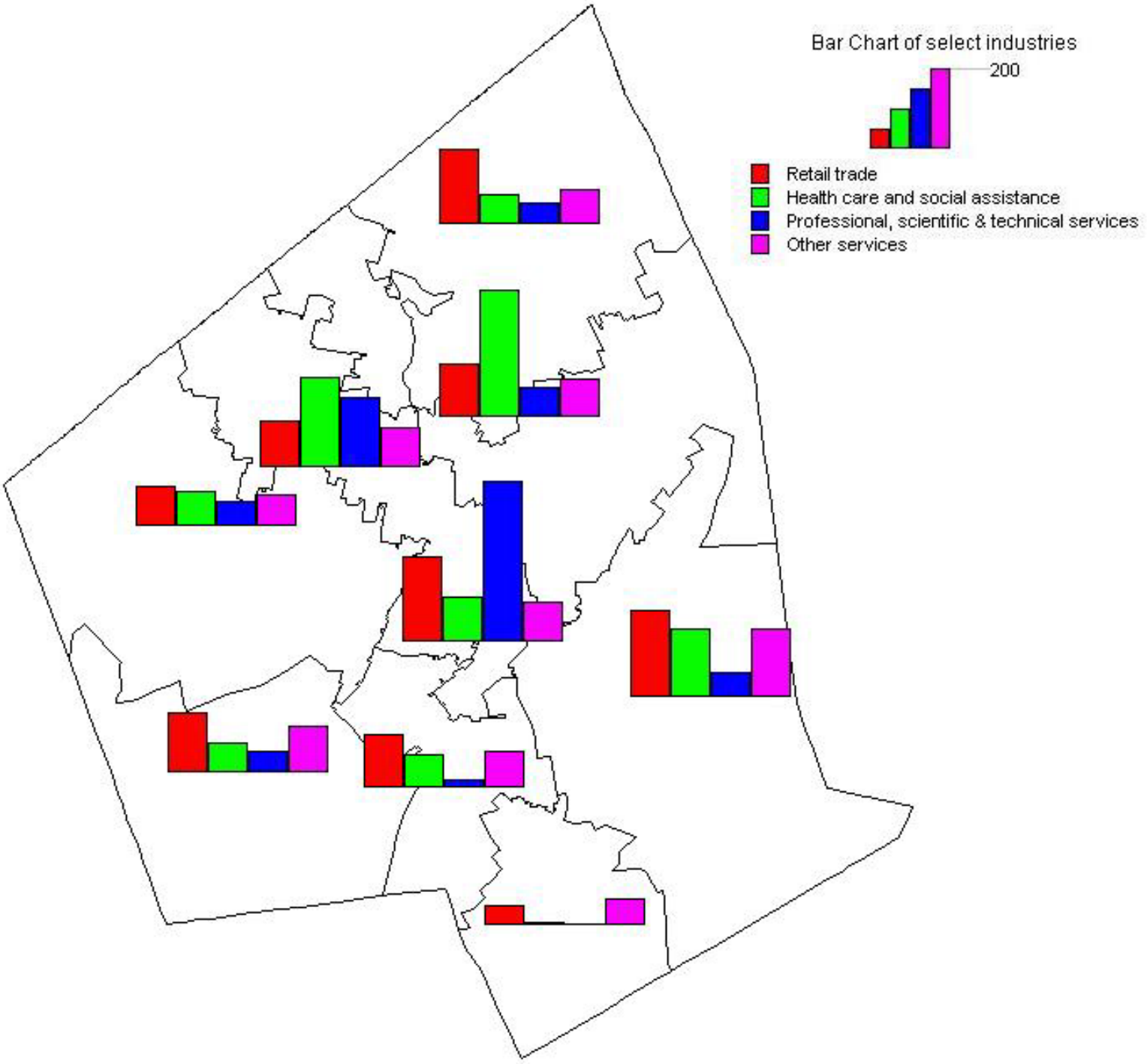


**Figure 10.3**
**Major Industry Concentrations per Zip Code**



## 10.2 Income Data Maps

These maps contain information from 1989 and 1999 on median household income, median family income, and per capita income for each census tract. They also contain the change and percent change from 1989-1999 for each of the three categories. As with the previous map, this information can be shown in several different ways. A thematic map can be used to show the different income levels in each census tract. For instance, one can display the per capita income as a scaled thematic map. The higher the value, the darker the shade of whichever color one chooses to use as a scale. This can be done for any of the categories. This map was not used, because the data was not included in our final list of criteria. There was no use for this information in our suitability analysis. That is not to say that this information is useless. This data would be useful for several different applications. For example, one could compare it with cost of housing as a way of analyzing the quality of life in a certain area. It would also be very useful to give a picture of where the higher income people reside. The following tables illustrate some examples of these maps.

**Figure 10.4**
**Median Household Income by Census Tract (1999)**

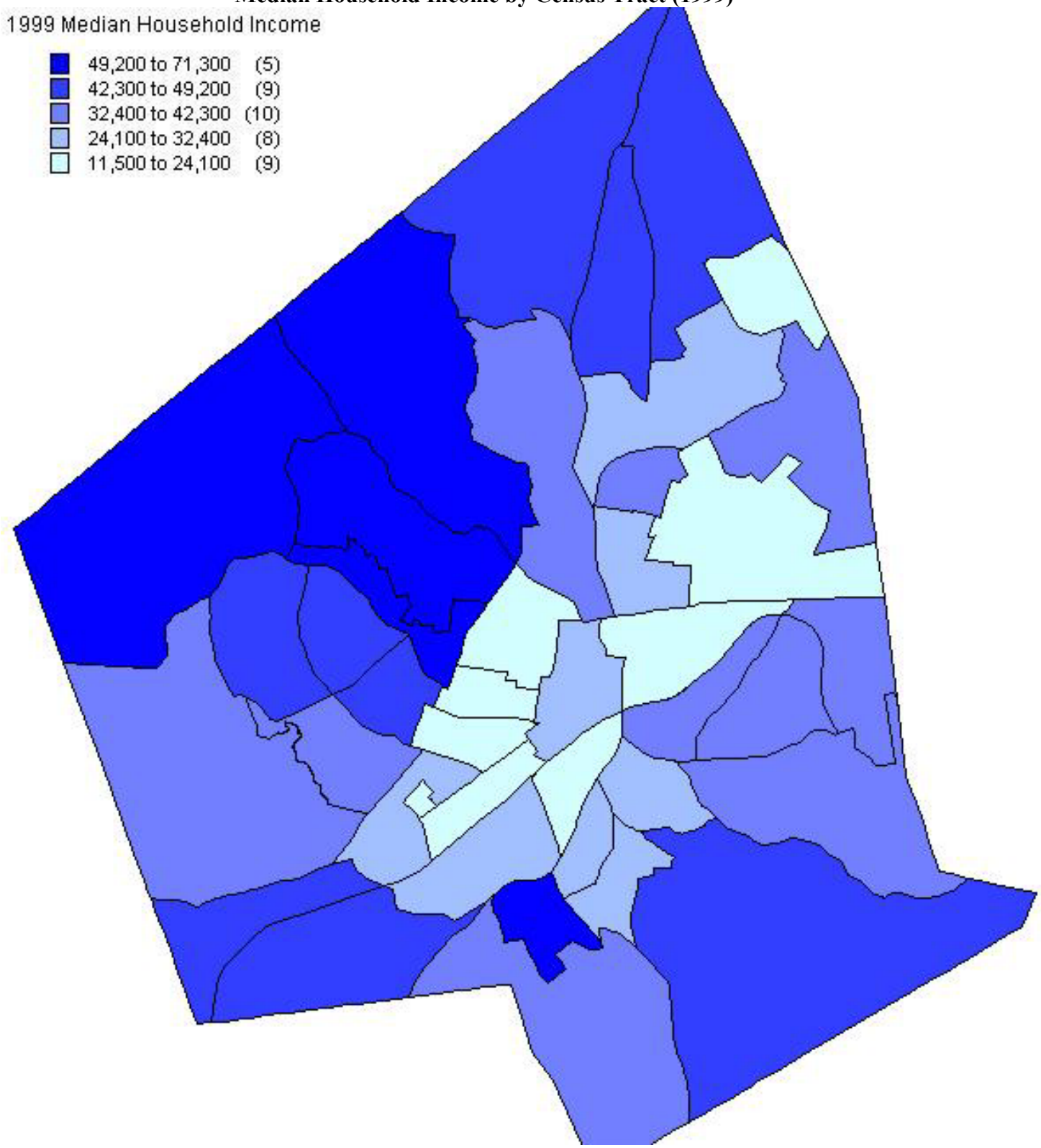


**Figure 10.5**
**Median Household Income Percent Change 1989-1999**

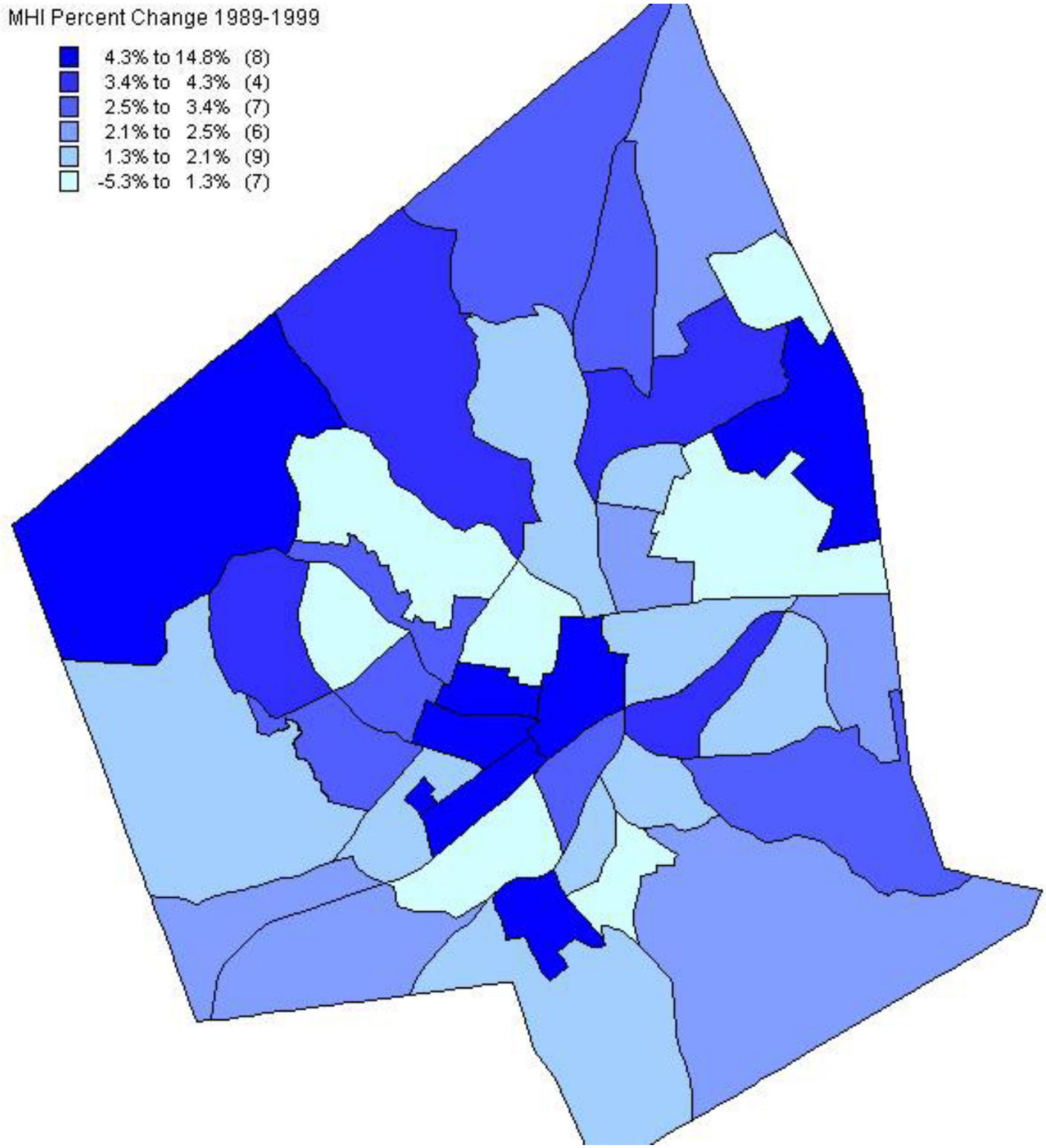
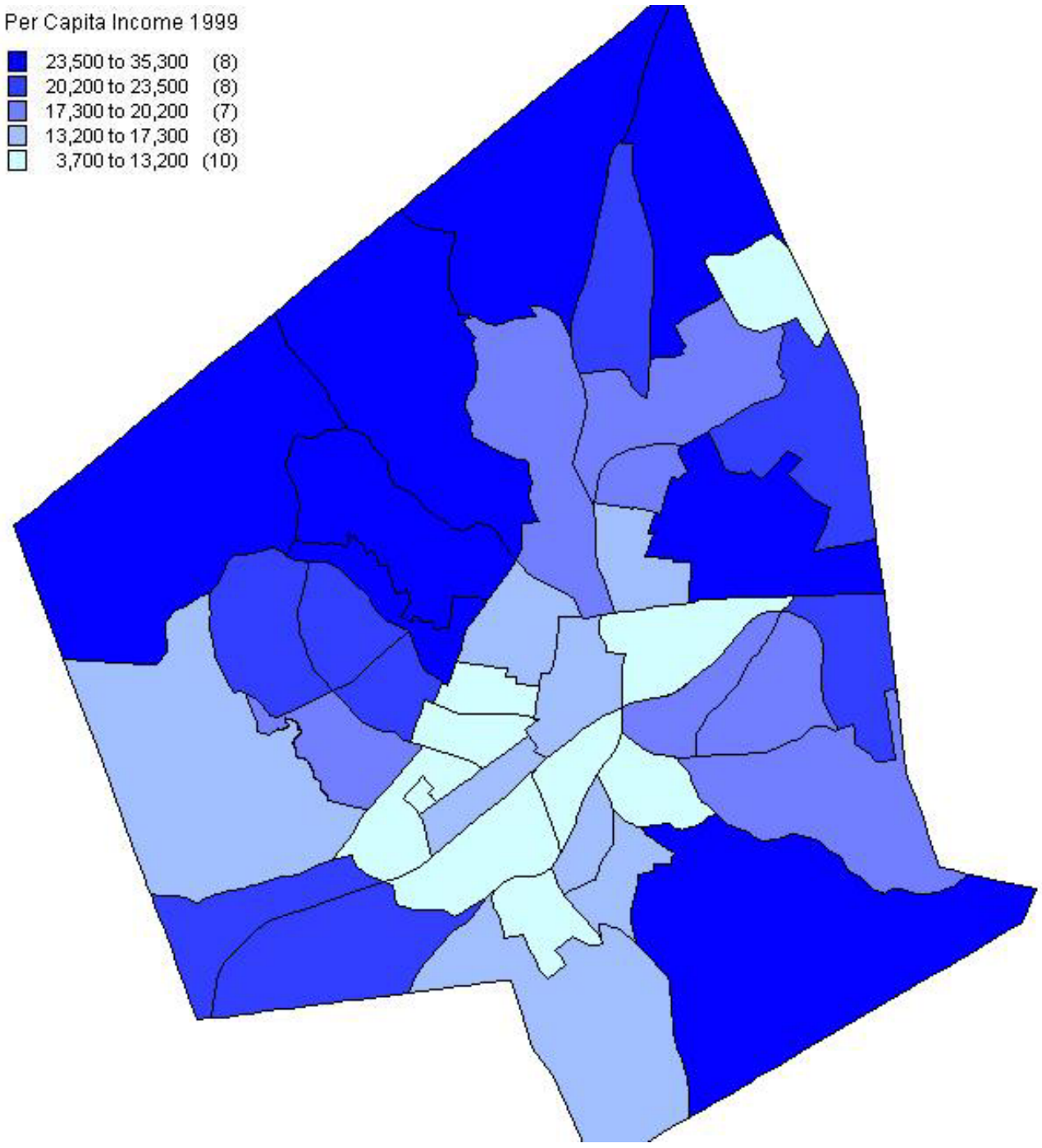


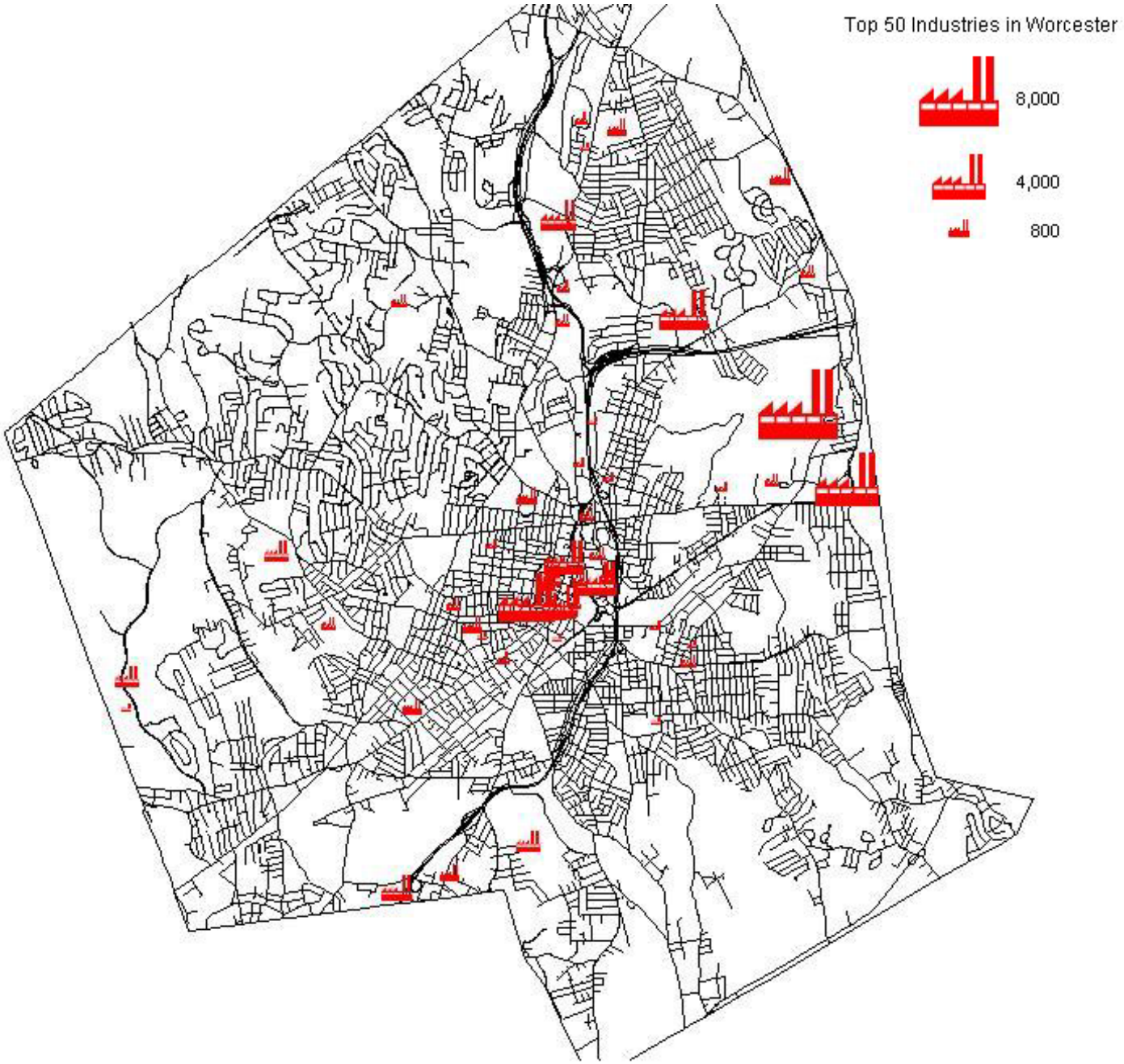
**Figure 10.6**
**1999 Per Capita Income**



### 10.3 Top 100 Industries in Worcester County

Another map that was created for this project was a map showing the top business of Worcester by employment. We received a list of the top 100 industries of Worcester County by employment and input them into our GIS software. The resulting map shows 50 of the top industries that were located in Worcester. This map was useful for our suitability analysis in that for each industry on the map, we were able to create a buffer around it. Any parcel within this buffer would be tagged as close to that major industry. These major industries were either similar or complimentary to some of the NAICS industry sectors we worked with. The following map shows the top 50 industries in Worcester, each symbol is sized proportionately based upon the number of employees in that company.

**Figure 10.7**
**Top 50 Industries in Worcester Graduated by Employment**



## Chapter 11: Conclusions

After the collection and analysis process was finished, the next step was to draw conclusions from the data that we had worked with. These conclusions include suggestions for development as well as a final description of what our results mean to the city of Worcester.

### 11.1 Evaluation of Data Sources:

In order to examine and ultimately make recommendations for Worcester's economy, one must utilize all available data types. There are a variety of different types, each of which has its own strengths and weaknesses. Of the data types that were used, there were several that helped greatly with the information gathering process.

ES-202 data was obtained from the Massachusetts Department of Employment and Training. This data was available at the city-wide level, and provided the information necessary to determine the most prominent industry sectors in Worcester. The data from ES-202 was used in the quotient analysis. This was the process that uncovered the leading and trailing industries in the City.

Business Patterns was a data source provided by the United States Census Bureau. This data was available at a slightly finer level of aggregation, and so helped to show where certain types of businesses were located. This provided information that was used along with the suitability analysis to determine the most suitable locations for different business types.

The Regional Economic Information System (REIS) was obtained from the Bureau of Economic Analysis. This data provided a broad range of information that dated back to 1969. From this data, we were able to find employment numbers for each industry sector dating back to 1969. This data was used for our time series analysis, which shows trends in the economy.

### 11.2 Comparison with Target Cities

Comparing Worcester to similarly sized cities provided its own set of conclusions. There was one city that, through all the different criteria, stood above the others. This city was Cambridge. When examining Cambridge, the criterion that stood out most was the education distribution. Cambridge had a value of 69% for the "College" range. This can be attributed mainly to the presence of several colleges and universities including Harvard and MIT. Worcester's value in this category is only 29%. However, the city of Worcester is home to many different colleges and universities. WPI, Clark University, The College of the Holy Cross are only a few of the many colleges located in Worcester and its suburbs. The presence of these schools is an asset that should be utilized to its full potential rather than overlooked. This presence gives Worcester a similar environment to that of Cambridge. Though the schools in Worcester are smaller than those in Cambridge, they still provide the base of education from which other complementary industries can feed.

It has been said in the past that talent follow jobs. With so many high-tech economic nodes such as Silicon Valley, it has become more and more apparent in the

recent years that jobs (or more accurately the businesses that provide them) follow talent. When marketed correctly, the mere presence of all of these institutions of higher education could be a strong incentive to prospective businesses. Worcester has the potential to be able to accommodate the same types of businesses as Cambridge.

The key to this theory is to bring in businesses that both hold opportunities for, and appeal to the talent emerging from these institutions. The biotechnology cluster is a perfect example of this. Students recently out of graduate school see these companies as a terrific opportunity to get into the work force, and the companies are hiring them. But this success does not need to be limited to only one industry sector. Other high-tech and information based businesses would most likely have the same results. Worcester has the talent. It only requires the right businesses to harness this talent, and turn it into a tangible asset of the City.

### 11.3 Quotient Analysis

Summary of the Quotient Analysis for Worcester versus Massachusetts at the 2-digit NAICS level

**Table 11.1**

| **Quotient Ratios for Worcester versus Massachusetts** | | |
|---|---|---|
| NAICS Code | Industry | Location Quotient Ratio |
| **62** | **Health Care and Social Assistance** | **1.745257765** |
| **55** | **Management of Companies and Enterprises** | **1.322139657** |
| **61** | **Educational Services** | **1.299033771** |
| **52** | **Finance and Insurance** | **1.270186841** |
| **81** | **Other Services, Ex. Public Admin** | **1.171260904** |
| 71 | Arts, Entertainment, and Recreation | 0.920971307 |
| 22 | Utilities | 0.914152572 |
| 56 | Administrative and Waste Services | 0.893544268 |
| 31-33 | Manufacturing | 0.858103031 |
| 44-45 | Retail Trade | 0.793227919 |
| 92 | Public Administration | 0.790054016 |
| 42 | Wholesale Trade | 0.779496924 |
| 23 | Construction | 0.773495368 |
| 72 | Accommodation and Food Services | 0.753334746 |
| 53 | Real Estate and Rental and Leasing | 0.706012609 |
| 54 | Professional and Technical Services | 0.645947775 |
| 51 | Information | 0.532285672 |
| 48-49 | Transportation and Warehousing | 0.430473183 |
| 11 | Agriculture, Forestry, Fishing & Hunting | 0.113629417 |

* Bold values indicate Worcester's strong industry sectors

As a result of the quotient analysis completed for the city of Worcester versus the state of Massachusetts, the top industries were found to be health care and social assistance, management of companies and enterprises, educational services, finance and insurance, and other services (except public administration). The weakest sectors of the economy include agriculture, forestry, fishing, and hunting, transportation and warehousing, information, professional and technical services, as well as real estate and rental and leasing.

### 11.4 Time Series Analysis

In examining the detailed, county-level time series analysis taken from 1969 to 2000, Worcester County follows the state's employment patterns most closely in the SIC industries of construction, finance-insurance-real estate, military, and service. The County follows the state the least closely in the SIC industries of agricultural services-forestry-fishing, mining, and government and government enterprises. Interestingly enough, Worcester County showed a large deviation in federal, civilian government employment from the state in 1977, when County employment decreased 44% and the state's employment increased by 2%.

In examining the city-level time series analysis taken from 1985 to 2001, Worcester follows the state's employment patterns closely, particularly in the SIC sectors of construction and manufacturing. Worcester deviates from the state's employment patterns mostly in the SIC sectors of government, transportation-communication-public utilities, and services. The most striking deviation is found in government employment in 1992, which rose 45% for the City and decreased 2% of the state. This large and sudden increase in government employment is comparable to the large and sudden decrease in federal, civilian government employment for the county of Worcester in 1977. However, in examining the percent change graphs for Worcester County and Massachusetts, the 45% increase in government employment at the city level is undetectable in the county graphs. In examining actual employment numbers, Worcester has shown steady and large increases in employment in the services. Most sectors of Worcester's economy tend to be decreasing. These include agriculture-forestry-fishing, manufacturing, and trade.

### 11.5 Suitability Analysis

From the maps that we created we can generate some powerful conclusions. From the conclusions we develop we can make final recommendations. After examining the maps that were generated from the analysis there are four maps that are particularly useful to the city. The map for manufacturing suitability (Figure 9.3) is particularly interesting. When examining the map in detail one can see that the large outlying parcels on the suitability map are in fact brownfields that are close to central roads and highways. These parcels would be especially valuable to manufacturing companies that wish to export their product outside the city. The second map that is particularly useful is the map for retail trade suitability (Figure 9.5). This map shows that there is a large concentration of the most suitable locations for retail trade in the northern downtown area. Since there is interest in revitalizing the downtown area this could be a major source of verification

on what industries to bring in. The map shows theses areas as most suitable due to their central location to major roads, highways, and availability of open parcels. The third map of interest is the suitability for the arts, entertainment, and recreation industries (Figure 9.9). The results of this map were not surprising. They show that there is a particular section of the city that is ideal for an arts district. This area is the southern downtown area. This is especially useful to the city in that there is already a master plan to create and arts district in the very same area. This map verifies the city's plans to put the arts district in that location. The fourth map that has valuable findings is the total suitability map (Figure 9.11). This map allows the city to have an overall idea about what sections of the city are most suitable for particular industries.

## Chapter 12: Final Recommendations

By examining the results of the quotient analysis, one can see that the stronger 2-digit NAICS industry sectors for Worcester include health care and social assistance, management of companies and enterprises, educational services, finance and insurance, and other services (except public administration). Our recommendations include strengthening the weaker sectors of the City that are complementary to the strong industry sectors. Two strong complementary industry sectors that exist in Worcester include finance and insurance, and health care and social assistance. The weaker industry sectors in Worcester that would be complementary to Worcester's strong industry sectors include manufacturing, construction, information, and professional and technical services (see Table 12.1 below).

**Table 12.1**

| **Industries Complimentary to Worcester's Leading Industry Sectors** | |
|---|---|
| **Worcester's Contributions** | **Complementary Industry Sectors** |
| Health Care & Social Assistance | Manufacturing |
| Educational Services | Construction, Manufacturing, & Information |
| Finance & Insurance | Professional, Scientific,& Technical Services; Health Care & Social Assistance |

** There are no complementary industry sectors for NAICS 55 (Management of Companies and Enterprises) or NAICS 81 (Other Services, Ex. Public Administration).*

After identifying complementary industry sectors at the 2-digit NAICS level, the idea was to further examine those sectors in order to identify which specific industries would be best to introduce. For example, manufacturing and health care and social assistance are supposedly complementary at the 2-digit NAICS level. Manufacturing, however, is an extremely broad category. It is not useful to recommend that more manufacturing be brought into the City. It is more useful to identify what types of manufacturing companies should be brought into the city. After studying the manufacturing sector, two industries at the 5-digit level were found to be complementary to health care and social assistance. Those were pharmaceutical and medicine manufacturing (32541) and medical equipment and supplies manufacturing (33911). The table below describes more specifically which industries are complementary to the strong sectors of Worcester's economy.

**Table 12.2**

| **Specific Relevant Industries** | |
|---|---|
| **Complementary Sectors** | **Possible Industries to Introduce** |
| **Health Care and Social Assistance & ** | Pharmaceutical and Medicine Manufacturing (32541)<br>Medical Equipment and Supplies Manufacturing (33911) |

| | |
|---|---|
| **Manufacturing** | |
| **Finance and Insurance & Professional, Scientific, and Technical Services** | Research and Development in the Physical, Engineering, and Life Sciences (541710) |
| **Finance and Insurance & Health Care and Social Assistance** | Health and Welfare Funds (525120)<br>Direct Health and Medical Insurance Carriers (524114) |
| **Educational Services & Manufacturing** | Computer and Peripheral Equipment Manufacturing (3341)<br>Communications Equipment Manufacturing (3342)<br>Semiconductor and Other Electronic Component Manufacturing (3344)<br>Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (3345)<br>Manufacturing and Reproducing Magnetic and Optical Media (3346) |
| **Educational Services & Information** | Internet Service Providers, Web Search Portals, and Data Processing Services (518) |
| **Educational Services & Construction** | Commercial and Institutional Building Construction (236220) |

As a result of the suitability analysis, the downtown portion of Worcester is most suitable for NAICS sector 71 which is arts, recreation, and entertainment. If you examine the summary quotient analysis, that sector of the economy has a quotient ratio just less than one. That sector of the economy could easily become one of Worcester's leading sectors if the appropriate industries were introduced.

Resulting from these analyses, we'd like to bring in the follow categories of industries: 1) biomedical/instrument manufacturing, 2) professional, scientific, and technical services, and 3) arts, entertainment, and recreation.

### 12.1 Biomedical/instrument Manufacturing

Biomedical manufacturing would encompass the 5-digit NAICS categories of pharmaceutical and medicine manufacturing (32541) and medical equipment and supplies manufacturing (33911). Biotech companies have recently been draw to the area, probably due to the colleges and health care centers located in the region. In bringing in biomedical manufacturing, we would provide grounds for biotech companies to expand. If biotech companies were to locate themselves in the City, the City might provide some financial support in selling products within City limits. They may also provide support to

biotech companies purchasing products within City limits. In doing so, the City would support both sectors of the economy.

To complement the colleges of the region, high tech manufacturing companies would also benefit the area. The following are examples of pertinent 4-digit industries that would complement the already strong educational services sector of the economy: computer and peripheral equipment manufacturing (3341), communications equipment manufacturing (3342), semiconductor and other electronic component manufacturing (3344), navigational, measuring, electro medical, and control instruments manufacturing (3345), and manufacturing and reproducing magnetic and optical media (3346).

Introducing businesses contained within this sector would also encourage the redevelopment of brownfields. Manufacturing companies require large plots of land. The many brownfields in Worcester would provide adequate space, as well as an existing infrastructure from which to build. Redeveloping these brownfields would reduce the amount of underutilized space and Worcester, and help to beautify the areas once occupied by these.

### 12.2 Professional, Scientific, and Technical Services

The most relevant category for professional, scientific, and technical services would be the 6-digits NAICS industry Research and Development in the Physical, Engineering, and Life Sciences (541710). The professional, scientific, and technical services sector composes a large portion of Cambridge's economy. On the other hand, it is one of Worcester's weakest sectors. With the colleges and health facilities in the area, providing employment opportunities in research and development might cause regional students to remain within the area. In providing jobs to college students, the average educational level of City residents would also increase.

### 12.3 Arts, Entertainment, and Recreation

Having the downtown region most suitable for arts, recommendation, and recreation is supportive of Worcester's Master Plan for the Arts District. Already located downtown is the Worcester Centrum Center, which brings in people from other parts of Massachusetts and the country. Having more arts, recreation, and entertainment industries would only enhance the sentiment of the area as well as provide jobs for all the starving artists located in the region. Improving the look and reputation of the downtown area will provide reason for other companies to locate themselves in the City.

### 12.4 Final Note

The industries mentioned in the previous sections would help to better create a reputation for Worcester as a biotechnology and high tech city. They would also enhance the cultural and aesthetic appeal of the city. These industries would create jobs for the recent college graduates of the area and promote a lower unemployment rate. Considering employment opportunities and city character, these industries seem like they would be a very beneficial addition to Worcester. Our research and recommendations should serve to inform the decision makers of the City. We strongly believe that the

information contained in this report is a powerful tool that can be used in the future to help to create a more vibrant and sustainable Worcester.

## Chapter 13: Acknowledgements

We would like to thank our sponsor, the City of Worcester, for making this research project possible. Particularly essential to the project was City Planner Joel Fontane, who worked directly with us in determining the necessary steps for a project of this type and in providing ideas on how to proceed with the project when difficulties arose. Other members of the City's planning office who were critical to the project's completion include Edgar Luna and Ruth Gentile. Edgar Luna provided us with valuable planning documents, and Ruth Gentile provided us with the City's buildout analysis and completed GIS layers. This project would not have been successful without the help and dedication of our advisors. Those working most closely with us during the duration of the project include Francis Noonan, who provided continual feedback along the way, and Fabio Carrera, who provided technical assistance in mapping spatial data. Rob Krueger worked with us early on in designing our project plan. Steven Metts aided us in the collection of necessary economic data. We would also like to thank Senior Planner Denis Superczynski of the Pioneer Valley Planning commission, who generously spent some of his time describing the process he used to analyze the suitability of economic development activities in a city. Lastly, we would like to thank Clark University for providing us with brownfield information including a GIS layer that was very useful in our analysis.

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**Appendix A: Comparison with Similar Cities Raw Data**

The first table below shows employment statistics for Worcester and the target cities. These data include median household income, per capita income, total employment, and unemployment rate.

The second table shows the household income distribution for Worcester and the target cities for the year 2000. It includes several increments from <$20,000 to >$200,000.

The third table shows the education distribution for Worcester and the target cities for the year 2000. It includes 5 categories that provide a good picture of the way education is distributed in the different cities.

Below is a list of the sources used for each different datum. There was some overlapping in the data. To insure accuracy, the data that overlapped were checked with each other.

**Employment**

Worcester- http://www.detma.org/lmi/local/Worceste.html
Lowell- http://www.detma.org/lmi/local/Lowell.html
Springfield- http://www.detma.org/lmi/local/Springfi.html
Cambridge- http://www.detma.org/lmi/local/Cambridg.html
Providence- http://www.planning.ri.gov/census/pdfcomm/provemploy.pdf

**Median household income**

Worcester- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3221
Lowell- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3011
Springfield- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3146
Cambridge- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=2894
Providence- http://www.ersys.com/usa/44/4459000/income.htm

**Per capita income**

Worcester- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3221
Lowell- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3011
Springfield- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=3146
Cambridge- http://www.epodunk.com/cgi-bin/incomeOverview.php?locIndex=2894
Providence http://www.nationmaster.com/encyclopedia/Providence,-Rhode-Island

**Income groups/distribution**

Worcester- http://www.ersys.com/usa/25/2582000/income.htm
Lowell- http://www.ersys.com/usa/25/2582000/income.htm
Springfield- http://www.ersys.com/usa/25/2567000/income.htm
Cambridge- http://www.ersys.com/usa/25/2511000/income.htm
Providence- http://www.ersys.com/usa/25/2582000/income.htm

## Income and Employment Statistics for Worcester and Similarly Sized Cities

| | Worcester | Lowell | Springfield | Cambridge | Providence |
|---|---|---|---|---|---|
| Median Household Income | $35,623 | $39,192 | $30,417 | $47,979 | $26,867 |
| Per Capita Income | $18,614 | $17,557 | $15,232 | $31,156 | $15,525 |
| Total Employment | 101,004 | 34,572 | 79,948 | 113,479 | 133,072 |
| Unemployment Rate | 6.60% | 8.20% | 7.40% | 3.80% | 4.10% |

## Household Income Distribution 2000 (Count)

| | Under $20,000 | $20,000-$30,000 | $30,000-$40,000 | $40,000-$50,000 | $50,000-$75,000 | $75,000-$100,000 | $100,000-$125,000 | $125,000-$150,000 | $150,000-$200,000 | Over $200,000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Worcester | 19,406 | 9,256 | 8177 | 6978 | 11965 | 5771 | 2814 | 1117 | 800 | 799 |
| Lowell | 9941 | 4769 | 4644 | 4228 | 7743 | 3587 | 1533 | 726 | 512 | 309 |
| Springfield | 19610 | 8627 | 6716 | 5553 | 9727 | 4105 | 1530 | 600 | 326 | 384 |
| Cambridge | 9058 | 4392 | 4432 | 4032 | 7314 | 5044 | 2815 | 1649 | 1667 | 2232 |
| Providence | 24784 | 8895 | 6867 | 5352 | 8143 | 3917 | 1655 | 657 | 861 | 1196 |

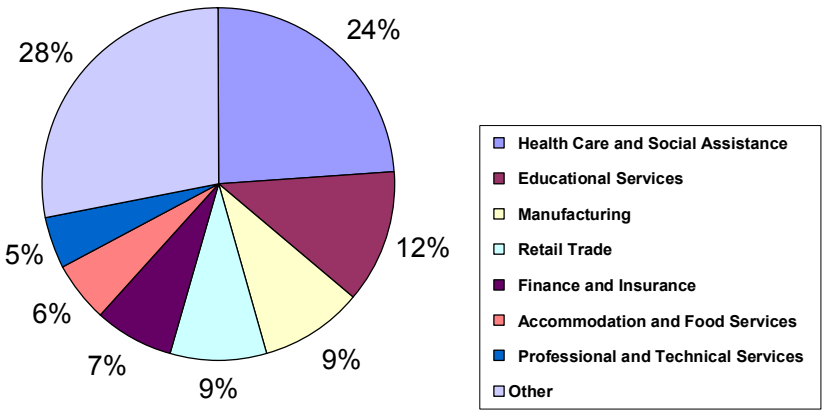
## Education Distribution 2000 (Count)

| | Under 9 | 9 to 12 | High school | Some College | College |
|---|---|---|---|---|---|
| Worcester Education Distribution 2000 | 9,332 | 16,055 | 31,901 | 19,080 | 32,401 |
| Lowell Education Distribution 2000 | 8,337 | 10,204 | 20,674 | 10,133 | 15,073 |
| Springfield Education Distribution 2000 | 9,467 | 14,706 | 29,881 | 16,541 | 20,205 |
| Cambridge Education Distribution 2000 | 3,348 | 3,592 | 8,084 | 5,814 | 45,477 |
| Providence Education Distribution 2000 | 14,608 | 18,296 | 22,167 | 13,136 | 27,947 |

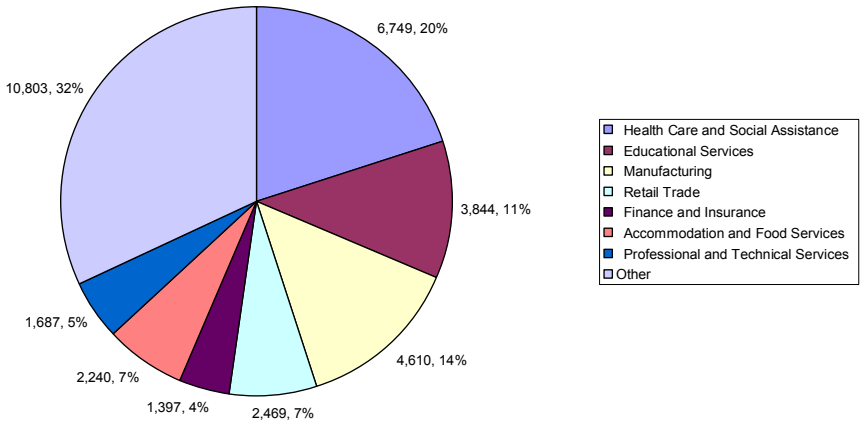
## Appendix B: Employment Distribution Graphs

The pie graphs below show how the employment of Worcester and the target Cities is distributed throughout the different sectors. This shows the comparative strengths and weaknesses of each city with respect to their major industries.

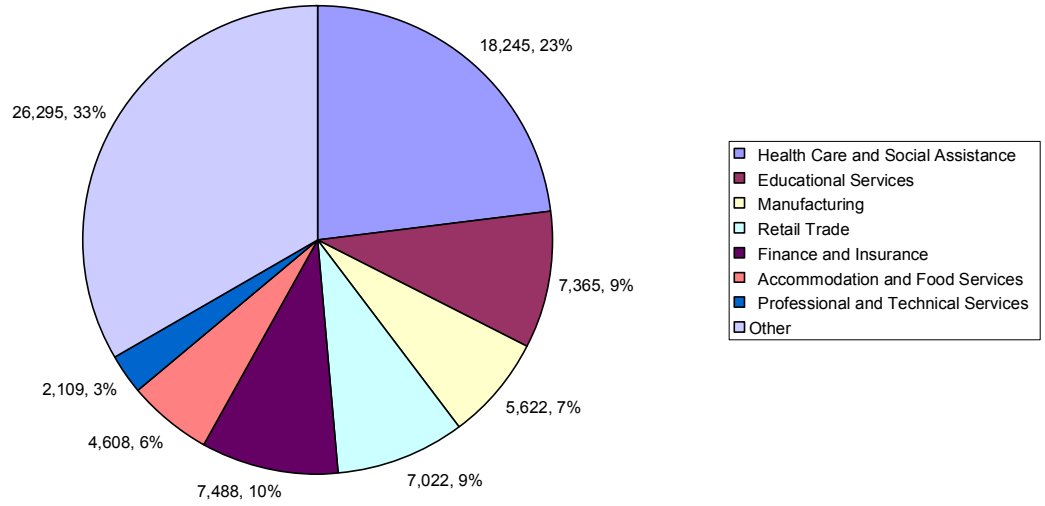
**Worcester Economic Distribution**



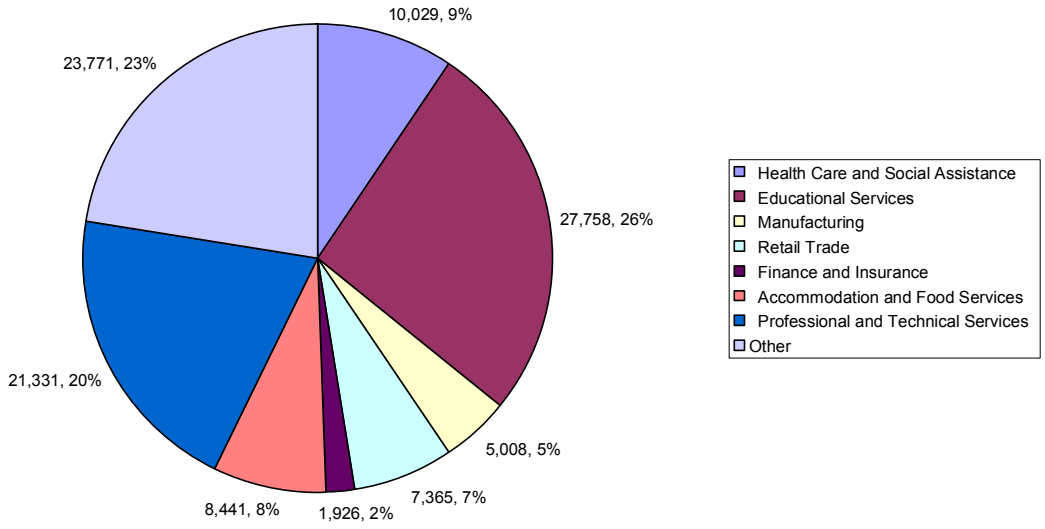

**Lowell's Economy**

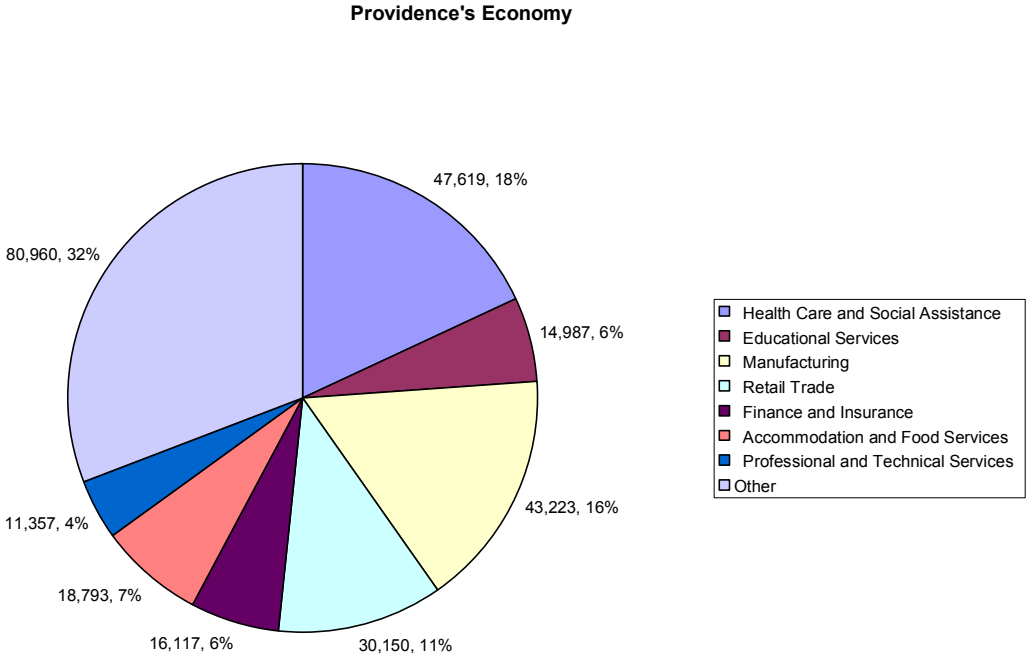


**Springfield's Economy**




**Cambridge's Economy**




Providence's Economy
47,619, 18%
14,987, 6%
43,223, 16%
30,150, 11%
16,117, 6%
18,793, 7%
11,357, 4%
80,960, 32%
Health Care and Social Assistance
Educational Services
Manufacturing
Retail Trade
Finance and Insurance
Accommodation and Food Services
Professional and Technical Services
Other

## Appendix C: Quotient Analysis

This section contains charts of data and calculations for the location quotient ratios of Worcester and the similar cities. For the Massachusetts cities, ES-202 data is used from the Massachusetts Division of Employment and Training's website. For Providence, ES-202 data at the 2-digit NAICS level was used from another website. The charts are found in the following order: Cambridge, Lowell, Springfield, Worcester, and Providence. Each chart, with the exception of the Providence one, is set up in a specific format. The first column contains the NAICS code of the industry. The second column contains a description of the industry. The third column contains regional employment values for each NAICS industry, which is employment at the city level. The fourth column calculates the numerator of the location quotient ratio, which is regional employment in a particular industry divided by total employment in that region (ri/rt). Total employment values for each city are found in the first row of the third column. The fifth column contains state employment numbers for the corresponding NAICS industries, which are specific to Massachusetts for Cambridge, Lowell, Springfield and Worcester and specific to Rhode Island for Providence. The sixth column calculates the denominator of the location quotient ratio, which is state employment in a particular divided by total employment for that state (si/st). The seventh column contains the location quotient ratios for each NAICS industry (lqr). The eighth column contains one of the calculations necessary to determine exported employment values. It calculates city employment in an industry divided by state employment in that industry (ri/si). The ninth column subtracts the following value from the ratio calculated in column eight: total employment in the city divided by total employment in the state (rt/st). Column ten contains the value for exported jobs, which is the value in column nine multiplied by regional employment in the corresponding NAICS industry. The value in column ten is (ri/si – rt/st)*ri. The columns of the Providence chart are laid out in the following way: NAICS code, industry description, city employment, state employment, numerator of location quotient ratio, denominator of location quotient ratio, the location quotient ratio, and the exported jobs value.

| | **Cambridge** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Cambridge | ri/rt | MA | si/st | | | rt/st = 0.032995 | |
| NAICS | Description | Employ-ment | top ratio | Employ-ment | bottom ratio | LQR | ri/si | ri/si - rt/st | Exported Jobs |
| | **Total, all industries** | 105,662 | | 3,202,323 | | | | | |
| | **Goods-Producing Domain** | 9,501 | 0.089919 | 508,329 | 0.158737282 | 0.566463 | 0.018691 | -0.014304349 | -135.9056186 |
| | **Construction** | 4,457 | 0.042182 | 152,821 | 0.04772183 | 0.883907 | 0.029165 | -0.00383016 | -17.07102352 |
| 23 | Construction | 4,457 | 0.042182 | 152,821 | 0.04772183 | 0.883907 | 0.029165 | -0.00383016 | -17.07102352 |
| 236 | Construction of Buildings | 495 | 0.004685 | 30,871 | 0.009640171 | 0.485961 | 0.016034 | -0.016960534 | -8.395464328 |
| 2361 | Residential Building Construction | 147 | 0.001391 | 16,882 | 0.005271788 | 0.263901 | 0.008707 | -0.024287501 | -3.570262631 |
| 2362 | Nonresidential Building Construction | 348 | 0.003294 | 13,989 | 0.004368383 | 0.753945 | 0.024877 | -0.008118311 | -2.825172288 |
| 2372 | Land Subdivision | 121 | 0.001145 | 1,358 | 0.000424066 | 2.700429 | 0.089102 | 0.05610662 | 6.788901024 |
| 238 | Specialty Trade Contractors | 841 | 0.007959 | 91,067 | 0.02843774 | 0.279887 | 0.009235 | -0.023760041 | -19.98219458 |
| 2382 | Building Equipment Contractors | 763 | 0.007221 | 44,326 | 0.013841801 | 0.521691 | 0.017213 | -0.015781626 | -12.04138091 |
| 2383 | Building Finishing Contractors | 14 | 0.000132 | 18,930 | 0.005911323 | 0.022414 | 0.00074 | -0.032255433 | -0.451576064 |
| | **Manufacturing** | 5,008 | 0.047396 | 347,430 | 0.108492913 | 0.436862 | 0.014414 | -0.018580586 | -93.05157261 |
| 31-33 | Manufacturing | 5,008 | 0.047396 | 347,430 | 0.108492913 | 0.436862 | 0.014414 | -0.018580586 | -93.05157261 |
| DUR | Durable Goods Manufacturing | 798 | 0.007552 | 229,268 | 0.071594143 | 0.105489 | 0.003481 | -0.029514357 | -23.55245709 |
| NONDUR | Non-Durable Goods Manufacturing | 4,210 | 0.039844 | 118,162 | 0.03689877 | 1.07982 | 0.035629 | 0.002634052 | 11.08935741 |
| 311 | Food Manufacturing | 1,021 | 0.009663 | 22,563 | 0.007045809 | 1.371437 | 0.045251 | 0.012256075 | 12.51345234 |
| 3113 | Sugar/Confectionery Product Manufacture | 792 | 0.007496 | 1,956 | 0.000610805 | 12.27166 | 0.404908 | 0.371912975 | 294.5550766 |
| 3118 | Bakeries and Tortilla Manufacturing | 229 | 0.002167 | 8,930 | 0.002788595 | 0.777197 | 0.025644 | -0.007351103 | -1.683402592 |
| 323 | Printing and Related Support Activities | 259 | 0.002451 | 17,586 | 0.005491628 | 0.446354 | 0.014728 | -0.018267376 | -4.73125032 |
| 3231 | Printing and Related | 259 | 0.002451 | 17,586 | 0.005491628 | 0.446354 | 0.014728 | -0.018267376 | -4.73125032 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Support Activities | | | | | | | | |
| 325 | Chemical Manufacturing | 2,928 | 0.027711 | 18,113 | 0.005656196 | 4.89923 | 0.161652 | 0.128656852 | 376.7072634 |
| 3254 | Pharmaceutical & Medicine Manufacturing | 2,430 | 0.022998 | 8,294 | 0.00258999 | 8.879517 | 0.292983 | 0.259987879 | 631.7705464 |
| 333 | Machinery Manufacturing | 178 | 0.001685 | 25,277 | 0.007893318 | 0.213423 | 0.007042 | -0.025953025 | -4.619638465 |
| 3333 | Commercial & Service Industry Machinery | 160 | 0.001514 | 5,248 | 0.001638807 | 0.924003 | 0.030488 | -0.002507195 | -0.40115122 |
| 334 | Computer and Electronic Product Mfg | 233 | 0.002205 | 84,065 | 0.026251207 | 0.084002 | 0.002772 | -0.030223335 | -7.042037106 |
| 3345 | Electronic Instrument Manufacturing | 79 | 0.000748 | 30,816 | 0.009622996 | 0.077696 | 0.002564 | -0.030431397 | -2.404080337 |
| 3346 | Magnetic Media Manufacture & Reproducing | 106 | 0.001003 | 1,349 | 0.000421256 | 2.381448 | 0.078577 | 0.045581723 | 4.831662691 |
| 337 | Furniture and Related Product Mfg | 75 | 0.00071 | 6,450 | 0.002014159 | 0.35241 | 0.011628 | -0.021367093 | -1.602531977 |
| 3371 | Household and Institutional Furniture | 59 | 0.000558 | 3,907 | 0.00122005 | 0.457673 | 0.015101 | -0.017893899 | -1.055740065 |
| 339 | Miscellaneous Manufacturing | 279 | 0.00264 | 29,551 | 0.009227971 | 0.28614 | 0.009441 | -0.023553695 | -6.571480943 |
| 3391 | Medical Equipment and Supplies Mfg | 179 | 0.001694 | 14,879 | 0.004646306 | 0.364608 | 0.01203 | -0.020964622 | -3.752667269 |
| | **Service-Providing Domain** | 96,161 | 0.910081 | 2,693,994 | 0.841260845 | 1.081806 | 0.035695 | 0.002699586 | 259.5948709 |
| | **Trade, Transportation and Utilities** | 11,498 | 0.108819 | 614,843 | 0.191998698 | 0.566768 | 0.018701 | -0.014294291 | -164.3557584 |
| 22 | Utilities | 58 | 0.000549 | 14,249 | 0.004449574 | 0.123365 | 0.00407 | -0.028924539 | -1.677623257 |
| 221 | Utilities | 58 | 0.000549 | 14,249 | 0.004449574 | 0.123365 | 0.00407 | -0.028924539 | -1.677623257 |
| 42 | Wholesale Trade | 2,830 | 0.026784 | 135,559 | 0.042331378 | 0.632711 | 0.020877 | -0.012118481 | -34.29530205 |
| 423 | Merchant Wholesalers, Durable Goods | 1,716 | 0.01624 | 68,565 | 0.021410979 | 0.758511 | 0.025027 | -0.007967654 | -13.67249373 |
| 4233 | Lumber and Supply Merchant Wholesalers | 39 | 0.000369 | 5,879 | 0.001835851 | 0.201052 | 0.006634 | -0.026361219 | -1.028087531 |
| 4234 | Commercial Goods Merchant Wholesalers | 1,345 | 0.012729 | 22,307 | 0.006965868 | 1.827377 | 0.060295 | 0.027299975 | 36.71846593 |
| 4236 | Electric Goods Merchant Wholesalers | 15 | 0.000142 | 11,912 | 0.003719793 | 0.038164 | 0.001259 | -0.031735766 | -0.476036484 |
| 4237 | Hardware & Plumbing Merchant Wholesalers | 129 | 0.001221 | 4,700 | 0.001467682 | 0.831838 | 0.027447 | -0.005548191 | -0.715716702 |
| 4238 | Machinery & Supply | 71 | 0.000672 | 10,018 | 0.003128348 | 0.214795 | 0.007087 | -0.025907757 | -1.83945075 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Merchant Wholesalers | | | | | | | | |
| 424 | Merchant Wholesalers, Nondurable Goods | 887 | 0.008395 | 46,152 | 0.014412011 | 0.582479 | 0.019219 | -0.013775898 | -12.21922144 |
| 4244 | Grocery Product Merchant Wholesalers | 153 | 0.001448 | 14,659 | 0.004577606 | 0.316326 | 0.010437 | -0.022557726 | -3.451332073 |
| 4249 | Misc Nondurable Goods Merchant Whsle | 397 | 0.003757 | 7,124 | 0.002224631 | 1.688938 | 0.055727 | 0.02273212 | 9.02465148 |
| 425 | Electronic Markets and Agents/Brokers | 227 | 0.002148 | 20,842 | 0.006508388 | 0.330091 | 0.010891 | -0.022103531 | -5.017501503 |
| 4251 | Electronic Markets and Agents/Brokers | 227 | 0.002148 | 20,842 | 0.006508388 | 0.330091 | 0.010891 | -0.022103531 | -5.017501503 |
| 44-45 | Retail Trade | 7,365 | 0.069703 | 357,581 | 0.111662793 | 0.624231 | 0.020597 | -0.012398268 | -91.31324434 |
| 441 | Motor Vehicle and Parts Dealers | 138 | 0.001306 | 37,374 | 0.011670881 | 0.111907 | 0.003692 | -0.029302594 | -4.043757905 |
| 4413 | Auto Parts, Accessories, and Tire Stores | 37 | 0.00035 | 8,115 | 0.002534093 | 0.138185 | 0.004559 | -0.028435542 | -1.052115062 |
| 442 | Furniture and Home Furnishings Stores | 322 | 0.003047 | 12,853 | 0.004013641 | 0.759274 | 0.025053 | -0.007942483 | -2.557479551 |
| 4421 | Furniture Stores | 142 | 0.001344 | 5,645 | 0.00176278 | 0.76238 | 0.025155 | -0.007839996 | -1.113279371 |
| 4422 | Home Furnishings Stores | 180 | 0.001704 | 7,208 | 0.002250862 | 0.756841 | 0.024972 | -0.008022747 | -1.444094451 |
| 443 | Electronics and Appliance Stores | 656 | 0.006208 | 12,861 | 0.00401614 | 1.545882 | 0.051007 | 0.01801192 | 11.81581962 |
| 4431 | Electronics and Appliance Stores | 656 | 0.006208 | 12,861 | 0.00401614 | 1.545882 | 0.051007 | 0.01801192 | 11.81581962 |
| 444 | Building Material & Garden Supply Stores | 199 | 0.001883 | 26,705 | 0.008339243 | 0.225844 | 0.007452 | -0.025543212 | -5.083099177 |
| 4441 | Building Material and Supplies Dealers | 174 | 0.001647 | 24,045 | 0.007508598 | 0.219317 | 0.007236 | -0.025758568 | -4.481990886 |
| 445 | Food and Beverage Stores | 1,923 | 0.0182 | 91,928 | 0.028706607 | 0.633984 | 0.020919 | -0.012076455 | -23.22302306 |
| 4451 | Grocery Stores | 1,602 | 0.015162 | 75,430 | 0.023554732 | 0.643673 | 0.021238 | -0.011756766 | -18.83433893 |
| 4452 | Specialty Food Stores | 177 | 0.001675 | 7,512 | 0.002345793 | 0.714109 | 0.023562 | -0.0094327 | -1.669587843 |
| 4453 | Beer, Wine, and Liquor Stores | 144 | 0.001363 | 8,986 | 0.002806083 | 0.485672 | 0.016025 | -0.016970072 | -2.443690416 |
| 446 | Health and Personal Care Stores | 605 | 0.005726 | 26,074 | 0.008142199 | 0.703226 | 0.023203 | -0.009791809 | -5.924044495 |
| 4461 | Health and Personal Care Stores | 605 | 0.005726 | 26,074 | 0.008142199 | 0.703226 | 0.023203 | -0.009791809 | -5.924044495 |
| 447 | Gasoline Stations | 77 | 0.000729 | 12,798 | 0.003996466 | 0.182346 | 0.006017 | -0.026978435 | -2.077339488 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4471 | Gasoline Stations | 77 | 0.000729 | 12,798 | 0.003996466 | 0.182346 | 0.006017 | -0.026978435 | -2.077339488 |
| 448 | Clothing and Clothing Accessories Stores | 1,516 | 0.014348 | 38,882 | 0.012141788 | 1.181674 | 0.03899 | 0.005994764 | 9.088062074 |
| 4481 | Clothing Stores | 1,184 | 0.011206 | 30,237 | 0.00944219 | 1.186752 | 0.039157 | 0.006162324 | 7.296191389 |
| 4482 | Shoe Stores | 228 | 0.002158 | 4,308 | 0.001345271 | 1.604007 | 0.052925 | 0.019929791 | 4.543992368 |
| 4483 | Jewelry, Luggage & Leather Goods Stores | 104 | 0.000984 | 4,338 | 0.001354639 | 0.726593 | 0.023974 | -0.009020818 | -0.938165108 |
| 451 | Sporting Goods/Hobby/Book/Music Stores | 897 | 0.008489 | 19,093 | 0.005962223 | 1.423854 | 0.046981 | 0.013985569 | 12.54505521 |
| 4511 | Sporting Goods/Musical Instrument Stores | 345 | 0.003265 | 11,760 | 0.003672327 | 0.889117 | 0.029337 | -0.003658265 | -1.262101531 |
| 4512 | Book, Periodical, and Music Stores | 552 | 0.005224 | 7,333 | 0.002289896 | 2.281416 | 0.075276 | 0.042281149 | 23.3391942 |
| 452 | General Merchandise Stores | 401 | 0.003795 | 43,477 | 0.013576681 | 0.279532 | 0.009223 | -0.023771733 | -9.532464743 |
| 4529 | Other General Merchandise Stores | 23 | 0.000218 | 9,135 | 0.002852611 | 0.076307 | 0.002518 | -0.030477211 | -0.700975859 |
| 453 | Miscellaneous Store Retailers | 438 | 0.004145 | 23,820 | 0.007438336 | 0.557288 | 0.018388 | -0.014607091 | -6.397905718 |
| 4531 | Florists | 44 | 0.000416 | 3,391 | 0.001058917 | 0.393253 | 0.012976 | -0.020019477 | -0.880856968 |
| 4532 | Office Supply, Stationery & Gift Stores | 229 | 0.002167 | 12,261 | 0.003828776 | 0.566052 | 0.018677 | -0.014317894 | -3.278797664 |
| 4533 | Used Merchandise Stores | 71 | 0.000672 | 1,806 | 0.000563965 | 1.191483 | 0.039313 | 0.0063184 | 0.448606384 |
| 4539 | Other Miscellaneous Store Retailers | 93 | 0.00088 | 6,362 | 0.001986679 | 0.443033 | 0.014618 | -0.018376955 | -1.709056848 |
| 454 | Nonstore Retailers | 193 | 0.001827 | 11,718 | 0.003659212 | 0.499173 | 0.01647 | -0.016524613 | -3.189250224 |
| 4541 | Electronic Shopping & Mail-Order Houses | 6 | 5.68E-05 | 4,208 | 0.001314044 | 0.043214 | 0.001426 | -0.031569144 | -0.189414867 |
| 4543 | Direct Selling Establishments | 187 | 0.00177 | 6,852 | 0.002139693 | 0.827125 | 0.027291 | -0.005703698 | -1.066591562 |
| 48-49 | Transportation and Warehousing | 1,245 | 0.011783 | 107,454 | 0.033554953 | 0.351151 | 0.011586 | -0.021408647 | -26.65376523 |
| 484 | Truck Transportation | 114 | 0.001079 | 16,247 | 0.005073495 | 0.212657 | 0.007017 | -0.02597832 | -2.96152848 |
| 4841 | General Freight Trucking | 83 | 0.000786 | 10,371 | 0.00323858 | 0.242552 | 0.008003 | -0.024991914 | -2.074328901 |
| 4842 | Specialized Freight Trucking | 31 | 0.000293 | 5,876 | 0.001834915 | 0.159892 | 0.005276 | -0.027719302 | -0.85929837 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 485 | Transit and Ground Passenger Transport | 32 | 0.000303 | 23,734 | 0.007411481 | 0.040863 | 0.001348 | -0.031646723 | -1.012695145 |
| 4885 | Freight Transportation Arrangement | 9 | 8.52E-05 | 2,114 | 0.000660145 | 0.129028 | 0.004257 | -0.028737668 | -0.258639011 |
| 492 | Couriers and Messengers | 6 | 5.68E-05 | 11,982 | 0.003741652 | 0.015176 | 0.000501 | -0.032494249 | -0.194965493 |
| | **Information** | 5,231 | 0.049507 | 106,185 | 0.033158679 | 1.49303 | 0.049263 | 0.016268079 | 85.0983191 |
| 51 | Information | 5,231 | 0.049507 | 106,185 | 0.033158679 | 1.49303 | 0.049263 | 0.016268079 | 85.0983191 |
| 511 | Publishing Industries | 3,228 | 0.03055 | 45,133 | 0.014093805 | 2.167636 | 0.071522 | 0.038526946 | 124.3649825 |
| 5111 | Newspaper, Book, & Directory Publishers | 645 | 0.006104 | 23,912 | 0.007467065 | 0.817506 | 0.026974 | -0.006021096 | -3.883606716 |
| 5112 | Software Publishers | 2,583 | 0.024446 | 21,221 | 0.006626739 | 3.688975 | 0.121719 | 0.088724052 | 229.174226 |
| 512 | Motion Picture & Sound Recording Ind | 278 | 0.002631 | 5,466 | 0.001706883 | 1.541425 | 0.05086 | 0.017864861 | 4.966431347 |
| 5121 | Motion Picture and Video Industries | 243 | 0.0023 | 5,226 | 0.001631937 | 1.409237 | 0.046498 | 0.013503278 | 3.281296515 |
| 5122 | Sound Recording Industries | 35 | 0.000331 | 239 | 7.46332E-05 | 4.438306 | 0.146444 | 0.113448515 | 3.970698013 |
| 516 | Internet Publishing and Broadcasting | 228 | 0.002158 | 3,248 | 0.001014262 | 2.127482 | 0.070197 | 0.037202044 | 8.482066108 |
| 5161 | Internet Publishing and Broadcasting | 228 | 0.002158 | 3,248 | 0.001014262 | 2.127482 | 0.070197 | 0.037202044 | 8.482066108 |
| 517 | Telecommunications | 843 | 0.007978 | 26,709 | 0.008340492 | 0.956571 | 0.031562 | -0.001432605 | -1.207686269 |
| 5171 | Wired Telecommunications Carriers | 782 | 0.007401 | 16,271 | 0.005080989 | 1.456598 | 0.048061 | 0.015065967 | 11.78158648 |
| 518 | ISPs, Search Portals, & Data Processing | 488 | 0.004619 | 12,395 | 0.00387062 | 1.19322 | 0.039371 | 0.006375714 | 3.111348431 |
| 5181 | ISPs and Web Search Portals | 274 | 0.002593 | 3,813 | 0.001190696 | 2.177865 | 0.071859 | 0.038864428 | 10.64885335 |
| 5182 | Data Processing and Related Services | 214 | 0.002025 | 8,581 | 0.002679612 | 0.755828 | 0.024939 | -0.008056182 | -1.72402288 |
| 519 | Other Information Services | 161 | 0.001524 | 7,211 | 0.002251799 | 0.676671 | 0.022327 | -0.010668 | -1.717547933 |
| 5191 | Other Information Services | 161 | 0.001524 | 7,211 | 0.002251799 | 0.676671 | 0.022327 | -0.010668 | -1.717547933 |
| | **Financial Activities** | 2,706 | 0.02561 | 226,401 | 0.070698857 | 0.36224 | 0.011952 | -0.021042756 | -56.94169766 |
| 52 | Finance and Insurance | 1,926 | 0.018228 | 182,186 | 0.056891718 | 0.320397 | 0.010572 | -0.022423386 | -43.18744216 |
| 522 | Credit Intermediation & Related Activity | 903 | 0.008546 | 62,277 | 0.019447408 | 0.439448 | 0.0145 | -0.018495265 | -16.70122425 |
| 5221 | Depository Credit | 749 | 0.007089 | 50,109 | 0.015647674 | 0.453016 | 0.014947 | -0.018047585 | -13.51764144 |

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|---|---|---|---|---|---|---|---|---|---|
| | Intermediation | | | | | | | | |
| 523 | Financial Investment & Related Activity | 627 | 0.005934 | 52,049 | 0.016253483 | 0.365092 | 0.012046 | -0.020948659 | -13.13480923 |
| 5231 | Security & Commodity Investment Activity | 191 | 0.001808 | 30,969 | 0.009670774 | 0.186919 | 0.006167 | -0.026827542 | -5.124060564 |
| 5239 | Other Financial Investment Activities | 436 | 0.004126 | 21,067 | 0.006578649 | 0.627236 | 0.020696 | -0.012299125 | -5.362418472 |
| 524 | Insurance Carriers & Related Activities | 385 | 0.003644 | 63,987 | 0.019981395 | 0.182354 | 0.006017 | -0.026978153 | -10.38658884 |
| 5242 | Insurance Agencies, Brokerages & Support | 281 | 0.002659 | 22,367 | 0.006984604 | 0.380755 | 0.012563 | -0.020431849 | -5.741349549 |
| 525 | Funds, Trusts & Other Financial Vehicles | 11 | 0.000104 | 2,624 | 0.000819404 | 0.12705 | 0.004192 | -0.028802927 | -0.316832195 |
| 5259 | Other Investment Pools and Funds | 8 | 7.57E-05 | 2,175 | 0.000679193 | 0.111475 | 0.003678 | -0.029316839 | -0.234534713 |
| 53 | Real Estate and Rental and Leasing | 781 | 0.007391 | 44,215 | 0.013807138 | 0.535339 | 0.017664 | -0.015331311 | -11.97375405 |
| 531 | Real Estate | 641 | 0.006067 | 30,051 | 0.009384108 | 0.646467 | 0.02133 | -0.011664595 | -7.477005409 |
| 5311 | Lessors of Real Estate | 102 | 0.000965 | 9,418 | 0.002940985 | 0.328238 | 0.01083 | -0.022164675 | -2.260796859 |
| 5312 | Offices of Real Estate Agents & Brokers | 276 | 0.002612 | 11,624 | 0.003629858 | 0.719616 | 0.023744 | -0.009251022 | -2.553282078 |
| 5313 | Activities Related to Real Estate | 263 | 0.002489 | 9,009 | 0.002813265 | 0.884762 | 0.029193 | -0.003801971 | -0.999918322 |
| 532 | Rental and Leasing Services | 139 | 0.001316 | 13,740 | 0.004290627 | 0.306602 | 0.010116 | -0.022878552 | -3.180118683 |
| 5321 | Automotive Equipment Rental and Leasing | 26 | 0.000246 | 4,178 | 0.001304675 | 0.188604 | 0.006223 | -0.026771927 | -0.696070096 |
| 5322 | Consumer Goods Rental | 107 | 0.001013 | 6,361 | 0.001986367 | 0.509807 | 0.016821 | -0.016173745 | -1.730590766 |
| | **Professional and Business Services** | 25,000 | 0.236604 | 460,871 | 0.143917443 | 1.644022 | 0.054245 | 0.021250114 | 531.2528536 |
| 54 | Professional and Technical Services | 21,331 | 0.20188 | 230,770 | 0.072063177 | 2.801425 | 0.092434 | 0.059439025 | 1267.893847 |
| 541 | Professional and Technical Services | 21,331 | 0.20188 | 230,770 | 0.072063177 | 2.801425 | 0.092434 | 0.059439025 | 1267.893847 |
| 5411 | Legal Services | 292 | 0.002764 | 31,006 | 0.009682328 | 0.28542 | 0.009418 | -0.023577468 | -6.88462063 |
| 5412 | Accounting and Bookkeeping Services | 350 | 0.003312 | 19,735 | 0.006162702 | 0.537499 | 0.017735 | -0.015260011 | -5.34100399 |
| 5413 | Architectural and | 3,178 | 0.030077 | 39,158 | 0.012227975 | 2.459691 | 0.081158 | 0.048163384 | 153.0632343 |

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|---|---|---|---|---|---|---|---|---|---|
| | Engineering Services | | | | | | | | |
| 5414 | Specialized Design Services | 110 | 0.001041 | 3,309 | 0.00103331 | 1.007495 | 0.033243 | 0.000247672 | 0.027243865 |
| 5415 | Computer Systems Design and Rel Services | 4,305 | 0.040743 | 48,393 | 0.015111814 | 2.696111 | 0.088959 | 0.055964147 | 240.9256528 |
| 5416 | Management & Technical Consulting Svc | 2,123 | 0.020092 | 30,603 | 0.009556482 | 2.102486 | 0.069372 | 0.036377284 | 77.22897343 |
| 5417 | Scientific Research and Development Svc | 10,334 | 0.097802 | 37,552 | 0.011726465 | 8.340316 | 0.275192 | 0.242196734 | 2502.86105 |
| 5418 | Advertising and Related Services | 373 | 0.00353 | 11,731 | 0.003663271 | 0.963654 | 0.031796 | -0.001198904 | -0.447191261 |
| 5419 | Other Professional & Technical Services | 267 | 0.002527 | 9,282 | 0.002898515 | 0.8718 | 0.028765 | -0.004229648 | -1.129315937 |
| 55 | Management of Companies and Enterprises | 595 | 0.005631 | 72,109 | 0.022517674 | 0.250077 | 0.008251 | -0.024743603 | -14.72244367 |
| 551 | Management of Companies and Enterprises | 595 | 0.005631 | 72,109 | 0.022517674 | 0.250077 | 0.008251 | -0.024743603 | -14.72244367 |
| 5511 | Management of Companies and Enterprises | 595 | 0.005631 | 72,109 | 0.022517674 | 0.250077 | 0.008251 | -0.024743603 | -14.72244367 |
| 56 | Administrative and Waste Services | 3,075 | 0.029102 | 157,991 | 0.04933628 | 0.589875 | 0.019463 | -0.013531866 | -41.61048802 |
| 561 | Administrative and Support Services | 3,075 | 0.029102 | 148,812 | 0.046469929 | 0.626259 | 0.020664 | -0.012331344 | -37.91888232 |
| 5611 | Office Administrative Services | 203 | 0.001921 | 9,414 | 0.002939735 | 0.653535 | 0.021564 | -0.011431371 | -2.320568386 |
| 5613 | Employment Services | 1,295 | 0.012256 | 54,333 | 0.016966714 | 0.722359 | 0.023835 | -0.009160498 | -11.86284484 |
| 5614 | Business Support Services | 252 | 0.002385 | 8,834 | 0.002758617 | 0.86455 | 0.028526 | -0.004468851 | -1.12615046 |
| 5615 | Travel Arrangement & Reservation Service | 540 | 0.005111 | 7,090 | 0.002214014 | 2.308313 | 0.076164 | 0.043168611 | 23.31104979 |
| 5616 | Investigation and Security Services | 360 | 0.003407 | 17,307 | 0.005404504 | 0.630417 | 0.020801 | -0.012194168 | -4.389900468 |
| 5617 | Services to Buildings and Dwellings | 362 | 0.003426 | 46,427 | 0.014497886 | 0.236312 | 0.007797 | -0.025197813 | -9.121608313 |
| 5619 | Other Support Services | 47 | 0.000445 | 4,925 | 0.001537943 | 0.289227 | 0.009543 | -0.023451853 | -1.102237081 |
| | **Education and Health Services** | 37,787 | 0.357621 | 741,468 | 0.231540232 | 1.544533 | 0.050962 | 0.017967415 | 678.9347144 |
| 61 | Educational Services | 27,758 | 0.262706 | 300,618 | 0.093874802 | 2.798468 | 0.092336 | 0.059341454 | 1647.200068 |
| 611 | Educational Services | 27,758 | 0.262706 | 300,618 | 0.093874802 | 2.798468 | 0.092336 | 0.059341454 | 1647.200068 |

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|---|---|---|---|---|---|---|---|---|---|
| 6111 | Elementary and Secondary Schools | 2,359 | 0.022326 | 182,693 | 0.057050041 | 0.391339 | 0.012912 | -0.020082628 | -47.37491917 |
| 6113 | Colleges and Universities | 24,841 | 0.235099 | 95,262 | 0.029747724 | 7.903082 | 0.260765 | 0.227770048 | 5658.035762 |
| 6114 | Business, Computer & Management Training | 91 | 0.000861 | 2,384 | 0.000744458 | 1.156864 | 0.038171 | 0.005176141 | 0.471028826 |
| 6115 | Technical and Trade Schools | 17 | 0.000161 | 2,028 | 0.000633289 | 0.254055 | 0.008383 | -0.024612357 | -0.418410069 |
| 6116 | Other Schools and Instruction | 305 | 0.002887 | 7,836 | 0.002446969 | 1.179648 | 0.038923 | 0.00592792 | 1.808015556 |
| 6117 | Educational Support Services | 79 | 0.000748 | 1,781 | 0.000556158 | 1.344344 | 0.044357 | 0.011362103 | 0.897606117 |
| 62 | Health Care and Social Assistance | 10,029 | 0.094916 | 440,850 | 0.13766543 | 0.689468 | 0.022749 | -0.010245766 | -102.7547829 |
| 621 | Ambulatory Health Care Services | 2,575 | 0.02437 | 125,106 | 0.039067191 | 0.623801 | 0.020583 | -0.012412454 | -31.96206905 |
| 6211 | Offices of Physicians | 874 | 0.008272 | 45,531 | 0.014218089 | 0.58177 | 0.019196 | -0.013799287 | -12.060577 |
| 6212 | Offices of Dentists | 297 | 0.002811 | 19,154 | 0.005981272 | 0.469942 | 0.015506 | -0.0174891 | -5.194262833 |
| 6213 | Offices of Other Health Practitioners | 81 | 0.000767 | 11,132 | 0.00347622 | 0.220526 | 0.007276 | -0.025718679 | -2.083213038 |
| 6214 | Outpatient Care Centers | 145 | 0.001372 | 20,089 | 0.006273247 | 0.218754 | 0.007218 | -0.02577712 | -3.737682337 |
| 6216 | Home Health Care Services | 240 | 0.002271 | 18,368 | 0.005735825 | 0.396001 | 0.013066 | -0.019928798 | -4.782911498 |
| 6219 | Other Ambulatory Health Care Services | 103 | 0.000975 | 6,674 | 0.002084108 | 0.467733 | 0.015433 | -0.017561976 | -1.808883562 |
| 622 | Hospitals | 3,784 | 0.035812 | 163,388 | 0.051021616 | 0.701905 | 0.02316 | -0.009835404 | -37.21717039 |
| 623 | Nursing and Residential Care Facilities | 863 | 0.008168 | 91,133 | 0.02845835 | 0.287 | 0.00947 | -0.023525324 | -20.30235445 |
| 6231 | Nursing Care Facilities | 439 | 0.004155 | 58,666 | 0.018319792 | 0.226791 | 0.007483 | -0.02551196 | -11.19975062 |
| 6233 | Community Care Facility for the Elderly | 201 | 0.001902 | 11,966 | 0.003736655 | 0.50909 | 0.016798 | -0.016197407 | -3.255678771 |
| 6239 | Other Residential Care Facilities | 57 | 0.000539 | 5,975 | 0.00186583 | 0.289124 | 0.00954 | -0.023455251 | -1.33694931 |
| 624 | Social Assistance | 2,807 | 0.026566 | 61,224 | 0.019118585 | 1.38953 | 0.045848 | 0.012853033 | 36.0784649 |
| 6241 | Individual and Family Services | 2,026 | 0.019174 | 25,726 | 0.008033528 | 2.38679 | 0.078753 | 0.045758013 | 92.70573336 |
| 6242 | Emergency and Other Relief Services | 102 | 0.000965 | 5,024 | 0.001568858 | 0.615315 | 0.020303 | -0.012692452 | -1.294630127 |
| 6243 | Vocational Rehabilitation | 67 | 0.000634 | 8,451 | 0.002639017 | 0.240278 | 0.007928 | -0.025066944 | -1.679485258 |

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|---|---|---|---|---|---|---|---|---|---|
| | Services | | | | | | | | |
| 6244 | Child Day Care Services | 612 | 0.005792 | 22,023 | 0.006877182 | 0.842213 | 0.027789 | -0.00520587 | -3.185992718 |
| | **Leisure and Hospitality** | 9,027 | 0.085433 | 290,914 | 0.090844507 | 0.940429 | 0.03103 | -0.001965211 | -17.73996085 |
| 71 | Arts, Entertainment, and Recreation | 586 | 0.005546 | 49,273 | 0.015386614 | 0.360442 | 0.011893 | -0.021102077 | -12.36581706 |
| 711 | Performing Arts and Spectator Sports | 88 | 0.000833 | 7,938 | 0.002478821 | 0.335984 | 0.011086 | -0.021909084 | -1.927999405 |
| 7111 | Performing Arts Companies | 61 | 0.000577 | 3,287 | 0.00102644 | 0.562441 | 0.018558 | -0.014437044 | -0.880659709 |
| 7115 | Independent Artists/Writers/Performers | 27 | 0.000256 | 441 | 0.000137712 | 1.855548 | 0.061224 | 0.02822949 | 0.762196224 |
| 713 | Amusement, Gambling & Recreation Ind | 479 | 0.004533 | 35,029 | 0.010938601 | 0.414434 | 0.013674 | -0.019320616 | -9.254575025 |
| 7139 | Other Amusement & Recreation Industries | 479 | 0.004533 | 33,670 | 0.010514223 | 0.431161 | 0.014226 | -0.018768686 | -8.990200486 |
| 72 | Accommodation and Food Services | 8,441 | 0.079887 | 241,640 | 0.075457581 | 1.058698 | 0.034932 | 0.00193713 | 16.35131806 |
| 721 | Accommodation | 1,930 | 0.018266 | 34,015 | 0.010621957 | 1.719626 | 0.05674 | 0.023744674 | 45.82722019 |
| 7211 | Traveler Accommodation | 1,902 | 0.018001 | 32,281 | 0.010080476 | 1.785709 | 0.05892 | 0.025925108 | 49.30955504 |
| 722 | Food Services and Drinking Places | 6,511 | 0.061621 | 207,626 | 0.064835937 | 0.950415 | 0.031359 | -0.001635729 | -10.65023154 |
| 7221 | Full-Service Restaurants | 3,835 | 0.036295 | 104,244 | 0.032552558 | 1.114965 | 0.036789 | 0.003793688 | 14.54879378 |
| 7222 | Limited-Service Eating Places | 1,422 | 0.013458 | 73,370 | 0.02291145 | 0.587392 | 0.019381 | -0.013613782 | -19.35879732 |
| 7223 | Special Food Services | 1,075 | 0.010174 | 20,263 | 0.006327582 | 1.607873 | 0.053052 | 0.020057361 | 21.56166356 |
| 7224 | Drinking Places (Alcoholic Beverages) | 178 | 0.001685 | 9,749 | 0.003044347 | 0.553359 | 0.018258 | -0.014736717 | -2.623135644 |
| | **Other Services** | 2,219 | 0.021001 | 116,564 | 0.036399758 | 0.576952 | 0.019037 | -0.013958248 | -30.97335155 |
| 81 | Other Services, Ex. Public Admin | 2,219 | 0.021001 | 116,564 | 0.036399758 | 0.576952 | 0.019037 | -0.013958248 | -30.97335155 |
| 811 | Repair and Maintenance | 233 | 0.002205 | 27,679 | 0.008643397 | 0.255125 | 0.008418 | -0.024577066 | -5.726456337 |
| 8111 | Automotive Repair and Maintenance | 213 | 0.002016 | 19,753 | 0.006168323 | 0.326809 | 0.010783 | -0.022211828 | -4.731119326 |
| 812 | Personal and Laundry Services | 927 | 0.008773 | 36,132 | 0.011283038 | 0.777562 | 0.025656 | -0.007339072 | -6.8033195 |
| 8121 | Personal Care Services | 311 | 0.002943 | 17,182 | 0.00536547 | 0.548572 | 0.0181 | -0.014894662 | -4.632240018 |
| 8123 | Drycleaning and Laundry | 228 | 0.002158 | 10,051 | 0.003138653 | 0.6875 | 0.022684 | -0.01031069 | -2.350837316 |

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|---|---|---|---|---|---|---|---|---|---|
| | Services | | | | | | | | |
| 8129 | Other Personal Services | 284 | 0.002688 | 6,214 | 0.001940463 | 1.385142 | 0.045703 | 0.012708251 | 3.609143206 |
| 813 | Membership Organizations & Associations | 670 | 0.006341 | 35,720 | 0.011154382 | 0.568474 | 0.018757 | -0.014238001 | -9.53946075 |
| 8131 | Religious Organizations | 64 | 0.000606 | 541 | 0.00016894 | 3.585336 | 0.118299 | 0.085304445 | 5.45948451 |
| 8132 | Grantmaking and Giving Services | 110 | 0.001041 | 2,609 | 0.00081472 | 1.277808 | 0.042162 | 0.009166748 | 1.008342258 |
| 8133 | Social Advocacy Organizations | 98 | 0.000927 | 6,255 | 0.001953266 | 0.474838 | 0.015667 | -0.017327534 | -1.698098329 |
| 8134 | Civic and Social Organizations | 226 | 0.002139 | 18,551 | 0.005792971 | 0.369223 | 0.012183 | -0.020812368 | -4.703595244 |
| 8139 | Professional and Similar Organizations | 172 | 0.001628 | 7,764 | 0.002424485 | 0.671413 | 0.022154 | -0.010841471 | -1.864732993 |
| 814 | Private Households | 389 | 0.003682 | 17,033 | 0.005318941 | 0.692159 | 0.022838 | -0.01015698 | -3.951065098 |
| 8141 | Private Households | 389 | 0.003682 | 17,033 | 0.005318941 | 0.692159 | 0.022838 | -0.01015698 | -3.951065098 |
| | **Public Administration** | 2,694 | 0.025496 | 136,749 | 0.042702983 | 0.597064 | 0.0197 | -0.013294673 | -35.8158494 |
| 92 | Public Administration | 2,694 | 0.025496 | 136,749 | 0.042702983 | 0.597064 | 0.0197 | -0.013294673 | -35.8158494 |
| 922 | Justice, Public Order, and Safety Activi | 1,673 | 0.015834 | 61,627 | 0.019244431 | 0.822758 | 0.027147 | -0.005847808 | -9.783382822 |
| 9221 | Justice, Public Order, and Safety Activi | 1,673 | 0.015834 | 61,627 | 0.019244431 | 0.822758 | 0.027147 | -0.005847808 | -9.783382822 |
| 926 | Administration of Economic Programs | 30 | 0.000284 | 6,595 | 0.002059439 | 0.137865 | 0.004549 | -0.028446099 | -0.85338298 |
| 9261 | Administration of Economic Programs | 30 | 0.000284 | 6,595 | 0.002059439 | 0.137865 | 0.004549 | -0.028446099 | -0.85338298 |

| | **Lowell** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Lowell | ri/rt | MA | si/st | | | rt/st = 0.010555 | |
| NAICS | Description | Employ-ment | top ratio | Employ-ment | bottom ratio | LQR | ri/si | ri/si - rt/st | Exported Jobs |
| | **Total, all industries** | 33,799 | | 3,202,323 | | | | | |
| | **Goods-Producing Domain** | 5,624 | 0.166395 | 508,329 | 0.15873728 | 1.048244 | 0.011064 | 0.000508701 | 2.860933698 |
| | **Construction** | 1,014 | 0.030001 | 152,821 | 0.04772183 | 0.628662 | 0.006635 | -0.003919786 | -3.974663261 |
| 23 | Construction | 1,014 | 0.030001 | 152,821 | 0.04772183 | 0.628662 | 0.006635 | -0.003919786 | -3.974663261 |
| 236 | Construction of Buildings | 218 | 0.00645 | 30,871 | 0.00964017 | 0.669064 | 0.007062 | -0.003493356 | -0.761551692 |
| 2361 | Residential Building Construction | 90 | 0.002663 | 16,882 | 0.00527179 | 0.505104 | 0.005331 | -0.005223878 | -0.470149029 |
| 2362 | Nonresidential Building Construction | 128 | 0.003787 | 13,989 | 0.00436838 | 0.866933 | 0.00915 | -0.001404954 | -0.179834052 |
| 237 | Heavy and Civil Engineering Construction | 152 | 0.004497 | 30,883 | 0.00964392 | 0.466322 | 0.004922 | -0.005633198 | -0.856246151 |
| 238 | Specialty Trade Contractors | 644 | 0.019054 | 91,067 | 0.02843774 | 0.670019 | 0.007072 | -0.003483284 | -2.24323462 |
| 2381 | Building Foundation/Exterior Contractors | 100 | 0.002959 | 15,356 | 0.00479526 | 0.616998 | 0.006512 | -0.004042887 | -0.404288747 |
| 2382 | Building Equipment Contractors | 293 | 0.008669 | 44,326 | 0.0138418 | 0.626284 | 0.00661 | -0.003944884 | -1.155851024 |
| 2383 | Building Finishing Contractors | 175 | 0.005178 | 18,930 | 0.00591132 | 0.87589 | 0.009245 | -0.001310415 | -0.22932257 |
| 2389 | Other Specialty Trade Contractors | 78 | 0.002308 | 12,456 | 0.00388967 | 0.593305 | 0.006262 | -0.004292958 | -0.334850694 |
| | **Manufacturing** | 4,610 | 0.136395 | 347,430 | 0.10849291 | 1.257175 | 0.013269 | 0.00271386 | 12.5108942 |
| 31-33 | Manufacturing | 4,610 | 0.136395 | 347,430 | 0.10849291 | 1.257175 | 0.013269 | 0.00271386 | 12.5108942 |
| DUR | Durable Goods Manufacturing | 2,645 | 0.078257 | 229,268 | 0.07159414 | 1.093061 | 0.011537 | 0.000981717 | 2.596641082 |
| NONDUR | Non-Durable Goods Manufacturing | 1,966 | 0.058167 | 118,162 | 0.03689877 | 1.576405 | 0.016638 | 0.006083175 | 11.95952148 |
| 313 | Textile Mills | 989 | 0.029261 | 10,741 | 0.00335412 | 8.72396 | 0.092077 | 0.081522088 | 80.62534483 |
| 3133 | Textile and Fabric Finishing and Fabric | 450 | 0.013314 | 4,189 | 0.00130811 | 10.17804 | 0.107424 | 0.096869206 | 43.59114281 |
| 322 | Paper Manufacturing | 359 | 0.010622 | 16,142 | 0.00504071 | 2.107168 | 0.02224 | 0.011685119 | 4.194957701 |
| 3222 | Converted Paper Product Manufacturing | 359 | 0.010622 | 12,579 | 0.00392808 | 2.704023 | 0.02854 | 0.01798463 | 6.456482005 |
| 323 | Printing and Related Support Activities | 286 | 0.008462 | 17,586 | 0.00549163 | 1.540852 | 0.016263 | 0.005707936 | 1.632469818 |
| 3231 | Printing and Related Support Activities | 286 | 0.008462 | 17,586 | 0.00549163 | 1.540852 | 0.016263 | 0.005707936 | 1.632469818 |
| 326 | Plastics & Rubber Products Manufacturing | 45 | 0.001331 | 18,409 | 0.00574863 | 0.231603 | 0.002444 | -0.008110543 | -0.364974457 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3261 | Plastics Product Manufacturing | 45 | 0.001331 | 15,817 | 0.00493922 | 0.269557 | 0.002845 | -0.00770996 | -0.346948193 |
| 332 | Fabricated Metal Product Manufacturing | 390 | 0.011539 | 38,390 | 0.01198815 | 0.962517 | 0.010159 | -0.000396104 | -0.154480737 |
| 3323 | Architectural and Structural Metals | 119 | 0.003521 | 6,630 | 0.00207037 | 1.700574 | 0.017949 | 0.007393718 | 0.879852436 |
| 3327 | Machine Shops and Threaded Products | 96 | 0.00284 | 10,508 | 0.00328136 | 0.865592 | 0.009136 | -0.001419104 | -0.13623394 |
| 3328 | Coating, Engraving & Heat Treating Metal | 108 | 0.003195 | 4,046 | 0.00126346 | 2.529065 | 0.026693 | 0.01613803 | 1.742907257 |
| 333 | Machinery Manufacturing | 265 | 0.00784 | 25,277 | 0.00789332 | 0.993305 | 0.010484 | -7.11609E-05 | -0.018857648 |
| 334 | Computer and Electronic Product Mfg | 1,670 | 0.04941 | 84,065 | 0.02625121 | 1.88219 | 0.019866 | 0.00931058 | 15.54866894 |
| 3344 | Semiconductor and Electronic Components | 1,449 | 0.042871 | 20,823 | 0.00650245 | 6.593062 | 0.069587 | 0.059031515 | 85.53666511 |
| 3345 | Electronic Instrument Manufacturing | 120 | 0.00355 | 30,816 | 0.009623 | 0.36895 | 0.003894 | -0.006660919 | -0.79931028 |
| 339 | Miscellaneous Manufacturing | 27 | 0.000799 | 29,551 | 0.00922797 | 0.086567 | 0.000914 | -0.009641325 | -0.260315784 |
| 3391 | Medical Equipment and Supplies Mfg | 23 | 0.00068 | 14,879 | 0.00464631 | 0.146459 | 0.001546 | -0.009009197 | -0.207211535 |
| | **Service-Providing Domain** | 28,175 | 0.833605 | 2,693,994 | 0.84126084 | 0.990899 | 0.010458 | -9.65506E-05 | -2.720312453 |
| | **Trade, Transportation and Utilities** | 4,407 | 0.130388 | 614,843 | 0.1919987 | 0.679111 | 0.007168 | -0.003387317 | -14.927904 |
| 22 | Utilities | 205 | 0.006065 | 14,249 | 0.00444957 | 1.363112 | 0.014387 | 0.003831975 | 0.785554778 |
| 221 | Utilities | 205 | 0.006065 | 14,249 | 0.00444957 | 1.363112 | 0.014387 | 0.003831975 | 0.785554778 |
| 2211 | Power Generation and Supply | 66 | 0.001953 | 8,658 | 0.00270366 | 0.722251 | 0.007623 | -0.002931992 | -0.193511497 |
| 42 | Wholesale Trade | 1,025 | 0.030326 | 135,559 | 0.04233138 | 0.716403 | 0.007561 | -0.002993717 | -3.068559639 |
| 423 | Merchant Wholesalers, Durable Goods | 794 | 0.023492 | 68,565 | 0.02141098 | 1.097186 | 0.01158 | 0.001025252 | 0.814050338 |
| 4231 | Motor Vehicle/Part Merchant Wholesalers | 48 | 0.00142 | 5,325 | 0.00166285 | 0.854051 | 0.009014 | -0.001540915 | -0.073963944 |
| 4233 | Lumber and Supply Merchant Wholesalers | 28 | 0.000828 | 5,879 | 0.00183585 | 0.451249 | 0.004763 | -0.005792285 | -0.162183987 |
| 4234 | Commercial Goods Merchant Wholesalers | 126 | 0.003728 | 22,307 | 0.00696587 | 0.53517 | 0.005648 | -0.004906549 | -0.618225154 |
| 4236 | Electric Goods Merchant Wholesalers | 142 | 0.004201 | 11,912 | 0.00371979 | 1.129447 | 0.011921 | 0.001365752 | 0.19393681 |
| 4237 | Hardware & Plumbing Merchant Wholesalers | 136 | 0.004024 | 4,700 | 0.00146768 | 2.741594 | 0.028936 | 0.01838117 | 2.499839149 |
| 4238 | Machinery & Supply Merchant Wholesalers | 45 | 0.001331 | 10,018 | 0.00312835 | 0.425592 | 0.004492 | -0.006063085 | -0.272838845 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4239 | Misc Durable Goods Merchant Wholesalers | 30 | 0.000888 | 3,992 | 0.00124659 | 0.712021 | 0.007515 | -0.00303997 | -0.091199098 |
| 424 | Merchant Wholesalers, Nondurable Goods | 199 | 0.005888 | 46,152 | 0.01441201 | 0.408531 | 0.004312 | -0.006243161 | -1.242389011 |
| 4244 | Grocery Product Merchant Wholesalers | 60 | 0.001775 | 14,659 | 0.00457761 | 0.387801 | 0.004093 | -0.006461951 | -0.387717082 |
| 425 | Electronic Markets and Agents/Brokers | 32 | 0.000947 | 20,842 | 0.00650839 | 0.14547 | 0.001535 | -0.009019639 | -0.288628439 |
| 4251 | Electronic Markets and Agents/Brokers | 32 | 0.000947 | 20,842 | 0.00650839 | 0.14547 | 0.001535 | -0.009019639 | -0.288628439 |
| 44-45 | Retail Trade | 2,469 | 0.073049 | 357,581 | 0.11166279 | 0.654197 | 0.006905 | -0.003650271 | -9.012518412 |
| 441 | Motor Vehicle and Parts Dealers | 467 | 0.013817 | 37,374 | 0.01167088 | 1.183885 | 0.012495 | 0.001940318 | 0.906128319 |
| 4411 | Automobile Dealers | 366 | 0.010829 | 26,753 | 0.00835423 | 1.296196 | 0.013681 | 0.003125709 | 1.144009386 |
| 4413 | Auto Parts, Accessories, and Tire Stores | 101 | 0.002988 | 8,115 | 0.00253409 | 1.17922 | 0.012446 | 0.001891087 | 0.190999837 |
| 442 | Furniture and Home Furnishings Stores | 99 | 0.002929 | 12,853 | 0.00401364 | 0.729781 | 0.007702 | -0.002852518 | -0.282399291 |
| 4421 | Furniture Stores | 64 | 0.001894 | 5,645 | 0.00176278 | 1.074183 | 0.011337 | 0.000782467 | 0.050077874 |
| 4422 | Home Furnishings Stores | 34 | 0.001006 | 7,208 | 0.00225086 | 0.446916 | 0.004717 | -0.005838019 | -0.198492642 |
| 443 | Electronics and Appliance Stores | 99 | 0.002929 | 12,861 | 0.00401614 | 0.729327 | 0.007698 | -0.002857309 | -0.282873621 |
| 4431 | Electronics and Appliance Stores | 99 | 0.002929 | 12,861 | 0.00401614 | 0.729327 | 0.007698 | -0.002857309 | -0.282873621 |
| 444 | Building Material & Garden Supply Stores | 117 | 0.003462 | 26,705 | 0.00833924 | 0.415103 | 0.004381 | -0.006173798 | -0.722334363 |
| 4441 | Building Material and Supplies Dealers | 111 | 0.003284 | 24,045 | 0.0075086 | 0.437381 | 0.004616 | -0.005938656 | -0.659190777 |
| 445 | Food and Beverage Stores | 837 | 0.024764 | 91,928 | 0.02870661 | 0.86266 | 0.009105 | -0.001450048 | -1.213690426 |
| 4451 | Grocery Stores | 746 | 0.022072 | 75,430 | 0.02355473 | 0.937037 | 0.00989 | -0.000665036 | -0.496116703 |
| 4452 | Specialty Food Stores | 25 | 0.00074 | 7,512 | 0.00234579 | 0.315316 | 0.003328 | -0.007226991 | -0.180674787 |
| 4453 | Beer, Wine, and Liquor Stores | 66 | 0.001953 | 8,986 | 0.00280608 | 0.695888 | 0.007345 | -0.003210241 | -0.211875938 |
| 446 | Health and Personal Care Stores | 302 | 0.008935 | 26,074 | 0.0081422 | 1.097391 | 0.011582 | 0.001027419 | 0.310280619 |
| 4461 | Health and Personal Care Stores | 302 | 0.008935 | 26,074 | 0.0081422 | 1.097391 | 0.011582 | 0.001027419 | 0.310280619 |
| 447 | Gasoline Stations | 155 | 0.004586 | 12,798 | 0.00399647 | 1.147497 | 0.012111 | 0.001556267 | 0.241221445 |
| 4471 | Gasoline Stations | 155 | 0.004586 | 12,798 | 0.00399647 | 1.147497 | 0.012111 | 0.001556267 | 0.241221445 |
| 448 | Clothing and Clothing Accessories Stores | 91 | 0.002692 | 38,882 | 0.01214179 | 0.221746 | 0.00234 | -0.008214585 | -0.747527273 |
| 4481 | Clothing Stores | 71 | 0.002101 | 30,237 | 0.00944219 | 0.222475 | 0.002348 | -0.008206883 | -0.582688725 |
| 4482 | Shoe Stores | 16 | 0.000473 | 4,308 | 0.00134527 | 0.35189 | 0.003714 | -0.00684098 | -0.109455673 |

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|---|---|---|---|---|---|---|---|---|---|
| 4483 | Jewelry, Luggage & Leather Goods Stores | 4 | 0.000118 | 4,338 | 0.00135464 | 0.087364 | 0.000922 | -0.009632916 | -0.038531664 |
| 451 | Sporting Goods/Hobby/Book/Music Stores | 76 | 0.002249 | 19,093 | 0.00596222 | 0.377139 | 0.003981 | -0.006574484 | -0.499660752 |
| 4511 | Sporting Goods/Musical Instrument Stores | 38 | 0.001124 | 11,760 | 0.00367233 | 0.306153 | 0.003231 | -0.007323707 | -0.278300884 |
| 452 | General Merchandise Stores | 118 | 0.003491 | 43,477 | 0.01357668 | 0.257149 | 0.002714 | -0.007840921 | -0.925228712 |
| 453 | Miscellaneous Store Retailers | 52 | 0.001539 | 23,820 | 0.00743834 | 0.206835 | 0.002183 | -0.008371961 | -0.435341948 |
| 4531 | Florists | 29 | 0.000858 | 3,391 | 0.00105892 | 0.810275 | 0.008552 | -0.00200295 | -0.058085563 |
| 4532 | Office Supply, Stationery & Gift Stores | 10 | 0.000296 | 12,261 | 0.00382878 | 0.077275 | 0.000816 | -0.009739406 | -0.097394058 |
| 4539 | Other Miscellaneous Store Retailers | 12 | 0.000355 | 6,362 | 0.00198668 | 0.17871 | 0.001886 | -0.008668801 | -0.104025608 |
| 454 | Nonstore Retailers | 55 | 0.001627 | 11,718 | 0.00365921 | 0.444704 | 0.004694 | -0.005861366 | -0.322375145 |
| 4543 | Direct Selling Establishments | 45 | 0.001331 | 6,852 | 0.00213969 | 0.622239 | 0.006567 | -0.003987574 | -0.179440849 |
| 48-49 | Transportation and Warehousing | 708 | 0.020947 | 107,454 | 0.03355495 | 0.62427 | 0.006589 | -0.003966134 | -2.808022919 |
| 484 | Truck Transportation | 221 | 0.006539 | 16,247 | 0.00507349 | 1.288787 | 0.013603 | 0.003047511 | 0.673499982 |
| 4841 | General Freight Trucking | 70 | 0.002071 | 10,371 | 0.00323858 | 0.639498 | 0.00675 | -0.00380541 | -0.266378686 |
| 4842 | Specialized Freight Trucking | 151 | 0.004468 | 5,876 | 0.00183491 | 2.434766 | 0.025698 | 0.015142754 | 2.28655579 |
| 485 | Transit and Ground Passenger Transport | 242 | 0.00716 | 23,734 | 0.00741148 | 0.966065 | 0.010196 | -0.000358657 | -0.086795043 |
| 4853 | Taxi and Limousine Service | 8 | 0.000237 | 3,313 | 0.00103456 | 0.228787 | 0.002415 | -0.00814027 | -0.065122161 |
| 488 | Support Activities for Transportation | 8 | 0.000237 | 9,509 | 0.0029694 | 0.079711 | 0.000841 | -0.009713692 | -0.077709534 |
| | **Information** | 1,331 | 0.03938 | 106,185 | 0.03315868 | 1.187619 | 0.012535 | 0.001979727 | 2.635016806 |
| 51 | Information | 1,331 | 0.03938 | 106,185 | 0.03315868 | 1.187619 | 0.012535 | 0.001979727 | 2.635016806 |
| 511 | Publishing Industries | 571 | 0.016894 | 45,133 | 0.0140938 | 1.198682 | 0.012651 | 0.002096497 | 1.197099609 |
| 5112 | Software Publishers | 246 | 0.007278 | 21,221 | 0.00662674 | 1.098326 | 0.011592 | 0.001037291 | 0.255173501 |
| | **Financial Activities** | 1,738 | 0.051422 | 226,401 | 0.07069886 | 0.727333 | 0.007677 | -0.002878355 | -5.002581793 |
| 52 | Finance and Insurance | 1,397 | 0.041333 | 182,186 | 0.05689172 | 0.726513 | 0.007668 | -0.002887012 | -4.033156238 |
| 522 | Credit Intermediation & Related Activity | 750 | 0.02219 | 62,277 | 0.01944741 | 1.141026 | 0.012043 | 0.001487969 | 1.115976986 |
| 5221 | Depository Credit Intermediation | 691 | 0.020444 | 50,109 | 0.01564767 | 1.306545 | 0.01379 | 0.003234938 | 2.235342113 |
| 5222 | Nondepository Credit Intermediation | 42 | 0.001243 | 9,575 | 0.00299001 | 0.415597 | 0.004386 | -0.006168577 | -0.259080235 |
| 524 | Insurance Carriers & Related Activities | 391 | 0.011568 | 63,987 | 0.01998139 | 0.578958 | 0.006111 | -0.004444384 | -1.737754058 |
| 5242 | Insurance Agencies, Brokerages & Support | 216 | 0.006391 | 22,367 | 0.0069846 | 0.914973 | 0.009657 | -0.000897916 | -0.193949835 |
| 53 | Real Estate and Rental and Leasing | 340 | 0.010059 | 44,215 | 0.01380714 | 0.72857 | 0.00769 | -0.002865302 | -0.974202657 |

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|---|---|---|---|---|---|---|---|---|---|
| 531 | Real Estate | 242 | 0.00716 | 30,051 | 0.00938411 | 0.762989 | 0.008053 | -0.002502023 | -0.605489661 |
| 5311 | Lessors of Real Estate | 51 | 0.001509 | 9,418 | 0.00294098 | 0.513066 | 0.005415 | -0.005139838 | -0.262131715 |
| 5312 | Offices of Real Estate Agents & Brokers | 81 | 0.002397 | 11,624 | 0.00362986 | 0.660224 | 0.006968 | -0.003586659 | -0.29051935 |
| 5313 | Activities Related to Real Estate | 110 | 0.003255 | 9,009 | 0.00281326 | 1.156853 | 0.01221 | 0.001655012 | 0.182051343 |
| 532 | Rental and Leasing Services | 98 | 0.002899 | 13,740 | 0.00429063 | 0.675774 | 0.007132 | -0.00342254 | -0.335408923 |
| 5321 | Automotive Equipment Rental and Leasing | 35 | 0.001036 | 4,178 | 0.00130468 | 0.79371 | 0.008377 | -0.002177786 | -0.076222511 |
| 5322 | Consumer Goods Rental | 41 | 0.001213 | 6,361 | 0.00198637 | 0.61069 | 0.006446 | -0.004109473 | -0.168488375 |
| | **Professional and Business Services** | 4,029 | 0.119205 | 460,871 | 0.14391744 | 0.828285 | 0.008742 | -0.001812857 | -7.304002484 |
| 54 | Professional and Technical Services | 1,687 | 0.049913 | 230,770 | 0.07206318 | 0.692624 | 0.00731 | -0.003244691 | -5.473793775 |
| 541 | Professional and Technical Services | 1,687 | 0.049913 | 230,770 | 0.07206318 | 0.692624 | 0.00731 | -0.003244691 | -5.473793775 |
| 5411 | Legal Services | 273 | 0.008077 | 31,006 | 0.00968233 | 0.834217 | 0.008805 | -0.001750253 | -0.477818941 |
| 5412 | Accounting and Bookkeeping Services | 151 | 0.004468 | 19,735 | 0.0061627 | 0.72494 | 0.007651 | -0.002903619 | -0.4384465 |
| 5413 | Architectural and Engineering Services | 203 | 0.006006 | 39,158 | 0.01222798 | 0.491177 | 0.005184 | -0.005370874 | -1.090287453 |
| 5415 | Computer Systems Design and Rel Services | 633 | 0.018728 | 48,393 | 0.01511181 | 1.239319 | 0.01308 | 0.002525404 | 1.598580853 |
| 5416 | Management & Technical Consulting Svc | 323 | 0.009556 | 30,603 | 0.00955648 | 1.000001 | 0.010555 | -4.79201E-07 | -0.000154782 |
| 5417 | Scientific Research and Development Svc | 64 | 0.001894 | 37,552 | 0.01172647 | 0.161476 | 0.001704 | -0.008850697 | -0.566444585 |
| 5419 | Other Professional & Technical Services | 31 | 0.000917 | 9,282 | 0.00289852 | 0.316433 | 0.00334 | -0.007215203 | -0.223671279 |
| 55 | Management of Companies and Enterprises | 358 | 0.010592 | 72,109 | 0.02251767 | 0.470387 | 0.004965 | -0.005590294 | -2.001325177 |
| 551 | Management of Companies and Enterprises | 358 | 0.010592 | 72,109 | 0.02251767 | 0.470387 | 0.004965 | -0.005590294 | -2.001325177 |
| 5511 | Management of Companies and Enterprises | 358 | 0.010592 | 72,109 | 0.02251767 | 0.470387 | 0.004965 | -0.005590294 | -2.001325177 |
| 56 | Administrative and Waste Services | 1,984 | 0.0587 | 157,991 | 0.04933628 | 1.189793 | 0.012558 | 0.002002677 | 3.973311835 |
| 561 | Administrative and Support Services | 1,922 | 0.056866 | 148,812 | 0.04646993 | 1.223707 | 0.012916 | 0.002360625 | 4.537121411 |
| 5611 | Office Administrative Services | 33 | 0.000976 | 9,414 | 0.00293974 | 0.332125 | 0.003505 | -0.007049583 | -0.232636224 |
| 5613 | Employment Services | 509 | 0.01506 | 54,333 | 0.01696671 | 0.887598 | 0.009368 | -0.001186844 | -0.604103783 |
| 5614 | Business Support Services | 59 | 0.001746 | 8,834 | 0.00275862 | 0.632786 | 0.006679 | -0.003876259 | -0.228699268 |

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|---|---|---|---|---|---|---|---|---|---|
| 5615 | Travel Arrangement & Reservation Service | 38 | 0.001124 | 7,090 | 0.00221401 | 0.507808 | 0.00536 | -0.005195339 | -0.197422863 |
| 5616 | Investigation and Security Services | 519 | 0.015355 | 17,307 | 0.0054045 | 2.841238 | 0.029988 | 0.019432866 | 10.08565755 |
| 5619 | Other Support Services | 119 | 0.003521 | 4,925 | 0.00153794 | 2.289301 | 0.024162 | 0.013607437 | 1.619284949 |
| 562 | Waste Management and Remediation Service | 62 | 0.001834 | 9,179 | 0.00286635 | 0.639968 | 0.006755 | -0.003800452 | -0.235627998 |
| 5629 | Remediation and Other Waste Services | 55 | 0.001627 | 3,253 | 0.00101582 | 1.60192 | 0.016907 | 0.00635247 | 0.349385852 |
| | **Education and Health Services** | 10,593 | 0.313412 | 741,468 | 0.23154023 | 1.353595 | 0.014287 | 0.003731523 | 39.52802834 |
| 61 | Educational Services | 3,844 | 0.113731 | 300,618 | 0.0938748 | 1.21152 | 0.012787 | 0.002231992 | 8.579777746 |
| 611 | Educational Services | 3,844 | 0.113731 | 300,618 | 0.0938748 | 1.21152 | 0.012787 | 0.002231992 | 8.579777746 |
| 6116 | Other Schools and Instruction | 44 | 0.001302 | 7,836 | 0.00244697 | 0.532011 | 0.005615 | -0.00493989 | -0.217355171 |
| 62 | Health Care and Social Assistance | 6,749 | 0.19968 | 440,850 | 0.13766543 | 1.450476 | 0.015309 | 0.004754062 | 32.0851647 |
| 621 | Ambulatory Health Care Services | 1,896 | 0.056096 | 125,106 | 0.03906719 | 1.435894 | 0.015155 | 0.004600148 | 8.721881431 |
| 6211 | Offices of Physicians | 482 | 0.014261 | 45,531 | 0.01421809 | 1.003002 | 0.010586 | 3.1194E-05 | 0.015035518 |
| 6212 | Offices of Dentists | 206 | 0.006095 | 19,154 | 0.00598127 | 1.01899 | 0.010755 | 0.000199934 | 0.041186341 |
| 6213 | Offices of Other Health Practitioners | 167 | 0.004941 | 11,132 | 0.00347622 | 1.421364 | 0.015002 | 0.004446797 | 0.742615036 |
| 6214 | Outpatient Care Centers | 536 | 0.015858 | 20,089 | 0.00627325 | 2.527951 | 0.026681 | 0.016126268 | 8.643679839 |
| 6216 | Home Health Care Services | 319 | 0.009438 | 18,368 | 0.00573583 | 1.645474 | 0.017367 | 0.00681216 | 2.173079129 |
| 622 | Hospitals | 2,466 | 0.072961 | 163,388 | 0.05102162 | 1.429997 | 0.015093 | 0.004537908 | 11.19048034 |
| 623 | Nursing and Residential Care Facilities | 1,547 | 0.045771 | 91,133 | 0.02845835 | 1.608336 | 0.016975 | 0.00642019 | 9.932034095 |
| 6231 | Nursing Care Facilities | 1,215 | 0.035948 | 58,666 | 0.01831979 | 1.962239 | 0.02071 | 0.010155463 | 12.33888708 |
| 6232 | Residential Mental Health Facilities | 111 | 0.003284 | 14,526 | 0.00453607 | 0.724001 | 0.007641 | -0.00291353 | -0.323401778 |
| 6233 | Community Care Facility for the Elderly | 119 | 0.003521 | 11,966 | 0.00373666 | 0.942237 | 0.009945 | -0.000610156 | -0.072608597 |
| 6239 | Other Residential Care Facilities | 102 | 0.003018 | 5,975 | 0.00186583 | 1.617426 | 0.017071 | 0.00651613 | 0.66464523 |
| 624 | Social Assistance | 840 | 0.024853 | 61,224 | 0.01911859 | 1.299929 | 0.01372 | 0.00316511 | 2.658692199 |
| 6241 | Individual and Family Services | 306 | 0.009054 | 25,726 | 0.00803353 | 1.126967 | 0.011895 | 0.001339581 | 0.409911895 |
| 6242 | Emergency and Other Relief Services | 107 | 0.003166 | 5,024 | 0.00156886 | 2.017884 | 0.021298 | 0.010742771 | 1.149476465 |
| 6243 | Vocational Rehabilitation Services | 134 | 0.003965 | 8,451 | 0.00263902 | 1.502307 | 0.015856 | 0.005301112 | 0.710348968 |
| 6244 | Child Day Care Services | 295 | 0.008728 | 22,023 | 0.00687718 | 1.269134 | 0.013395 | 0.002840087 | 0.837825652 |
| | **Leisure and Hospitality** | 2,833 | 0.083819 | 290,914 | 0.09084451 | 0.922665 | 0.009738 | -0.000816727 | -2.313787119 |
| 71 | Arts, Entertainment, and Recreation | 593 | 0.017545 | 49,273 | 0.01538661 | 1.14027 | 0.012035 | 0.001479989 | 0.877633321 |
| 712 | Museums, Parks and Historical Sites | 230 | 0.006805 | 6,307 | 0.0019695 | 3.455152 | 0.036467 | 0.025912417 | 5.959855946 |

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|---|---|---|---|---|---|---|---|---|---|
| 7121 | Museums, Parks and Historical Sites | 230 | 0.006805 | 6,307 | 0.0019695 | 3.455152 | 0.036467 | 0.025912417 | 5.959855946 |
| 713 | Amusement, Gambling & Recreation Ind | 265 | 0.00784 | 35,029 | 0.0109386 | 0.716771 | 0.007565 | -0.00298984 | -0.792307522 |
| 7139 | Other Amusement & Recreation Industries | 265 | 0.00784 | 33,670 | 0.01051422 | 0.745701 | 0.007871 | -0.002684492 | -0.711390414 |
| 72 | Accommodation and Food Services | 2,240 | 0.066274 | 241,640 | 0.07545758 | 0.878297 | 0.00927 | -0.001285012 | -2.878425956 |
| 721 | Accommodation | 141 | 0.004172 | 34,015 | 0.01062196 | 0.392745 | 0.004145 | -0.00640977 | -0.903777564 |
| 7211 | Traveler Accommodation | 129 | 0.003817 | 32,281 | 0.01008048 | 0.378621 | 0.003996 | -0.006558841 | -0.846090524 |
| 722 | Food Services and Drinking Places | 2,099 | 0.062102 | 207,626 | 0.06483594 | 0.95784 | 0.01011 | -0.000445476 | -0.935054428 |
| 7221 | Full-Service Restaurants | 629 | 0.01861 | 104,244 | 0.03255256 | 0.571691 | 0.006034 | -0.00452108 | -2.843759057 |
| 7222 | Limited-Service Eating Places | 1,124 | 0.033255 | 73,370 | 0.02291145 | 1.451476 | 0.01532 | 0.004764613 | 5.355424923 |
| 7223 | Special Food Services | 207 | 0.006124 | 20,263 | 0.00632758 | 0.967896 | 0.010216 | -0.000339336 | -0.070242548 |
| 7224 | Drinking Places (Alcoholic Beverages) | 139 | 0.004113 | 9,749 | 0.00304435 | 1.35088 | 0.014258 | 0.003702873 | 0.514699292 |
| | **Other Services** | 1,240 | 0.036687 | 116,564 | 0.03639976 | 1.007904 | 0.010638 | 8.29328E-05 | 0.102836684 |
| 81 | Other Services, Ex. Public Admin | 1,240 | 0.036687 | 116,564 | 0.03639976 | 1.007904 | 0.010638 | 8.29328E-05 | 0.102836684 |
| 811 | Repair and Maintenance | 380 | 0.011243 | 27,679 | 0.0086434 | 1.300754 | 0.013729 | 0.00317382 | 1.206051479 |
| 8111 | Automotive Repair and Maintenance | 307 | 0.009083 | 19,753 | 0.00616832 | 1.472541 | 0.015542 | 0.004986943 | 1.5309915 |
| 8113 | Commercial Machinery Repair/Maintenance | 10 | 0.000296 | 2,392 | 0.00074696 | 0.396096 | 0.004181 | -0.006374398 | -0.06374398 |
| 812 | Personal and Laundry Services | 336 | 0.009941 | 36,132 | 0.01128304 | 0.881068 | 0.009299 | -0.001255764 | -0.421936659 |
| 8121 | Personal Care Services | 113 | 0.003343 | 17,182 | 0.00536547 | 0.623113 | 0.006577 | -0.00397835 | -0.449553552 |
| 8122 | Death Care Services | 46 | 0.001361 | 2,684 | 0.00083814 | 1.623818 | 0.017139 | 0.006583599 | 0.302845559 |
| 8123 | Drycleaning and Laundry Services | 143 | 0.004231 | 10,051 | 0.00313865 | 1.347997 | 0.014227 | 0.00367244 | 0.525158928 |
| 813 | Membership Organizations & Associations | 387 | 0.01145 | 35,720 | 0.01115438 | 1.026506 | 0.010834 | 0.000279267 | 0.108076142 |
| 8133 | Social Advocacy Organizations | 27 | 0.000799 | 6,255 | 0.00195327 | 0.408977 | 0.004317 | -0.006238453 | -0.168438237 |
| 8134 | Civic and Social Organizations | 316 | 0.009349 | 18,551 | 0.00579297 | 1.613919 | 0.017034 | 0.006479122 | 2.047402599 |
| 8139 | Professional and Similar Organizations | 26 | 0.000769 | 7,764 | 0.00242449 | 0.317285 | 0.003349 | -0.007206211 | -0.187361479 |
| 814 | Private Households | 136 | 0.004024 | 17,033 | 0.00531894 | 0.756502 | 0.007985 | -0.002570499 | -0.349587908 |
| 8141 | Private Households | 136 | 0.004024 | 17,033 | 0.00531894 | 0.756502 | 0.007985 | -0.002570499 | -0.349587908 |
| | **Public Administration** | 2,005 | 0.059321 | 136,749 | 0.04270298 | 1.38916 | 0.014662 | 0.004106899 | 8.234332109 |
| 92 | Public Administration | 2,005 | 0.059321 | 136,749 | 0.04270298 | 1.38916 | 0.014662 | 0.004106899 | 8.234332109 |
| 921 | Executive, Legislative, & Gen Government | 924 | 0.027338 | 34,268 | 0.01070096 | 2.554732 | 0.026964 | 0.016408931 | 15.16185258 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9211 | Executive, Legislative, & Gen Government | 924 | 0.027338 | 34,268 | 0.01070096 | 2.554732 | 0.026964 | 0.016408931 | 15.16185258 |

| | **Springfield** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Springfield | ri/rt | MA | si/st | | | rt/st = 0.02459 | |
| NAICS | Description | Employ-ment | top ratio | Employ-ment | bottom ratio | LQR | ri/si | ri/si-rt/st | Exported Jobs |
| | **Total, all industries** | 78,755 | | 3,202,323 | | | | | |
| | **Goods-Producing Domain** | 7,814 | 0.099219 | 508,329 | 0.158737282 | 0.625052 | 0.015372 | -0.009221066 | -72.05340724 |
| | **Construction** | 2,192 | 0.027833 | 152,821 | 0.04772183 | 0.583237 | 0.014344 | -0.010249422 | -22.46673207 |
| 23 | Construction | 2,192 | 0.027833 | 152,821 | 0.04772183 | 0.583237 | 0.014344 | -0.010249422 | -22.46673207 |
| 236 | Construction of Buildings | 386 | 0.004901 | 30,871 | 0.009640171 | 0.508422 | 0.012504 | -0.012089356 | -4.66649134 |
| 2361 | Residential Building Construction | 83 | 0.001054 | 16,882 | 0.005271788 | 0.199913 | 0.004916 | -0.019676521 | -1.633151236 |
| 2362 | Nonresidential Building Construction | 304 | 0.00386 | 13,989 | 0.004368383 | 0.883639 | 0.021731 | -0.00286164 | -0.869938452 |
| 237 | Heavy and Civil Engineering Construction | 643 | 0.008165 | 30,883 | 0.009643919 | 0.846602 | 0.020821 | -0.003772484 | -2.425707121 |
| 2373 | Highway, Street, and Bridge Construction | 609 | 0.007733 | 20,633 | 0.006443123 | 1.20017 | 0.029516 | 0.004922824 | 2.997999917 |
| 238 | Specialty Trade Contractors | 1,162 | 0.014755 | 91,067 | 0.02843774 | 0.518839 | 0.01276 | -0.011833164 | -13.75013638 |
| 2381 | Building Foundation/Exterior Contractors | 238 | 0.003022 | 15,356 | 0.00479526 | 0.630212 | 0.015499 | -0.009094172 | -2.164412979 |
| 2382 | Building Equipment Contractors | 697 | 0.00885 | 44,326 | 0.013841801 | 0.639384 | 0.015724 | -0.008868594 | -6.181410338 |
| 2383 | Building Finishing Contractors | 92 | 0.001168 | 18,930 | 0.005911323 | 0.197617 | 0.00486 | -0.019732989 | -1.815435028 |
| 2389 | Other Specialty Trade Contractors | 136 | 0.001727 | 12,456 | 0.003889669 | 0.443964 | 0.010918 | -0.013674567 | -1.859741128 |
| | **Manufacturing** | 5,622 | 0.071386 | 347,430 | 0.108492913 | 0.657978 | 0.016182 | -0.008411323 | -47.28845856 |
| 31-33 | Manufacturing | 5,622 | 0.071386 | 347,430 | 0.108492913 | 0.657978 | 0.016182 | -0.008411323 | -47.28845856 |
| DUR | Durable Goods Manufacturing | 3,497 | 0.044404 | 229,268 | 0.071594143 | 0.620212 | 0.015253 | -0.009340108 | -32.66235833 |
| NONDUR | Non-Durable Goods Manufacturing | 2,125 | 0.026982 | 118,162 | 0.03689877 | 0.731255 | 0.017984 | -0.006609215 | -14.04458193 |
| 311 | Food Manufacturing | 622 | 0.007898 | 22,563 | 0.007045809 | 1.120937 | 0.027567 | 0.002974256 | 1.849987311 |
| 3116 | Animal Slaughtering and Processing | 424 | 0.005384 | 2,132 | 0.000665765 | 8.086609 | 0.198874 | 0.174281296 | 73.89526969 |
| 3118 | Bakeries and Tortilla Manufacturing | 162 | 0.002057 | 8,930 | 0.002788595 | 0.737652 | 0.018141 | -0.006451903 | -1.045208217 |
| 322 | Paper Manufacturing | 410 | 0.005206 | 16,142 | 0.005040706 | 1.032795 | 0.0254 | 0.000806579 | 0.330697283 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3222 | Converted Paper Product Manufacturing | 404 | 0.00513 | 12,579 | 0.003928079 | 1.30594 | 0.032117 | 0.00752402 | 3.039704254 |
| 323 | Printing and Related Support Activities | 204 | 0.00259 | 17,586 | 0.005491628 | 0.471684 | 0.0116 | -0.012992864 | -2.65054416 |
| 3231 | Printing and Related Support Activities | 204 | 0.00259 | 17,586 | 0.005491628 | 0.471684 | 0.0116 | -0.012992864 | -2.65054416 |
| 325 | Chemical Manufacturing | 140 | 0.001778 | 18,113 | 0.005656196 | 0.314286 | 0.007729 | -0.016863745 | -2.360924268 |
| 331 | Primary Metal Manufacturing | 123 | 0.001562 | 5,986 | 0.001869265 | 0.835519 | 0.020548 | -0.004045055 | -0.49754174 |
| 3315 | Foundries | 123 | 0.001562 | 1,652 | 0.000515875 | 3.027491 | 0.074455 | 0.049862206 | 6.133051315 |
| 332 | Fabricated Metal Product Manufacturing | 1,946 | 0.02471 | 38,390 | 0.01198815 | 2.061164 | 0.05069 | 0.026097284 | 50.78531452 |
| 3323 | Architectural and Structural Metals | 174 | 0.002209 | 6,630 | 0.002070368 | 1.067145 | 0.026244 | 0.001651344 | 0.287333837 |
| 3328 | Coating, Engraving & Heat Treating Metal | 223 | 0.002832 | 4,046 | 0.001263455 | 2.241129 | 0.055116 | 0.030523164 | 6.806665597 |
| 333 | Machinery Manufacturing | 541 | 0.006869 | 25,277 | 0.007893318 | 0.870281 | 0.021403 | -0.003190144 | -1.725867714 |
| 3332 | Industrial Machinery Manufacturing | 136 | 0.001727 | 5,725 | 0.001787761 | 0.965942 | 0.023755 | -0.000837541 | -0.113905642 |
| 3335 | Metalworking Machinery Manufacturing | 269 | 0.003416 | 4,874 | 0.001522017 | 2.244164 | 0.055191 | 0.030597808 | 8.230810452 |
| 3339 | Other General Purpose Machinery Mfg | 99 | 0.001257 | 5,702 | 0.001780579 | 0.705986 | 0.017362 | -0.007230671 | -0.715836428 |
| 337 | Furniture and Related Product Mfg | 87 | 0.001105 | 6,450 | 0.002014159 | 0.548463 | 0.013488 | -0.011104628 | -0.966102628 |
| 3371 | Household and Institutional Furniture | 19 | 0.000241 | 3,907 | 0.00122005 | 0.197742 | 0.004863 | -0.019729934 | -0.37486874 |
| 339 | Miscellaneous Manufacturing | 341 | 0.00433 | 29,551 | 0.009227971 | 0.469213 | 0.011539 | -0.013053627 | -4.45128694 |
| 3391 | Medical Equipment and Supplies Mfg | 90 | 0.001143 | 14,879 | 0.004646306 | 0.245956 | 0.006049 | -0.018544206 | -1.668978576 |
| 3399 | Other Miscellaneous Manufacturing | 250 | 0.003174 | 14,672 | 0.004581665 | 0.692849 | 0.017039 | -0.007553742 | -1.888435387 |
| | **Service-Providing Domain** | 70,940 | 0.900768 | 2,693,994 | 0.841260845 | 1.070736 | 0.026333 | 0.00173965 | 123.4107419 |
| | **Trade, Transportation and Utilities** | 14,309 | 0.18169 | 614,843 | 0.191998698 | 0.946309 | 0.023273 | -0.001320392 | -18.89349193 |
| 22 | Utilities | 464 | 0.005892 | 14,249 | 0.004449574 | 1.324102 | 0.032564 | 0.007970689 | 3.698399547 |
| 221 | Utilities | 464 | 0.005892 | 14,249 | 0.004449574 | 1.324102 | 0.032564 | 0.007970689 | 3.698399547 |
| 42 | Wholesale Trade | 1,994 | 0.025319 | 135,559 | 0.042331378 | 0.598115 | 0.014709 | -0.009883538 | -19.70777417 |
| 423 | Merchant Wholesalers, Durable | 900 | 0.011428 | 68,565 | 0.021410979 | 0.533738 | 0.013126 | -0.011466769 | -10.32009247 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Goods | | | | | | | | |
| 4231 | Motor Vehicle/Part Merchant Wholesalers | 107 | 0.001359 | 5,325 | 0.001662852 | 0.817056 | 0.020094 | -0.004499103 | -0.481404052 |
| 4232 | Furniture & Furnishings Merchant Whsle | 49 | 0.000622 | 2,530 | 0.00079005 | 0.787523 | 0.019368 | -0.005225411 | -0.256045142 |
| 4233 | Lumber and Supply Merchant Wholesalers | 140 | 0.001778 | 5,879 | 0.001835851 | 0.968305 | 0.023814 | -0.000779426 | -0.109119677 |
| 4234 | Commercial Goods Merchant Wholesalers | 119 | 0.001511 | 22,307 | 0.006965868 | 0.216917 | 0.005335 | -0.019258352 | -2.29174385 |
| 4235 | Metal and Mineral Merchant Wholesalers | 54 | 0.000686 | 1,903 | 0.000594255 | 1.153833 | 0.028376 | 0.003783248 | 0.204295394 |
| 4237 | Hardware & Plumbing Merchant Wholesalers | 99 | 0.001257 | 4,700 | 0.001467682 | 0.856496 | 0.021064 | -0.00352917 | -0.349387851 |
| 4238 | Machinery & Supply Merchant Wholesalers | 170 | 0.002159 | 10,018 | 0.003128348 | 0.690011 | 0.016969 | -0.007623545 | -1.296002653 |
| 4239 | Misc Durable Goods Merchant Wholesalers | 82 | 0.001041 | 3,992 | 0.001246593 | 0.83524 | 0.020541 | -0.004051918 | -0.332257263 |
| 424 | Merchant Wholesalers, Nondurable Goods | 882 | 0.011199 | 46,152 | 0.014412011 | 0.77708 | 0.019111 | -0.005482236 | -4.835331772 |
| 4244 | Grocery Product Merchant Wholesalers | 473 | 0.006006 | 14,659 | 0.004577606 | 1.312033 | 0.032267 | 0.007673867 | 3.629738983 |
| 4246 | Chemical Merchant Wholesalers | 71 | 0.000902 | 2,383 | 0.000744146 | 1.211496 | 0.029794 | 0.005201377 | 0.369297755 |
| 4247 | Petroleum Merchant Wholesalers | 90 | 0.001143 | 1,475 | 0.000460602 | 2.481066 | 0.061017 | 0.036423949 | 3.278155424 |
| 4249 | Misc Nondurable Goods Merchant Whsle | 77 | 0.000978 | 7,124 | 0.002224631 | 0.439496 | 0.010809 | -0.013784465 | -1.061403841 |
| 425 | Electronic Markets and Agents/Brokers | 212 | 0.002692 | 20,842 | 0.006508388 | 0.413604 | 0.010172 | -0.014421231 | -3.057301069 |
| 4251 | Electronic Markets and Agents/Brokers | 212 | 0.002692 | 20,842 | 0.006508388 | 0.413604 | 0.010172 | -0.014421231 | -3.057301069 |
| 44-45 | Retail Trade | 7,022 | 0.089163 | 357,581 | 0.111662793 | 0.798499 | 0.019638 | -0.004955491 | -34.79745988 |
| 441 | Motor Vehicle and Parts Dealers | 647 | 0.008215 | 37,374 | 0.011670881 | 0.703919 | 0.017311 | -0.0072815 | -4.711130517 |
| 4411 | Automobile Dealers | 370 | 0.004698 | 26,753 | 0.008354232 | 0.562363 | 0.01383 | -0.010762775 | -3.98222688 |
| 4412 | Other Motor Vehicle Dealers | 55 | 0.000698 | 2,506 | 0.000782555 | 0.89242 | 0.021947 | -0.002645674 | -0.145512047 |
| 4413 | Auto Parts, Accessories, and Tire Stores | 223 | 0.002832 | 8,115 | 0.002534093 | 1.117388 | 0.02748 | 0.002886975 | 0.643795504 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 442 | Furniture and Home Furnishings Stores | 165 | 0.002095 | 12,853 | 0.004013641 | 0.521996 | 0.012837 | -0.01175553 | -1.939662475 |
| 4421 | Furniture Stores | 100 | 0.00127 | 5,645 | 0.00176278 | 0.720317 | 0.017715 | -0.006878208 | -0.687820815 |
| 4422 | Home Furnishings Stores | 65 | 0.000825 | 7,208 | 0.002250862 | 0.366679 | 0.009018 | -0.015575242 | -1.012390727 |
| 443 | Electronics and Appliance Stores | 307 | 0.003898 | 12,861 | 0.00401614 | 0.970625 | 0.023871 | -0.000722383 | -0.221771706 |
| 4431 | Electronics and Appliance Stores | 307 | 0.003898 | 12,861 | 0.00401614 | 0.970625 | 0.023871 | -0.000722383 | -0.221771706 |
| 444 | Building Material & Garden Supply Stores | 640 | 0.008126 | 26,705 | 0.008339243 | 0.974485 | 0.023966 | -0.00062745 | -0.401568306 |
| 4441 | Building Material and Supplies Dealers | 600 | 0.007619 | 24,045 | 0.007508598 | 1.014645 | 0.024953 | 0.000360213 | 0.216127636 |
| 445 | Food and Beverage Stores | 1,758 | 0.022322 | 91,928 | 0.028706607 | 0.777605 | 0.019124 | -0.005469338 | -9.61509621 |
| 4451 | Grocery Stores | 1,391 | 0.017662 | 75,430 | 0.023554732 | 0.749844 | 0.018441 | -0.006152061 | -8.557517382 |
| 4452 | Specialty Food Stores | 75 | 0.000952 | 7,512 | 0.002345793 | 0.40597 | 0.009984 | -0.014608974 | -1.095673083 |
| 4453 | Beer, Wine, and Liquor Stores | 292 | 0.003708 | 8,986 | 0.002806083 | 1.321309 | 0.032495 | 0.007901992 | 2.307381725 |
| 446 | Health and Personal Care Stores | 669 | 0.008495 | 26,074 | 0.008142199 | 1.043293 | 0.025658 | 0.001064743 | 0.712313298 |
| 4461 | Health and Personal Care Stores | 669 | 0.008495 | 26,074 | 0.008142199 | 1.043293 | 0.025658 | 0.001064743 | 0.712313298 |
| 447 | Gasoline Stations | 405 | 0.005143 | 12,798 | 0.003996466 | 1.286769 | 0.031646 | 0.00705257 | 2.856290696 |
| 4471 | Gasoline Stations | 405 | 0.005143 | 12,798 | 0.003996466 | 1.286769 | 0.031646 | 0.00705257 | 2.856290696 |
| 448 | Clothing and Clothing Accessories Stores | 474 | 0.006019 | 38,882 | 0.012141788 | 0.495698 | 0.012191 | -0.012402269 | -5.878675539 |
| 4481 | Clothing Stores | 321 | 0.004076 | 30,237 | 0.00944219 | 0.431672 | 0.010616 | -0.013976867 | -4.486574451 |
| 4482 | Shoe Stores | 76 | 0.000965 | 4,308 | 0.001345271 | 0.717341 | 0.017642 | -0.006951403 | -0.528306626 |
| 4483 | Jewelry, Luggage & Leather Goods Stores | 78 | 0.00099 | 4,338 | 0.001354639 | 0.731127 | 0.017981 | -0.006612364 | -0.515764373 |
| 451 | Sporting Goods/Hobby/Book/Music Stores | 230 | 0.00292 | 19,093 | 0.005962223 | 0.489826 | 0.012046 | -0.0125467 | -2.885741071 |
| 4511 | Sporting Goods/Musical Instrument Stores | 145 | 0.001841 | 11,760 | 0.003672327 | 0.501359 | 0.01233 | -0.012263068 | -1.778144864 |
| 4512 | Book, Periodical, and Music Stores | 85 | 0.001079 | 7,333 | 0.002289896 | 0.47133 | 0.011591 | -0.013001564 | -1.105132942 |
| 452 | General Merchandise Stores | 1,238 | 0.01572 | 43,477 | 0.013576681 | 1.157841 | 0.028475 | 0.003881826 | 4.805700303 |
| 4521 | Department Stores | 1,067 | 0.013548 | 34,341 | 0.010723758 | 1.263395 | 0.031071 | 0.006477732 | 6.911739807 |
| 4529 | Other General Merchandise | 171 | 0.002171 | 9,135 | 0.002852611 | 0.761159 | 0.018719 | -0.005873788 | -1.004417778 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Stores | | | | | | | | |
| 453 | Miscellaneous Store Retailers | 314 | 0.003987 | 23,820 | 0.007438336 | 0.536013 | 0.013182 | -0.0114108 | -3.582991253 |
| 4531 | Florists | 66 | 0.000838 | 3,391 | 0.001058917 | 0.791414 | 0.019463 | -0.005129715 | -0.338561179 |
| 4532 | Office Supply, Stationery & Gift Stores | 114 | 0.001448 | 12,261 | 0.003828776 | 0.378065 | 0.009298 | -0.015295227 | -1.743655829 |
| 4539 | Other Miscellaneous Store Retailers | 106 | 0.001346 | 6,362 | 0.001986679 | 0.677486 | 0.016661 | -0.007931573 | -0.840746714 |
| 454 | Nonstore Retailers | 174 | 0.002209 | 11,718 | 0.003659212 | 0.603787 | 0.014849 | -0.00974405 | -1.695464642 |
| 4541 | Electronic Shopping & Mail-Order Houses | 33 | 0.000419 | 4,208 | 0.001314044 | 0.318879 | 0.007842 | -0.016750795 | -0.552776224 |
| 4542 | Vending Machine Operators | 15 | 0.00019 | 658 | 0.000205475 | 0.926943 | 0.022796 | -0.001796647 | -0.026949711 |
| 4543 | Direct Selling Establishments | 127 | 0.001613 | 6,852 | 0.002139693 | 0.753658 | 0.018535 | -0.006058266 | -0.769399733 |
| 48-49 | Transportation and Warehousing | 4,829 | 0.061317 | 107,454 | 0.033554953 | 1.827353 | 0.04494 | 0.02034716 | 98.25643777 |
| 484 | Truck Transportation | 816 | 0.010361 | 16,247 | 0.005073495 | 2.042231 | 0.050225 | 0.025631657 | 20.915432 |
| 4841 | General Freight Trucking | 744 | 0.009447 | 10,371 | 0.00323858 | 2.917025 | 0.071739 | 0.047145502 | 35.07625318 |
| 4842 | Specialized Freight Trucking | 72 | 0.000914 | 5,876 | 0.001834915 | 0.49824 | 0.012253 | -0.012339767 | -0.888463189 |
| 485 | Transit and Ground Passenger Transport | 895 | 0.011364 | 23,734 | 0.007411481 | 1.533345 | 0.03771 | 0.013116615 | 11.73937033 |
| 488 | Support Activities for Transportation | 97 | 0.001232 | 9,509 | 0.002969401 | 0.414787 | 0.010201 | -0.014392138 | -1.396037353 |
| 4885 | Freight Transportation Arrangement | 33 | 0.000419 | 2,114 | 0.000660145 | 0.634741 | 0.01561 | -0.008982782 | -0.296431819 |
| | **Information** | 2,083 | 0.026449 | 106,185 | 0.033158679 | 0.797653 | 0.019617 | -0.004976293 | -10.36561896 |
| 51 | Information | 2,083 | 0.026449 | 106,185 | 0.033158679 | 0.797653 | 0.019617 | -0.004976293 | -10.36561896 |
| 512 | Motion Picture & Sound Recording Ind | 106 | 0.001346 | 5,466 | 0.001706883 | 0.788541 | 0.019393 | -0.005200391 | -0.551241461 |
| 5121 | Motion Picture and Video Industries | 106 | 0.001346 | 5,226 | 0.001631937 | 0.824754 | 0.020283 | -0.004309801 | -0.456838865 |
| 515 | Broadcasting (except Internet) | 258 | 0.003276 | 6,024 | 0.001881131 | 1.741496 | 0.042829 | 0.018235685 | 4.704806797 |
| 5151 | Radio and Television Broadcasting | 257 | 0.003263 | 5,106 | 0.001594465 | 2.046634 | 0.050333 | 0.025739942 | 6.615165001 |
| 517 | Telecommunications | 695 | 0.008825 | 26,709 | 0.008340492 | 1.058071 | 0.026021 | 0.001428191 | 0.992592994 |
| | **Financial Activities** | 8,498 | 0.107904 | 226,401 | 0.070698857 | 1.526252 | 0.037535 | 0.01294217 | 109.9825598 |
| 52 | Finance and Insurance | 7,488 | 0.09508 | 182,186 | 0.056891718 | 1.671239 | 0.041101 | 0.016507853 | 123.6108031 |
| 522 | Credit Intermediation & Related Activity | 1,017 | 0.012913 | 62,277 | 0.019447408 | 0.66402 | 0.01633 | -0.008262734 | -8.403200081 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5221 | Depository Credit Intermediation | 896 | 0.011377 | 50,109 | 0.015647674 | 0.727076 | 0.017881 | -0.006711981 | -6.013934638 |
| 5222 | Nondepository Credit Intermediation | 74 | 0.00094 | 9,575 | 0.002990011 | 0.314254 | 0.007728 | -0.01686454 | -1.247975995 |
| 5223 | Activities Rel to Credit Intermediation | 47 | 0.000597 | 2,593 | 0.000809723 | 0.737027 | 0.018126 | -0.006467277 | -0.303962014 |
| 523 | Financial Investment & Related Activity | 818 | 0.010387 | 52,049 | 0.016253483 | 0.639041 | 0.015716 | -0.00887704 | -7.261418752 |
| 5231 | Security & Commodity Investment Activity | 424 | 0.005384 | 30,969 | 0.009670774 | 0.556707 | 0.013691 | -0.01090189 | -4.622401163 |
| 524 | Insurance Carriers & Related Activities | 5,636 | 0.071564 | 63,987 | 0.019981395 | 3.581517 | 0.08808 | 0.063487391 | 357.8149375 |
| 5242 | Insurance Agencies, Brokerages & Support | 958 | 0.012164 | 22,367 | 0.006984604 | 1.741589 | 0.042831 | 0.018237956 | 17.47196215 |
| 525 | Funds, Trusts & Other Financial Vehicles | 17 | 0.000216 | 2,624 | 0.000819404 | 0.263435 | 0.006479 | -0.018114341 | -0.307943805 |
| 5251 | Insurance and Employee Benefit Funds | 16 | 0.000203 | 449 | 0.00014021 | 1.448977 | 0.035635 | 0.011041744 | 0.176667902 |
| 53 | Real Estate and Rental and Leasing | 1,010 | 0.012825 | 44,215 | 0.013807138 | 0.928837 | 0.022843 | -0.001750073 | -1.767574125 |
| 531 | Real Estate | 628 | 0.007974 | 30,051 | 0.009384108 | 0.849745 | 0.020898 | -0.003695193 | -2.320581165 |
| 5311 | Lessors of Real Estate | 133 | 0.001689 | 9,418 | 0.002940985 | 0.574223 | 0.014122 | -0.010471106 | -1.392657065 |
| 5312 | Offices of Real Estate Agents & Brokers | 219 | 0.002781 | 11,624 | 0.003629858 | 0.766084 | 0.01884 | -0.00575267 | -1.259834653 |
| 5313 | Activities Related to Real Estate | 276 | 0.003505 | 9,009 | 0.002813265 | 1.24572 | 0.030636 | 0.006043031 | 1.667876456 |
| 532 | Rental and Leasing Services | 382 | 0.00485 | 13,740 | 0.004290627 | 1.130484 | 0.027802 | 0.003209038 | 1.225852457 |
| 5321 | Automotive Equipment Rental and Leasing | 133 | 0.001689 | 4,178 | 0.001304675 | 1.294407 | 0.031833 | 0.007240413 | 0.962974944 |
| 5322 | Consumer Goods Rental | 199 | 0.002527 | 6,361 | 0.001986367 | 1.272083 | 0.031284 | 0.006691389 | 1.33158646 |
| 5323 | General Rental Centers | 36 | 0.000457 | 1,482 | 0.000462788 | 0.987739 | 0.024291 | -0.000301502 | -0.010854073 |
| | **Professional and Business Services** | 7,277 | 0.0924 | 460,871 | 0.143917443 | 0.642038 | 0.01579 | -0.008803332 | -64.06184824 |
| 54 | Professional and Technical Services | 2,109 | 0.026779 | 230,770 | 0.072063177 | 0.371608 | 0.009139 | -0.01545403 | -32.59255025 |
| 541 | Professional and Technical Services | 2,109 | 0.026779 | 230,770 | 0.072063177 | 0.371608 | 0.009139 | -0.01545403 | -32.59255025 |
| 5411 | Legal Services | 1,115 | 0.014158 | 31,006 | 0.009682328 | 1.462234 | 0.035961 | 0.011367782 | 12.67507669 |
| 5412 | Accounting and Bookkeeping | 196 | 0.002489 | 19,735 | 0.006162702 | 0.403838 | 0.009932 | -0.014661406 | -2.873635651 |

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|---|---|---|---|---|---|---|---|---|---|
| | Services | | | | | | | | |
| 5413 | Architectural and Engineering Services | 186 | 0.002362 | 39,158 | 0.012227975 | 0.193144 | 0.00475 | -0.019843013 | -3.690800375 |
| 5414 | Specialized Design Services | 18 | 0.000229 | 3,309 | 0.00103331 | 0.221189 | 0.00544 | -0.01915329 | -0.344759222 |
| 5415 | Computer Systems Design and Rel Services | 145 | 0.001841 | 48,393 | 0.015111814 | 0.121835 | 0.002996 | -0.021596699 | -3.131521338 |
| 5416 | Management & Technical Consulting Svc | 92 | 0.001168 | 30,603 | 0.009556482 | 0.12224 | 0.003006 | -0.021586759 | -1.985981808 |
| 5418 | Advertising and Related Services | 83 | 0.001054 | 11,731 | 0.003663271 | 0.287694 | 0.007075 | -0.017517729 | -1.453971536 |
| 5419 | Other Professional & Technical Services | 262 | 0.003327 | 9,282 | 0.002898515 | 1.147751 | 0.028227 | 0.003633675 | 0.952022925 |
| 55 | Management of Companies and Enterprises | 2,056 | 0.026106 | 72,109 | 0.022517674 | 1.159368 | 0.028512 | 0.003919391 | 8.058267821 |
| 551 | Management of Companies and Enterprises | 2,056 | 0.026106 | 72,109 | 0.022517674 | 1.159368 | 0.028512 | 0.003919391 | 8.058267821 |
| 5511 | Management of Companies and Enterprises | 2,056 | 0.026106 | 72,109 | 0.022517674 | 1.159368 | 0.028512 | 0.003919391 | 8.058267821 |
| 56 | Administrative and Waste Services | 3,112 | 0.039515 | 157,991 | 0.04933628 | 0.800931 | 0.019697 | -0.004895675 | -15.23534206 |
| 561 | Administrative and Support Services | 3,055 | 0.038791 | 148,812 | 0.046469929 | 0.834759 | 0.020529 | -0.004063742 | -12.41473061 |
| 5611 | Office Administrative Services | 73 | 0.000927 | 9,414 | 0.002939735 | 0.315309 | 0.007754 | -0.016838592 | -1.229217192 |
| 5613 | Employment Services | 1,769 | 0.022462 | 54,333 | 0.016966714 | 1.32389 | 0.032558 | 0.007965482 | 14.09093758 |
| 5614 | Business Support Services | 221 | 0.002806 | 8,834 | 0.002758617 | 1.017238 | 0.025017 | 0.00042398 | 0.093699547 |
| 5615 | Travel Arrangement & Reservation Service | 29 | 0.000368 | 7,090 | 0.002214014 | 0.166318 | 0.00409 | -0.020502732 | -0.594579228 |
| 5616 | Investigation and Security Services | 271 | 0.003441 | 17,307 | 0.005404504 | 0.636701 | 0.015658 | -0.008934596 | -2.421275485 |
| 5617 | Services to Buildings and Dwellings | 645 | 0.00819 | 46,427 | 0.014497886 | 0.564907 | 0.013893 | -0.010700222 | -6.901643248 |
| 5619 | Other Support Services | 46 | 0.000584 | 4,925 | 0.001537943 | 0.379786 | 0.00934 | -0.015252898 | -0.70163333 |
| 562 | Waste Management and Remediation Service | 58 | 0.000736 | 9,179 | 0.002866351 | 0.256933 | 0.006319 | -0.018274229 | -1.059905276 |
| 5629 | Remediation and Other Waste Services | 48 | 0.000609 | 3,253 | 0.001015823 | 0.599991 | 0.014756 | -0.00983739 | -0.47219471 |
| | **Education and Health Services** | 25,610 | 0.325186 | 741,468 | 0.231540232 | 1.404446 | 0.03454 | 0.009946589 | 254.7321451 |
| 61 | Educational Services | 7,365 | 0.093518 | 300,618 | 0.093874802 | 0.996198 | 0.0245 | -9.3469E-05 | -0.688399434 |

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|---|---|---|---|---|---|---|---|---|---|
| 611 | Educational Services | 7,365 | 0.093518 | 300,618 | 0.093874802 | 0.996198 | 0.0245 | -9.3469E-05 | -0.688399434 |
| 6113 | Colleges and Universities | 1,364 | 0.01732 | 95,262 | 0.029747724 | 0.582214 | 0.014318 | -0.010274594 | -14.01454611 |
| 6115 | Technical and Trade Schools | 18 | 0.000229 | 2,028 | 0.000633289 | 0.360905 | 0.008876 | -0.01571726 | -0.282910686 |
| 6116 | Other Schools and Instruction | 150 | 0.001905 | 7,836 | 0.002446969 | 0.778367 | 0.019142 | -0.00545058 | -0.81758706 |
| 6117 | Educational Support Services | 11 | 0.00014 | 1,781 | 0.000556158 | 0.25114 | 0.006176 | -0.018416695 | -0.20258364 |
| 62 | Health Care and Social Assistance | 18,245 | 0.231668 | 440,850 | 0.13766543 | 1.682832 | 0.041386 | 0.016792959 | 306.3875359 |
| 621 | Ambulatory Health Care Services | 6,379 | 0.080998 | 125,106 | 0.039067191 | 2.073301 | 0.050989 | 0.026395762 | 168.3785628 |
| 6211 | Offices of Physicians | 2,062 | 0.026182 | 45,531 | 0.014218089 | 1.84149 | 0.045288 | 0.020694826 | 42.67273096 |
| 6212 | Offices of Dentists | 303 | 0.003847 | 19,154 | 0.005981272 | 0.643237 | 0.015819 | -0.00877385 | -2.658476536 |
| 6213 | Offices of Other Health Practitioners | 496 | 0.006298 | 11,132 | 0.00347622 | 1.811742 | 0.044556 | 0.019963234 | 9.901764203 |
| 6214 | Outpatient Care Centers | 1,919 | 0.024367 | 20,089 | 0.006273247 | 3.884226 | 0.095525 | 0.070931914 | 136.1183432 |
| 6216 | Home Health Care Services | 1,167 | 0.014818 | 18,368 | 0.005735825 | 2.583431 | 0.063534 | 0.038941408 | 45.44462275 |
| 6219 | Other Ambulatory Health Care Services | 114 | 0.001448 | 6,674 | 0.002084108 | 0.694555 | 0.017081 | -0.007511789 | -0.856343984 |
| 622 | Hospitals | 7,448 | 0.094572 | 163,388 | 0.051021616 | 1.853563 | 0.045585 | 0.020991743 | 156.3465024 |
| 6221 | General Medical and Surgical Hospitals | 6,726 | 0.085404 | 141,005 | 0.044032015 | 1.939591 | 0.0477 | 0.023107436 | 155.4206156 |
| 623 | Nursing and Residential Care Facilities | 2,045 | 0.025967 | 91,133 | 0.02845835 | 0.912442 | 0.02244 | -0.002153269 | -4.403435222 |
| 6231 | Nursing Care Facilities | 416 | 0.005282 | 58,666 | 0.018319792 | 0.288333 | 0.007091 | -0.01750201 | -7.280836297 |
| 6232 | Residential Mental Health Facilities | 911 | 0.011568 | 14,526 | 0.004536074 | 2.550117 | 0.062715 | 0.038122131 | 34.72926179 |
| 6233 | Community Care Facility for the Elderly | 439 | 0.005574 | 11,966 | 0.003736655 | 1.491775 | 0.036687 | 0.012094281 | 5.309389196 |
| 6239 | Other Residential Care Facilities | 279 | 0.003543 | 5,975 | 0.00186583 | 1.89869 | 0.046695 | 0.022101561 | 6.166335427 |
| 624 | Social Assistance | 2,373 | 0.030131 | 61,224 | 0.019118585 | 1.576028 | 0.038759 | 0.01416631 | 33.61665381 |
| 6241 | Individual and Family Services | 841 | 0.010679 | 25,726 | 0.008033528 | 1.329265 | 0.032691 | 0.008097663 | 6.810134703 |
| 6242 | Emergency and Other Relief Services | 325 | 0.004127 | 5,024 | 0.001568858 | 2.630398 | 0.064689 | 0.04009649 | 13.03135939 |
| 6243 | Vocational Rehabilitation Services | 374 | 0.004749 | 8,451 | 0.002639017 | 1.799498 | 0.044255 | 0.019662118 | 7.353632034 |
| 6244 | Child Day Care Services | 833 | 0.010577 | 22,023 | 0.006877182 | 1.538 | 0.037824 | 0.013231093 | 11.02150046 |
| | **Leisure and Hospitality** | 5,462 | 0.069354 | 290,914 | 0.090844507 | 0.76344 | 0.018775 | -0.005817692 | -31.77623279 |

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|---|---|---|---|---|---|---|---|---|---|
| 71 | Arts, Entertainment, and Recreation | 854 | 0.010844 | 49,273 | 0.015386614 | 0.704753 | 0.017332 | -0.007260993 | -6.200887691 |
| 711 | Performing Arts and Spectator Sports | 119 | 0.001511 | 7,938 | 0.002478821 | 0.60957 | 0.014991 | -0.009601818 | -1.142616383 |
| 7111 | Performing Arts Companies | 69 | 0.000876 | 3,287 | 0.00102644 | 0.853566 | 0.020992 | -0.003601214 | -0.248483778 |
| 7112 | Spectator Sports | 42 | 0.000533 | 2,180 | 0.000680755 | 0.783395 | 0.019266 | -0.005326945 | -0.223731688 |
| 712 | Museums, Parks and Historical Sites | 227 | 0.002882 | 6,307 | 0.001969504 | 1.463494 | 0.035992 | 0.011398755 | 2.587517429 |
| 7121 | Museums, Parks and Historical Sites | 227 | 0.002882 | 6,307 | 0.001969504 | 1.463494 | 0.035992 | 0.011398755 | 2.587517429 |
| 713 | Amusement, Gambling & Recreation Ind | 507 | 0.006438 | 35,029 | 0.010938601 | 0.588529 | 0.014474 | -0.010119278 | -5.130474061 |
| 7131 | Amusement Parks and Arcades | 48 | 0.000609 | 1,275 | 0.000398148 | 1.530801 | 0.037647 | 0.013054059 | 0.626594824 |
| 7139 | Other Amusement & Recreation Industries | 459 | 0.005828 | 33,670 | 0.010514223 | 0.554316 | 0.013632 | -0.010960686 | -5.030955043 |
| 72 | Accommodation and Food Services | 4,608 | 0.058511 | 241,640 | 0.075457581 | 0.77541 | 0.01907 | -0.00552331 | -25.45141041 |
| 721 | Accommodation | 592 | 0.007517 | 34,015 | 0.010621957 | 0.707683 | 0.017404 | -0.007188914 | -4.255836832 |
| 7211 | Traveler Accommodation | 592 | 0.007517 | 32,281 | 0.010080476 | 0.745697 | 0.018339 | -0.006254039 | -3.702391089 |
| 722 | Food Services and Drinking Places | 4,017 | 0.051006 | 207,626 | 0.064835937 | 0.786698 | 0.019347 | -0.005245712 | -21.07202546 |
| 7221 | Full-Service Restaurants | 1,809 | 0.02297 | 104,244 | 0.032552558 | 0.705627 | 0.017354 | -0.007239483 | -13.0962252 |
| 7222 | Limited-Service Eating Places | 1,434 | 0.018208 | 73,370 | 0.02291145 | 0.794728 | 0.019545 | -0.005048227 | -7.23915742 |
| 7223 | Special Food Services | 352 | 0.00447 | 20,263 | 0.006327582 | 0.706361 | 0.017372 | -0.007221436 | -2.541945495 |
| 7224 | Drinking Places (Alcoholic Beverages) | 421 | 0.005346 | 9,749 | 0.003044347 | 1.755941 | 0.043184 | 0.018590916 | 7.826775762 |
| | **Other Services** | 4,393 | 0.055781 | 116,564 | 0.036399758 | 1.532444 | 0.037687 | 0.013094451 | 57.5239218 |
| 81 | Other Services, Ex. Public Admin | 4,393 | 0.055781 | 116,564 | 0.036399758 | 1.532444 | 0.037687 | 0.013094451 | 57.5239218 |
| 811 | Repair and Maintenance | 705 | 0.008952 | 27,679 | 0.008643397 | 1.035682 | 0.025471 | 0.000877573 | 0.618689218 |
| 8111 | Automotive Repair and Maintenance | 552 | 0.007009 | 19,753 | 0.006168323 | 1.136302 | 0.027945 | 0.003352122 | 1.850371487 |
| 8112 | Electronic Equipment Repair/Maintenance | 32 | 0.000406 | 3,540 | 0.001105445 | 0.367565 | 0.00904 | -0.015553452 | -0.497710463 |
| 8113 | Commercial Machinery Repair/Maintenance | 103 | 0.001308 | 2,392 | 0.000746956 | 1.75091 | 0.04306 | 0.018467201 | 1.902121669 |
| 8114 | Household Goods Repair and Maintenance | 18 | 0.000229 | 1,995 | 0.000622984 | 0.366874 | 0.009023 | -0.015570444 | -0.280267985 |

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|---|---|---|---|---|---|---|---|---|---|
| 812 | Personal and Laundry Services | 820 | 0.010412 | 36,132 | 0.011283038 | 0.922804 | 0.022695 | -0.001898436 | -1.556717212 |
| 8121 | Personal Care Services | 209 | 0.002654 | 17,182 | 0.00536547 | 0.494607 | 0.012164 | -0.012429108 | -2.597683479 |
| 8122 | Death Care Services | 115 | 0.00146 | 2,684 | 0.00083814 | 1.742221 | 0.042846 | 0.018253498 | 2.099152243 |
| 8123 | Drycleaning and Laundry Services | 258 | 0.003276 | 10,051 | 0.003138653 | 1.043754 | 0.025669 | 0.001076088 | 0.277630614 |
| 8129 | Other Personal Services | 239 | 0.003035 | 6,214 | 0.001940463 | 1.56392 | 0.038462 | 0.013868538 | 3.314580692 |
| 813 | Membership Organizations & Associations | 1,205 | 0.015301 | 35,720 | 0.011154382 | 1.371713 | 0.033735 | 0.009141602 | 11.01563097 |
| 8132 | Grantmaking and Giving Services | 109 | 0.001384 | 2,609 | 0.00081472 | 1.698792 | 0.041778 | 0.017185459 | 1.873215051 |
| 8133 | Social Advocacy Organizations | 273 | 0.003466 | 6,255 | 0.001953266 | 1.774693 | 0.043645 | 0.019052084 | 5.201218914 |
| 8134 | Civic and Social Organizations | 558 | 0.007085 | 18,551 | 0.005792971 | 1.223079 | 0.030079 | 0.005486241 | 3.061322484 |
| 8139 | Professional and Similar Organizations | 264 | 0.003352 | 7,764 | 0.002424485 | 1.382631 | 0.034003 | 0.009410091 | 2.484264074 |
| 814 | Private Households | 1,664 | 0.021129 | 17,033 | 0.005318941 | 3.972373 | 0.097693 | 0.073099714 | 121.6379243 |
| 8141 | Private Households | 1,664 | 0.021129 | 17,033 | 0.005318941 | 3.972373 | 0.097693 | 0.073099714 | 121.6379243 |
| | **Public Administration** | 3,308 | 0.042004 | 136,749 | 0.042702983 | 0.983624 | 0.02419 | -0.000402695 | -1.332115506 |
| 92 | Public Administration | 3,308 | 0.042004 | 136,749 | 0.042702983 | 0.983624 | 0.02419 | -0.000402695 | -1.332115506 |
| 921 | Executive, Legislative, & Gen Government | 558 | 0.007085 | 34,268 | 0.010700962 | 0.662115 | 0.016283 | -0.008309587 | -4.636749492 |
| 9211 | Executive, Legislative, & Gen Government | 558 | 0.007085 | 34,268 | 0.010700962 | 0.662115 | 0.016283 | -0.008309587 | -4.636749492 |
| 922 | Justice, Public Order, and Safety Activi | 1,663 | 0.021116 | 61,627 | 0.019244431 | 1.097259 | 0.026985 | 0.002391925 | 3.977772004 |
| 9221 | Justice, Public Order, and Safety Activi | 1,663 | 0.021116 | 61,627 | 0.019244431 | 1.097259 | 0.026985 | 0.002391925 | 3.977772004 |
| 926 | Administration of Economic Programs | 95 | 0.001206 | 6,595 | 0.002059439 | 0.585729 | 0.014405 | -0.010188148 | -0.967874045 |
| 9261 | Administration of Economic Programs | 95 | 0.001206 | 6,595 | 0.002059439 | 0.585729 | 0.014405 | -0.010188148 | -0.967874045 |

| | **Worcester** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | Worcester | ri/rt | MA | si/st | | | rt/st = 0.030785 | |
| NAICS | Description | Employ-ment | top ratio | Employ-ment | bottom ratio | | ri/si | ri/si-rt/st | Exported Jobs |
| | **Total, all industries** | 98,584 | | 3,202,323 | | | | | |
| | **Goods-Producing Domain** | 12,841 | 0.130254402 | 508,329 | 0.158737579 | 0.820564376 | 0.025261199 | -0.005523801 | -70.93112931 |
| | **Natural Resources and Mining** | 23 | 0.000233304 | 8,077 | 0.002522232 | 0.092498875 | 0.002847592 | -0.027937408 | -0.642560386 |
| 11 | Agriculture, Forestry, Fishing & Hunting | 23 | 0.000233304 | 6,575 | 0.002053197 | 0.113629417 | 0.003498099 | -0.027286901 | -0.627598726 |
| 111 | Crop Production | 20 | 0.000202873 | 3,132 | 0.00097804 | 0.207427791 | 0.006385696 | -0.024399304 | -0.487986079 |
| 1114 | Greenhouse and Nursery Production | 20 | 0.000202873 | 1,591 | 0.000496827 | 0.408336794 | 0.01257071 | -0.01821429 | -0.364285795 |
| | **Construction** | 3,639 | 0.036912684 | 152,821 | 0.047721919 | 0.773495368 | 0.023812172 | -0.006972828 | -25.3741196 |
| 23 | Construction | 3,639 | 0.036912684 | 152,821 | 0.047721919 | 0.773495368 | 0.023812172 | -0.006972828 | -25.3741196 |
| 236 | Construction of Buildings | 531 | 0.00538627 | 30,871 | 0.009640189 | 0.558730684 | 0.017200609 | -0.013584391 | -7.213311629 |
| 2361 | Residential Building Construction | 195 | 0.001978009 | 16,882 | 0.005271798 | 0.375205689 | 0.011550764 | -0.019234236 | -3.750675995 |
| 2362 | Nonresidential Building Construction | 336 | 0.003408261 | 13,989 | 0.004368391 | 0.78020963 | 0.024018872 | -0.006766128 | -2.273419018 |
| 237 | Heavy and Civil Engineering Construction | 706 | 0.007161406 | 30,883 | 0.009643937 | 0.742581147 | 0.022860473 | -0.007924527 | -5.59471578 |
| 2371 | Utility System Construction | 68 | 0.000689767 | 7,044 | 0.002199653 | 0.313579934 | 0.009653606 | -0.021131394 | -1.436934798 |
| 2373 | Highway, Street, and Bridge Construction | 608 | 0.006167329 | 20,633 | 0.006443135 | 0.957193851 | 0.029467358 | -0.001317642 | -0.801126266 |
| 238 | Specialty Trade Contractors | 2,402 | 0.024365009 | 91,067 | 0.028437793 | 0.856782667 | 0.026376185 | -0.004408815 | -10.58997467 |
| 2381 | Building Foundation/Exterior Contractors | 119 | 0.001207092 | 15,356 | 0.004795269 | 0.2517257 | 0.007749414 | -0.023035586 | -2.741234745 |
| 2382 | Building Equipment Contractors | 1,701 | 0.017254321 | 44,326 | 0.013841827 | 1.246534981 | 0.038374769 | 0.007589769 | 12.91019666 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2383 | Building Finishing Contractors | 376 | 0.003814006 | 18,930 | 0.005911334 | 0.645202334 | 0.019862652 | -0.010922348 | -4.106802895 |
| 2389 | Other Specialty Trade Contractors | 206 | 0.002089589 | 12,456 | 0.003889676 | 0.537213997 | 0.016538215 | -0.014246785 | -2.93483781 |
| | **Manufacturing** | 9,178 | 0.093098272 | 347,430 | 0.108493116 | 0.858103031 | 0.026416832 | -0.004368168 | -40.09104437 |
| 31-33 | Manufacturing | 9,178 | 0.093098272 | 347,430 | 0.108493116 | 0.858103031 | 0.026416832 | -0.004368168 | -40.09104437 |
| DUR | Durable Goods Manufacturing | 6,721 | 0.068175363 | 229,268 | 0.071594277 | 0.952245989 | 0.029315037 | -0.001469963 | -9.879618477 |
| NONDUR | Non-Durable Goods Manufacturing | 2,458 | 0.024933052 | 118,162 | 0.036898839 | 0.675713731 | 0.02080195 | -0.00998305 | -24.53833723 |
| 311 | Food Manufacturing | 305 | 0.003093808 | 22,563 | 0.007045823 | 0.439098239 | 0.013517706 | -0.017267294 | -5.266524676 |
| 3118 | Bakeries and Tortilla Manufacturing | 291 | 0.002951797 | 8,930 | 0.002788601 | 1.05852283 | 0.032586786 | 0.001801786 | 0.524319759 |
| 314 | Textile Product Mills | 26 | 0.000263734 | 3,190 | 0.000996152 | 0.264753289 | 0.00815047 | -0.02263453 | -0.588497774 |
| 3141 | Textile Furnishings Mills | 24 | 0.000243447 | 1,660 | 0.000518374 | 0.469636511 | 0.014457831 | -0.016327169 | -0.391852048 |
| 315 | Apparel Manufacturing | 67 | 0.000679623 | 5,035 | 0.001572296 | 0.43224903 | 0.013306852 | -0.017478148 | -1.171035914 |
| 3152 | Cut and Sew Apparel Manufacturing | 67 | 0.000679623 | 4,421 | 0.00138056 | 0.492280901 | 0.015154942 | -0.015630058 | -1.047213865 |
| 321 | Wood Product Manufacturing | 58 | 0.000588331 | 2,983 | 0.000931511 | 0.631587374 | 0.019443513 | -0.011341487 | -0.657806232 |
| 3219 | Other Wood Product Manufacturing | 58 | 0.000588331 | 2,463 | 0.000769129 | 0.764931034 | 0.023548518 | -0.007236482 | -0.419715952 |
| 322 | Paper Manufacturing | 523 | 0.005305121 | 16,142 | 0.005040716 | 1.052453811 | 0.03239995 | 0.00161495 | 0.84461908 |
| 3222 | Converted Paper Product Manufacturing | 473 | 0.004797939 | 12,579 | 0.003928086 | 1.221444456 | 0.037602353 | 0.006817353 | 3.22460803 |
| 323 | Printing and Related Support Activities | 503 | 0.005102248 | 17,586 | 0.005491638 | 0.929093914 | 0.028602297 | -0.002182703 | -1.097899467 |
| 3231 | Printing and Related Support Activities | 503 | 0.005102248 | 17,586 | 0.005491638 | 0.929093914 | 0.028602297 | -0.002182703 | -1.097899467 |
| 326 | Plastics & Rubber Products Manufacturing | 201 | 0.00203887 | 18,409 | 0.005748639 | 0.354670085 | 0.010918572 | -0.019866428 | -3.99315194 |
| 3261 | Plastics Product Manufacturing | 150 | 0.001521545 | 15,817 | 0.004939227 | 0.308053284 | 0.009483467 | -0.021301533 | -3.195229927 |
| 327 | Nonmetallic Mineral Product Mfg | 1,444 | 0.014647407 | 7,381 | 0.002304889 | 6.354928769 | 0.195637448 | 0.164852448 | 238.0469342 |
| 3273 | Cement & Concrete Product Manufacturing | 12 | 0.000121724 | 2,195 | 0.00068544 | 0.177584649 | 0.00546697 | -0.02531803 | -0.303816355 |
| 332 | Fabricated Metal Product | 1,794 | 0.018197679 | 38,390 | 0.011988172 | 1.517969431 | 0.04673092 | 0.01594592 | 28.6069796 |

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|---|---|---|---|---|---|---|---|---|---|
| | Manufacturing | | | | | | | | |
| 3321 | Forging and Stamping | 490 | 0.004970381 | 3,188 | 0.000995527 | 4.992711443 | 0.15370138 | 0.12291638 | 60.22902629 |
| 3323 | Architectural and Structural Metals | 170 | 0.001724418 | 6,630 | 0.002070372 | 0.832902359 | 0.025641026 | -0.005143974 | -0.874475641 |
| 3326 | Spring and Wire Product Manufacturing | 245 | 0.00248519 | 1,052 | 0.000328512 | 7.565001939 | 0.232889734 | 0.202104734 | 49.51565979 |
| 3327 | Machine Shops and Threaded Products | 402 | 0.004077741 | 10,508 | 0.003281368 | 1.242695392 | 0.038256566 | 0.007471566 | 3.003569703 |
| 3328 | Coating, Engraving & Heat Treating Metal | 212 | 0.00215045 | 4,046 | 0.001263458 | 1.702035765 | 0.05239743 | 0.02161243 | 4.581835067 |
| 3329 | Other Fabricated Metal Product Mfg | 207 | 0.002099732 | 5,139 | 0.001604773 | 1.3084298 | 0.04028021 | 0.00949521 | 1.965508503 |
| 333 | Machinery Manufacturing | 1,185 | 0.012020206 | 25,277 | 0.007893332 | 1.522830341 | 0.046880563 | 0.016095563 | 19.07324258 |
| 3332 | Industrial Machinery Manufacturing | 50 | 0.000507182 | 5,725 | 0.001787765 | 0.283696 | 0.008733624 | -0.022051376 | -1.102568777 |
| 3335 | Metalworking Machinery Manufacturing | 697 | 0.007070113 | 4,874 | 0.00152202 | 4.645216418 | 0.143003693 | 0.112218693 | 78.21642907 |
| 334 | Computer and Electronic Product Mfg | 1,225 | 0.012425951 | 84,065 | 0.026251256 | 0.473346936 | 0.014572057 | -0.016212943 | -19.86085476 |
| 3344 | Semiconductor and Electronic Components | 903 | 0.009159701 | 20,823 | 0.006502467 | 1.408650164 | 0.043365509 | 0.012580509 | 11.36019989 |
| 337 | Furniture and Related Product Mfg | 328 | 0.003327112 | 6,450 | 0.002014163 | 1.651858446 | 0.050852713 | 0.020067713 | 6.582209922 |
| 3371 | Household and Institutional Furniture | 182 | 0.001846141 | 3,907 | 0.001220052 | 1.513166354 | 0.046583056 | 0.015798056 | 2.875246202 |
| 339 | Miscellaneous Manufacturing | 121 | 0.00122738 | 29,551 | 0.009227989 | 0.133006201 | 0.004094616 | -0.026690384 | -3.229536453 |
| 3391 | Medical Equipment and Supplies Mfg | 35 | 0.000355027 | 14,879 | 0.004646315 | 0.076410493 | 0.002352309 | -0.028432691 | -0.995144198 |
| 3399 | Other Miscellaneous Manufacturing | 85 | 0.000862209 | 14,672 | 0.004581674 | 0.188186431 | 0.005793348 | -0.024991652 | -2.124290431 |
| | **Service-Providing Domain** | 85,743 | 0.869745598 | 2,693,994 | 0.841262421 | 1.033857659 | 0.031827465 | 0.001042465 | 89.3840846 |
| | **Trade, Transportation and Utilities** | 13,811 | 0.140093727 | 614,843 | 0.191999058 | 0.729658408 | 0.022462645 | -0.008322355 | -114.9400458 |
| 22 | Utilities | 401 | 0.004067597 | 14,249 | 0.004449582 | 0.914152572 | 0.028142326 | -0.002642674 | -1.059712363 |
| 221 | Utilities | 401 | 0.004067597 | 14,249 | 0.004449582 | 0.914152572 | 0.028142326 | -0.002642674 | -1.059712363 |
| 42 | Wholesale Trade | 3,253 | 0.032997241 | 135,559 | 0.042331458 | 0.779496924 | 0.023996931 | -0.006788069 | -22.08158772 |

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|---|---|---|---|---|---|---|---|---|---|
| 423 | Merchant Wholesalers, Durable Goods | 1,361 | 0.013805486 | 68,565 | 0.021411019 | 0.644784136 | 0.019849778 | -0.010935222 | -14.88283771 |
| 4231 | Motor Vehicle/Part Merchant Wholesalers | 173 | 0.001754849 | 5,325 | 0.001662855 | 1.055322482 | 0.032488263 | 0.001703263 | 0.294664484 |
| 4233 | Lumber and Supply Merchant Wholesalers | 115 | 0.001166518 | 5,879 | 0.001835855 | 0.635408586 | 0.01956115 | -0.01122385 | -1.290742767 |
| 4234 | Commercial Goods Merchant Wholesalers | 147 | 0.001491114 | 22,307 | 0.006965881 | 0.214059677 | 0.00658986 | -0.02419514 | -3.556685626 |
| 4235 | Metal and Mineral Merchant Wholesalers | 35 | 0.000355027 | 1,903 | 0.000594256 | 0.597431277 | 0.018392013 | -0.012392987 | -0.433754559 |
| 4236 | Electric Goods Merchant Wholesalers | 217 | 0.002201169 | 11,912 | 0.0037198 | 0.591743843 | 0.018216924 | -0.012568076 | -2.727272468 |
| 4237 | Hardware & Plumbing Merchant Wholesalers | 227 | 0.002302605 | 4,700 | 0.001467685 | 1.56886906 | 0.048297872 | 0.017512872 | 3.975422021 |
| 4238 | Machinery & Supply Merchant Wholesalers | 362 | 0.003671995 | 10,018 | 0.003128354 | 1.173778749 | 0.036134957 | 0.005349957 | 1.936684462 |
| 4239 | Misc Durable Goods Merchant Wholesalers | 83 | 0.000841922 | 3,992 | 0.001246595 | 0.675376988 | 0.020791583 | -0.009993417 | -0.829453597 |
| 424 | Merchant Wholesalers, Nondurable Goods | 1,701 | 0.017254321 | 46,152 | 0.014412038 | 1.19721593 | 0.036856474 | 0.006071474 | 10.32757771 |
| 4241 | Paper/Paper Product Merchant Wholesalers | 74 | 0.000750629 | 5,076 | 0.001585099 | 0.473553232 | 0.014578408 | -0.016206592 | -1.199287794 |
| 4244 | Grocery Product Merchant Wholesalers | 106 | 0.001075225 | 14,659 | 0.004577614 | 0.23488767 | 0.007231053 | -0.023553947 | -2.496718425 |
| 4246 | Chemical Merchant Wholesalers | 61 | 0.000618762 | 2,383 | 0.000744147 | 0.831504285 | 0.025597986 | -0.005187014 | -0.31640787 |
| 425 | Electronic Markets and Agents/Brokers | 191 | 0.001937434 | 20,842 | 0.0065084 | 0.297682069 | 0.009164188 | -0.021620812 | -4.12957515 |
| 4251 | Electronic Markets and Agents/Brokers | 191 | 0.001937434 | 20,842 | 0.0065084 | 0.297682069 | 0.009164188 | -0.021620812 | -4.12957515 |
| 44-45 | Retail Trade | 8,732 | 0.088574211 | 357,581 | 0.111663002 | 0.793227919 | 0.024419642 | -0.006365358 | -55.5823062 |
| 441 | Motor Vehicle and Parts Dealers | 1,073 | 0.010884119 | 37,374 | 0.011670903 | 0.932585889 | 0.028709798 | -0.002075202 | -2.226691472 |
| 4411 | Automobile Dealers | 762 | 0.007729449 | 26,753 | 0.008354248 | 0.925211838 | 0.028482787 | -0.002302213 | -1.754286323 |
| 4412 | Other Motor Vehicle Dealers | 44 | 0.00044632 | 2,506 | 0.000782557 | 0.570335374 | 0.017557861 | -0.013227139 | -0.58199411 |
| 4413 | Auto Parts, Accessories, and Tire Stores | 267 | 0.00270835 | 8,115 | 0.002534098 | 1.068763064 | 0.032902033 | 0.002117033 | 0.565247884 |

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|---|---|---|---|---|---|---|---|---|---|
| 442 | Furniture and Home Furnishings Stores | 368 | 0.003732857 | 12,853 | 0.004013649 | 0.93004082 | 0.028631448 | -0.002153552 | -0.792507169 |
| 4421 | Furniture Stores | 292 | 0.002961941 | 5,645 | 0.001762783 | 1.680264316 | 0.051727192 | 0.020942192 | 6.115120124 |
| 4422 | Home Furnishings Stores | 76 | 0.000770916 | 7,208 | 0.002250866 | 0.342497585 | 0.01054384 | -0.02024116 | -1.538328147 |
| 443 | Electronics and Appliance Stores | 356 | 0.003611134 | 12,861 | 0.004016147 | 0.899153748 | 0.027680585 | -0.003104415 | -1.105171842 |
| 4431 | Electronics and Appliance Stores | 356 | 0.003611134 | 12,861 | 0.004016147 | 0.899153748 | 0.027680585 | -0.003104415 | -1.105171842 |
| 444 | Building Material & Garden Supply Stores | 821 | 0.008327923 | 26,705 | 0.008339259 | 0.998640728 | 0.030743306 | -4.16935E-05 | -0.034230366 |
| 4441 | Building Material and Supplies Dealers | 803 | 0.008145338 | 24,045 | 0.007508612 | 1.084799467 | 0.033395716 | 0.002610716 | 2.096405241 |
| 4442 | Lawn & Garden Equipment/Supplies Stores | 18 | 0.000182585 | 2,660 | 0.000830647 | 0.219811074 | 0.006766917 | -0.024018083 | -0.432325489 |
| 445 | Food and Beverage Stores | 2,328 | 0.02361438 | 91,928 | 0.028706661 | 0.82260977 | 0.025324167 | -0.005460833 | -12.71281983 |
| 4451 | Grocery Stores | 1,722 | 0.017467337 | 75,430 | 0.023554776 | 0.741562463 | 0.022829113 | -0.007955887 | -13.70003727 |
| 4452 | Specialty Food Stores | 334 | 0.003387974 | 7,512 | 0.002345797 | 1.444273979 | 0.044462194 | 0.013677194 | 4.568182737 |
| 4453 | Beer, Wine, and Liquor Stores | 272 | 0.002759068 | 8,986 | 0.002806088 | 0.983243737 | 0.030269308 | -0.000515692 | -0.140268275 |
| 446 | Health and Personal Care Stores | 883 | 0.008956829 | 26,074 | 0.008142214 | 1.100048268 | 0.033865153 | 0.003080153 | 2.719775122 |
| 4461 | Health and Personal Care Stores | 883 | 0.008956829 | 26,074 | 0.008142214 | 1.100048268 | 0.033865153 | 0.003080153 | 2.719775122 |
| 447 | Gasoline Stations | 460 | 0.004666072 | 12,798 | 0.003996474 | 1.167547142 | 0.035943116 | 0.005158116 | 2.372733411 |
| 4471 | Gasoline Stations | 460 | 0.004666072 | 12,798 | 0.003996474 | 1.167547142 | 0.035943116 | 0.005158116 | 2.372733411 |
| 448 | Clothing and Clothing Accessories Stores | 966 | 0.00979875 | 38,882 | 0.012141811 | 0.807025448 | 0.024844401 | -0.005940599 | -5.738618626 |
| 4481 | Clothing Stores | 698 | 0.007080256 | 30,237 | 0.009442208 | 0.749851772 | 0.023084301 | -0.007700699 | -5.375088118 |
| 4482 | Shoe Stores | 186 | 0.001886716 | 4,308 | 0.001345273 | 1.402477649 | 0.043175487 | 0.012390487 | 2.304630669 |
| 4483 | Jewelry, Luggage & Leather Goods Stores | 83 | 0.000841922 | 4,338 | 0.001354642 | 0.621508745 | 0.019133241 | -0.011651759 | -0.967095987 |
| 451 | Sporting Goods/Hobby/Book/Music Stores | 466 | 0.004726933 | 19,093 | 0.005962234 | 0.792812417 | 0.024406851 | -0.006378149 | -2.972217584 |
| 4511 | Sporting Goods/Musical | 262 | 0.002657632 | 11,760 | 0.003672334 | 0.723690162 | 0.022278912 | -0.008506088 | -2.22859517 |

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|---|---|---|---|---|---|---|---|---|---|
| | Instrument Stores | | | | | | | | |
| 4512 | Book, Periodical, and Music Stores | 204 | 0.002069301 | 7,333 | 0.0022899 | 0.903664417 | 0.027819446 | -0.002965554 | -0.604972947 |
| 452 | General Merchandise Stores | 606 | 0.006147042 | 43,477 | 0.013576707 | 0.45276386 | 0.013938404 | -0.016846596 | -10.20903705 |
| 4521 | Department Stores | 372 | 0.003773432 | 34,341 | 0.010723778 | 0.351875234 | 0.010832533 | -0.019952467 | -7.422317895 |
| 4529 | Other General Merchandise Stores | 234 | 0.00237361 | 9,135 | 0.002852617 | 0.832081765 | 0.025615764 | -0.005169236 | -1.20960133 |
| 453 | Miscellaneous Store Retailers | 198 | 0.00200844 | 23,820 | 0.00743835 | 0.27001142 | 0.008312343 | -0.022472657 | -4.449586171 |
| 4531 | Florists | 48 | 0.000486894 | 3,391 | 0.001058919 | 0.459803367 | 0.014155116 | -0.016629884 | -0.798234409 |
| 4532 | Office Supply, Stationery & Gift Stores | 68 | 0.000689767 | 12,261 | 0.003828783 | 0.180153092 | 0.00554604 | -0.02523896 | -1.71624926 |
| 4533 | Used Merchandise Stores | 41 | 0.000415889 | 1,806 | 0.000563966 | 0.737436806 | 0.022702104 | -0.008082896 | -0.331398732 |
| 4539 | Other Miscellaneous Store Retailers | 41 | 0.000415889 | 6,362 | 0.001986683 | 0.209338395 | 0.006444514 | -0.024340486 | -0.997959914 |
| 454 | Nonstore Retailers | 208 | 0.002109876 | 11,718 | 0.003659219 | 0.576591904 | 0.017750469 | -0.013034531 | -2.711182372 |
| 4543 | Direct Selling Establishments | 181 | 0.001835998 | 6,852 | 0.002139697 | 0.85806447 | 0.026415645 | -0.004369355 | -0.790853243 |
| 48-49 | Transportation and Warehousing | 1,424 | 0.014444535 | 107,454 | 0.033555016 | 0.430473183 | 0.013252182 | -0.017532818 | -24.96673236 |
| 484 | Truck Transportation | 331 | 0.003357543 | 16,247 | 0.005073504 | 0.661779809 | 0.020372992 | -0.010412008 | -3.446374669 |
| 4841 | General Freight Trucking | 250 | 0.002535908 | 10,371 | 0.003238586 | 0.783029409 | 0.024105679 | -0.006679321 | -1.669830175 |
| 4842 | Specialized Freight Trucking | 82 | 0.000831778 | 5,876 | 0.001834918 | 0.453305266 | 0.013955071 | -0.016829929 | -1.380054139 |
| 485 | Transit and Ground Passenger Transport | 392 | 0.003976304 | 23,734 | 0.007411495 | 0.536505067 | 0.01651639 | -0.01426861 | -5.593295124 |
| 4853 | Taxi and Limousine Service | 39 | 0.000395602 | 3,313 | 0.001034561 | 0.3823859 | 0.011771808 | -0.019013192 | -0.741514487 |
| 488 | Support Activities for Transportation | 57 | 0.000578187 | 9,509 | 0.002969407 | 0.194714685 | 0.005994321 | -0.024790679 | -1.413068693 |
| 4881 | Support Activities for Air Transport | 16 | 0.000162298 | 3,412 | 0.001065477 | 0.152324464 | 0.004689332 | -0.026095668 | -0.417530692 |
| 492 | Couriers and Messengers | 61 | 0.000618762 | 11,982 | 0.003741659 | 0.165370949 | 0.00509097 | -0.02569403 | -1.567335843 |
| 4921 | Couriers | 51 | 0.000517325 | 11,303 | 0.003529625 | 0.146566645 | 0.004512076 | -0.026272924 | -1.339919102 |
| 493 | Warehousing and | 75 | 0.000760773 | 8,636 | 0.002696792 | 0.282102756 | 0.008684576 | -0.022100424 | -1.657531786 |

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|---|---|---|---|---|---|---|---|---|---|
| | Storage | | | | | | | | |
| 4931 | Warehousing and Storage | 75 | 0.000760773 | 8,636 | 0.002696792 | 0.282102756 | 0.008684576 | -0.022100424 | -1.657531786 |
| | **Information** | 1,740 | 0.017649923 | 106,185 | 0.033158741 | 0.532285672 | 0.016386495 | -0.014398505 | -25.05339823 |
| 51 | Information | 1,740 | 0.017649923 | 106,185 | 0.033158741 | 0.532285672 | 0.016386495 | -0.014398505 | -25.05339823 |
| 511 | Publishing Industries | 216 | 0.002191025 | 45,133 | 0.014093831 | 0.155459851 | 0.004785855 | -0.025999145 | -5.61581529 |
| 5111 | Newspaper, Book, & Directory Publishers | 206 | 0.002089589 | 23,912 | 0.007467079 | 0.279840145 | 0.008614921 | -0.022170079 | -4.567036196 |
| 5112 | Software Publishers | 10 | 0.000101436 | 21,221 | 0.006626752 | 0.015307098 | 0.000471231 | -0.030313769 | -0.303137687 |
| 515 | Broadcasting (except Internet) | 70 | 0.000710054 | 6,024 | 0.001881134 | 0.37746073 | 0.011620186 | -0.019164814 | -1.341536985 |
| 5151 | Radio and Television Broadcasting | 59 | 0.000598474 | 5,106 | 0.001594468 | 0.375344365 | 0.011555033 | -0.019229967 | -1.134568036 |
| 517 | Telecommunications | 1,034 | 0.010488517 | 26,709 | 0.008340508 | 1.257539426 | 0.038713542 | 0.007928542 | 8.198112688 |
| 518 | ISPs, Search Portals, & Data Processing | 125 | 0.001267954 | 12,395 | 0.003870628 | 0.327583622 | 0.010084712 | -0.020700288 | -2.587536053 |
| 5182 | Data Processing and Related Services | 56 | 0.000568043 | 8,581 | 0.002679617 | 0.211986802 | 0.006526046 | -0.024258954 | -1.358501429 |
| 519 | Other Information Services | 171 | 0.001734561 | 7,211 | 0.002251803 | 0.770298964 | 0.023713771 | -0.007071229 | -1.209180223 |
| 5191 | Other Information Services | 171 | 0.001734561 | 7,211 | 0.002251803 | 0.770298964 | 0.023713771 | -0.007071229 | -1.209180223 |
| | **Financial Activities** | 8,085 | 0.08201128 | 226,401 | 0.070698989 | 1.160006393 | 0.035710973 | 0.004925973 | 39.82649177 |
| 52 | Finance and Insurance | 7,124 | 0.072263248 | 182,186 | 0.056891825 | 1.270186841 | 0.039102895 | 0.008317895 | 59.25668287 |
| 522 | Credit Intermediation & Related Activity | 1,088 | 0.011036274 | 62,277 | 0.019447445 | 0.567492219 | 0.017470334 | -0.013314666 | -14.48635644 |
| 5221 | Depository Credit Intermediation | 864 | 0.0087641 | 50,109 | 0.015647703 | 0.560088565 | 0.017242412 | -0.013542588 | -11.70079643 |
| 5222 | Nondepository Credit Intermediation | 197 | 0.001998296 | 9,575 | 0.002990017 | 0.668322593 | 0.020574413 | -0.010210587 | -2.011485731 |
| 5223 | Activities Rel to Credit Intermediation | 27 | 0.000273878 | 2,593 | 0.000809725 | 0.338236091 | 0.010412649 | -0.020372351 | -0.550053465 |
| 523 | Financial Investment & Related Activity | 283 | 0.002870648 | 52,049 | 0.016253513 | 0.176617098 | 0.005437184 | -0.025347816 | -7.173431874 |
| 5231 | Security & Commodity Investment Activity | 239 | 0.002424328 | 30,969 | 0.009670792 | 0.250685617 | 0.007717395 | -0.023067605 | -5.513157639 |
| 5239 | Other Financial Investment Activities | 44 | 0.00044632 | 21,067 | 0.006578662 | 0.067843568 | 0.002088575 | -0.028696425 | -1.26264272 |

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|---|---|---|---|---|---|---|---|---|---|
| 524 | Insurance Carriers & Related Activities | 5,743 | 0.058254889 | 63,987 | 0.019981432 | 2.915451133 | 0.089752606 | 0.058967606 | 338.6509612 |
| 5241 | Insurance Carriers | 4,848 | 0.049176337 | 41,621 | 0.012997127 | 3.783631215 | 0.116479662 | 0.085694662 | 415.44772 |
| 5242 | Insurance Agencies, Brokerages & Support | 895 | 0.009078552 | 22,367 | 0.006984617 | 1.29979241 | 0.040014307 | 0.009229307 | 8.260229578 |
| 525 | Funds, Trusts & Other Financial Vehicles | 10 | 0.000101436 | 2,624 | 0.000819405 | 0.123792652 | 0.003810976 | -0.026974024 | -0.269740244 |
| 5251 | Insurance and Employee Benefit Funds | 9 | 9.12927E-05 | 449 | 0.000140211 | 0.651110753 | 0.020044543 | -0.010740457 | -0.096664109 |
| 53 | Real Estate and Rental and Leasing | 961 | 0.009748032 | 44,215 | 0.013807164 | 0.706012609 | 0.021734705 | -0.009050295 | -8.697333095 |
| 531 | Real Estate | 589 | 0.0059746 | 30,051 | 0.009384125 | 0.636670996 | 0.019600013 | -0.011184987 | -6.58795716 |
| 5311 | Lessors of Real Estate | 244 | 0.002475047 | 9,418 | 0.00294099 | 0.841569213 | 0.025907836 | -0.004877164 | -1.190028002 |
| 5312 | Offices of Real Estate Agents & Brokers | 144 | 0.001460683 | 11,624 | 0.003629865 | 0.402407058 | 0.012388162 | -0.018396838 | -2.649144611 |
| 5313 | Activities Related to Real Estate | 202 | 0.002049014 | 9,009 | 0.00281327 | 0.728338859 | 0.022422022 | -0.008362978 | -1.689321471 |
| 532 | Rental and Leasing Services | 372 | 0.003773432 | 13,740 | 0.004290635 | 0.8794576 | 0.027074236 | -0.003710764 | -1.380404279 |
| 5321 | Automotive Equipment Rental and Leasing | 111 | 0.001125943 | 4,178 | 0.001304678 | 0.863004862 | 0.026567736 | -0.004217264 | -0.468116331 |
| 5322 | Consumer Goods Rental | 142 | 0.001440396 | 6,361 | 0.001986371 | 0.725139642 | 0.022323534 | -0.008461466 | -1.201528167 |
| 5323 | General Rental Centers | 82 | 0.000831778 | 1,482 | 0.000462789 | 1.797315617 | 0.055330634 | 0.024545634 | 2.012742011 |
| 5324 | Machinery & Equipment Rental & Leasing | 37 | 0.000375314 | 1,719 | 0.000536798 | 0.699172835 | 0.021524142 | -0.009260858 | -0.342651748 |
| | **Professional and Business Services** | 11,870 | 0.120404934 | 460,871 | 0.143917712 | 0.836623457 | 0.02575558 | -0.00502942 | -59.69921309 |
| 54 | Professional and Technical Services | 4,589 | 0.046549136 | 230,770 | 0.072063312 | 0.645947775 | 0.0198856 | -0.0108994 | -50.01734485 |
| 541 | Professional and Technical Services | 4,589 | 0.046549136 | 230,770 | 0.072063312 | 0.645947775 | 0.0198856 | -0.0108994 | -50.01734485 |
| 5411 | Legal Services | 1,198 | 0.012152073 | 31,006 | 0.009682346 | 1.255075276 | 0.038637683 | 0.007852683 | 9.407514269 |
| 5412 | Accounting and Bookkeeping Services | 1,062 | 0.010772539 | 19,735 | 0.006162714 | 1.748018743 | 0.053813023 | 0.023028023 | 24.45575995 |
| 5413 | Architectural and Engineering Services | 761 | 0.007719305 | 39,158 | 0.012227998 | 0.631281197 | 0.019434088 | -0.011350912 | -8.63804438 |
| 5414 | Specialized Design Services | 22 | 0.00022316 | 3,309 | 0.001033312 | 0.215965616 | 0.006648534 | -0.024136466 | -0.531002245 |

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|---|---|---|---|---|---|---|---|---|---|
| 5415 | Computer Systems Design and Rel Services | 183 | 0.001856285 | 48,393 | 0.015111842 | 0.122836446 | 0.003781539 | -0.027003461 | -4.941633427 |
| 5416 | Management & Technical Consulting Svc | 226 | 0.002292461 | 30,603 | 0.0095565 | 0.239885024 | 0.007384897 | -0.023400103 | -5.288423299 |
| 5417 | Scientific Research and Development Svc | 874 | 0.008865536 | 37,552 | 0.011726487 | 0.756026571 | 0.023274393 | -0.007510607 | -6.564270656 |
| 5418 | Advertising and Related Services | 100 | 0.001014363 | 11,731 | 0.003663278 | 0.276900452 | 0.008524422 | -0.022260578 | -2.226057753 |
| 5419 | Other Professional & Technical Services | 164 | 0.001663556 | 9,282 | 0.002898521 | 0.573932718 | 0.017668606 | -0.013116394 | -2.151088632 |
| 55 | Management of Companies and Enterprises | 2,935 | 0.029771565 | 72,109 | 0.022517716 | 1.322139657 | 0.04070227 | 0.00991727 | 29.10718796 |
| 551 | Management of Companies and Enterprises | 2,935 | 0.029771565 | 72,109 | 0.022517716 | 1.322139657 | 0.04070227 | 0.00991727 | 29.10718796 |
| 5511 | Management of Companies and Enterprises | 2,935 | 0.029771565 | 72,109 | 0.022517716 | 1.322139657 | 0.04070227 | 0.00991727 | 29.10718796 |
| 56 | Administrative and Waste Services | 4,346 | 0.044084233 | 157,991 | 0.049336372 | 0.893544268 | 0.027507896 | -0.003277104 | -14.2422939 |
| 561 | Administrative and Support Services | 4,170 | 0.042298953 | 148,812 | 0.046470016 | 0.910241853 | 0.028021934 | -0.002763066 | -11.52198641 |
| 5611 | Office Administrative Services | 248 | 0.002515621 | 9,414 | 0.002939741 | 0.855728874 | 0.026343743 | -0.004441257 | -1.101431646 |
| 5613 | Employment Services | 3,106 | 0.031506127 | 54,333 | 0.016966746 | 1.856933988 | 0.057165995 | 0.026380995 | 81.93937011 |
| 5614 | Business Support Services | 134 | 0.001359247 | 8,834 | 0.002758622 | 0.492726707 | 0.015168667 | -0.015616333 | -2.092588687 |
| 5615 | Travel Arrangement & Reservation Service | 59 | 0.000598474 | 7,090 | 0.002214018 | 0.270311471 | 0.00832158 | -0.02246342 | -1.325341798 |
| 5616 | Investigation and Security Services | 241 | 0.002444616 | 17,307 | 0.005404514 | 0.452328496 | 0.013925001 | -0.016859999 | -4.063259652 |
| 5617 | Services to Buildings and Dwellings | 271 | 0.002748925 | 46,427 | 0.014497913 | 0.189608311 | 0.005837121 | -0.024947879 | -6.760875306 |
| 5619 | Other Support Services | 110 | 0.0011158 | 4,925 | 0.001537946 | 0.725512918 | 0.022335025 | -0.008449975 | -0.929497208 |
| 562 | Waste Management and Remediation Service | 176 | 0.00178528 | 9,179 | 0.002866357 | 0.622839284 | 0.019174202 | -0.011610798 | -2.043500451 |
| 5629 | Remediation and Other | 129 | 0.001308529 | 3,253 | 0.001015825 | 1.288143796 | 0.039655702 | 0.008870702 | 1.144320613 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Waste Services | | | | | | | | |
| | **Education and Health Services** | 35,707 | 0.362198734 | 741,468 | 0.231540666 | 1.564298576 | 0.048157169 | 0.017372169 | 620.3080489 |
| 61 | Educational Services | 12,022 | 0.121946766 | 300,618 | 0.093874978 | 1.299033771 | 0.039990952 | 0.009205952 | 110.6739546 |
| 611 | Educational Services | 12,022 | 0.121946766 | 300,618 | 0.093874978 | 1.299033771 | 0.039990952 | 0.009205952 | 110.6739546 |
| 6113 | Colleges and Universities | 5,791 | 0.058741784 | 95,262 | 0.02974778 | 1.974661091 | 0.060790242 | 0.030005242 | 173.7603544 |
| 6114 | Business, Computer & Management Training | 12 | 0.000121724 | 2,384 | 0.00074446 | 0.163506 | 0.005033557 | -0.025751443 | -0.309017315 |
| 6115 | Technical and Trade Schools | 51 | 0.000517325 | 2,028 | 0.00063329 | 0.816885006 | 0.025147929 | -0.005637071 | -0.287490621 |
| 6116 | Other Schools and Instruction | 217 | 0.002201169 | 7,836 | 0.002446974 | 0.899547303 | 0.0276927 | -0.0030923 | -0.671029022 |
| 62 | Health Care and Social Assistance | 23,686 | 0.240262111 | 440,850 | 0.137665688 | 1.745257765 | 0.053728025 | 0.022943025 | 543.4284998 |
| 621 | Ambulatory Health Care Services | 6,161 | 0.062494928 | 125,106 | 0.039067265 | 1.599675043 | 0.049246239 | 0.018461239 | 113.7396946 |
| 6211 | Offices of Physicians | 1,253 | 0.012709973 | 45,531 | 0.014218116 | 0.893928084 | 0.027519712 | -0.003265288 | -4.091406059 |
| 6212 | Offices of Dentists | 622 | 0.00630934 | 19,154 | 0.005981283 | 1.054847312 | 0.032473635 | 0.001688635 | 1.050330814 |
| 6213 | Offices of Other Health Practitioners | 187 | 0.00189686 | 11,132 | 0.003476226 | 0.545666269 | 0.016798419 | -0.013986581 | -2.615490652 |
| 6214 | Outpatient Care Centers | 2,663 | 0.027012497 | 20,089 | 0.006273259 | 4.305975424 | 0.132560108 | 0.101775108 | 271.0271113 |
| 6215 | Medical and Diagnostic Laboratories | 312 | 0.003164814 | 4,157 | 0.00129812 | 2.437997571 | 0.075054126 | 0.044269126 | 13.81196718 |
| 6216 | Home Health Care Services | 902 | 0.009149558 | 18,368 | 0.005735836 | 1.59515675 | 0.049107143 | 0.018322143 | 16.52657286 |
| 6219 | Other Ambulatory Health Care Services | 222 | 0.002251887 | 6,674 | 0.002084112 | 1.080501742 | 0.03326341 | 0.00247841 | 0.550207075 |
| 622 | Hospitals | 10,928 | 0.110849631 | 163,388 | 0.051021711 | 2.172597266 | 0.066883737 | 0.036098737 | 394.4869965 |
| 623 | Nursing and Residential Care Facilities | 4,083 | 0.041416457 | 91,133 | 0.028458403 | 1.455333117 | 0.044802651 | 0.014017651 | 57.23406932 |
| 6231 | Nursing Care Facilities | 2,978 | 0.030207742 | 58,666 | 0.018319826 | 1.648909859 | 0.05076194 | 0.01997694 | 59.49132874 |
| 6232 | Residential Mental Health Facilities | 558 | 0.005660148 | 14,526 | 0.004536082 | 1.247805393 | 0.038413879 | 0.007628879 | 4.256914238 |
| 6233 | Community Care Facility for the Elderly | 472 | 0.004787795 | 11,966 | 0.003736662 | 1.281302576 | 0.039445094 | 0.008660094 | 4.087564573 |
| 6239 | Other Residential Care Facilities | 75 | 0.000760773 | 5,975 | 0.001865833 | 0.407738812 | 0.012552301 | -0.018232699 | -1.367452406 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 624 | Social Assistance | 2,514 | 0.025501096 | 61,224 | 0.019118621 | 1.333835501 | 0.041062328 | 0.010277328 | 25.83720385 |
| 6241 | Individual and Family Services | 1,625 | 0.016483405 | 25,726 | 0.008033543 | 2.051822553 | 0.063165669 | 0.032380669 | 52.61858708 |
| 6242 | Emergency and Other Relief Services | 177 | 0.001795423 | 5,024 | 0.001568861 | 1.14441182 | 0.035230892 | 0.004445892 | 0.786922834 |
| 6244 | Child Day Care Services | 510 | 0.005173253 | 22,023 | 0.006877195 | 0.752233025 | 0.023157608 | -0.007627392 | -3.889969943 |
| | **Leisure and Hospitality** | 7,001 | 0.071015581 | 290,914 | 0.090844677 | 0.781725277 | 0.024065531 | -0.006719469 | -47.04299971 |
| 71 | Arts, Entertainment, and Recreation | 1,397 | 0.014170656 | 49,273 | 0.015386643 | 0.920971307 | 0.028352242 | -0.002432758 | -3.398563495 |
| 712 | Museums, Parks and Historical Sites | 272 | 0.002759068 | 6,307 | 0.001969508 | 1.400892377 | 0.043126685 | 0.012341685 | 3.356938221 |
| 7121 | Museums, Parks and Historical Sites | 272 | 0.002759068 | 6,307 | 0.001969508 | 1.400892377 | 0.043126685 | 0.012341685 | 3.356938221 |
| 713 | Amusement, Gambling & Recreation Ind | 470 | 0.004767508 | 35,029 | 0.010938622 | 0.435841738 | 0.013417454 | -0.017367546 | -8.162746569 |
| 7139 | Other Amusement & Recreation Industries | 467 | 0.004737077 | 33,670 | 0.010514242 | 0.450539075 | 0.013869914 | -0.016915086 | -7.899345223 |
| 72 | Accommodation and Food Services | 5,604 | 0.056844924 | 241,640 | 0.075457722 | 0.753334746 | 0.023191525 | -0.007593475 | -42.55383624 |
| 721 | Accommodation | 542 | 0.00549785 | 34,015 | 0.010621977 | 0.517591947 | 0.015934147 | -0.014850853 | -8.049162489 |
| 7211 | Traveler Accommodation | 530 | 0.005376126 | 32,281 | 0.010080495 | 0.533319654 | 0.016418327 | -0.014366673 | -7.614336918 |
| 722 | Food Services and Drinking Places | 5,062 | 0.051347075 | 207,626 | 0.064836058 | 0.791952443 | 0.024380376 | -0.006404624 | -32.42020541 |
| 7221 | Full-Service Restaurants | 2,024 | 0.020530715 | 104,244 | 0.032552619 | 0.630693187 | 0.019415986 | -0.011369014 | -23.0108852 |
| 7222 | Limited-Service Eating Places | 1,804 | 0.018299115 | 73,370 | 0.022911493 | 0.79868718 | 0.024587706 | -0.006197294 | -11.17991811 |
| 7223 | Special Food Services | 862 | 0.008743812 | 20,263 | 0.006327594 | 1.381854193 | 0.042540591 | 0.011755591 | 10.13331964 |
| 7224 | Drinking Places (Alcoholic Beverages) | 372 | 0.003773432 | 9,749 | 0.003044352 | 1.239485837 | 0.03815776 | 0.00737276 | 2.742666635 |
| | **Other Services** | 4,203 | 0.042633693 | 116,564 | 0.036399826 | 1.171260904 | 0.036057445 | 0.005272445 | 22.16008565 |
| 81 | Other Services, Ex. Public Admin | 4,203 | 0.042633693 | 116,564 | 0.036399826 | 1.171260904 | 0.036057445 | 0.005272445 | 22.16008565 |
| 811 | Repair and Maintenance | 976 | 0.009900187 | 27,679 | 0.008643413 | 1.145402485 | 0.03526139 | 0.00447639 | 4.368956153 |
| 8111 | Automotive Repair and Maintenance | 802 | 0.008135194 | 19,753 | 0.006168335 | 1.318863969 | 0.040601428 | 0.009816428 | 7.87277496 |
| 8112 | Electronic Equipment Repair/Maintenance | 95 | 0.000963645 | 3,540 | 0.001105448 | 0.871724079 | 0.026836158 | -0.003948842 | -0.375139972 |
| 8113 | Commercial Machinery | 62 | 0.000628905 | 2,392 | 0.000746958 | 0.841955645 | 0.025919732 | -0.004865268 | -0.301646589 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Repair/Maintenance | | | | | | | | |
| 8114 | Household Goods Repair and Maintenance | 18 | 0.000182585 | 1,995 | 0.000622985 | 0.293081432 | 0.009022556 | -0.021762444 | -0.391723985 |
| 812 | Personal and Laundry Services | 1,108 | 0.011239146 | 36,132 | 0.011283059 | 0.996108069 | 0.030665338 | -0.000119662 | -0.13258527 |
| 8121 | Personal Care Services | 416 | 0.004219752 | 17,182 | 0.00536548 | 0.786463035 | 0.024211384 | -0.006573616 | -2.734624253 |
| 8122 | Death Care Services | 67 | 0.000679623 | 2,684 | 0.000838142 | 0.810869547 | 0.024962742 | -0.005822258 | -0.390091274 |
| 8123 | Drycleaning and Laundry Services | 539 | 0.005467419 | 10,051 | 0.003138659 | 1.741960052 | 0.053626505 | 0.022841505 | 12.3115711 |
| 8129 | Other Personal Services | 86 | 0.000872353 | 6,214 | 0.001940466 | 0.449558177 | 0.013839717 | -0.016945283 | -1.457294358 |
| 813 | Membership Organizations & Associations | 1,598 | 0.016209527 | 35,720 | 0.011154403 | 1.453195432 | 0.044736842 | 0.013951842 | 22.29504368 |
| 8132 | Grantmaking and Giving Services | 101 | 0.001024507 | 2,609 | 0.000814721 | 1.257494209 | 0.03871215 | 0.00792715 | 0.800642175 |
| 8133 | Social Advocacy Organizations | 262 | 0.002657632 | 6,255 | 0.00195327 | 1.360606923 | 0.041886491 | 0.011101491 | 2.908590592 |
| 8134 | Civic and Social Organizations | 1,028 | 0.010427656 | 18,551 | 0.005792982 | 1.800049667 | 0.055414802 | 0.024629802 | 25.3194369 |
| 8139 | Professional and Similar Organizations | 204 | 0.002069301 | 7,764 | 0.00242449 | 0.853499635 | 0.026275116 | -0.004509884 | -0.920016352 |
| 814 | Private Households | 521 | 0.005284833 | 17,033 | 0.005318951 | 0.993585571 | 0.030587683 | -0.000197317 | -0.102802296 |
| 8141 | Private Households | 521 | 0.005284833 | 17,033 | 0.005318951 | 0.993585571 | 0.030587683 | -0.000197317 | -0.102802296 |
| | **Public Administration** | 3,326 | 0.033737726 | 136,749 | 0.042703063 | 0.790054016 | 0.024321933 | -0.006463067 | -21.49616123 |
| 92 | Public Administration | 3,326 | 0.033737726 | 136,749 | 0.042703063 | 0.790054016 | 0.024321933 | -0.006463067 | -21.49616123 |
| 921 | Executive, Legislative, & Gen Government | 541 | 0.005487706 | 34,268 | 0.010700982 | 0.512822659 | 0.015787323 | -0.014997677 | -8.113743013 |
| 9211 | Executive, Legislative, & Gen Government | 541 | 0.005487706 | 34,268 | 0.010700982 | 0.512822659 | 0.015787323 | -0.014997677 | -8.113743013 |
| 922 | Justice, Public Order, and Safety Activi | 1,577 | 0.015996511 | 61,627 | 0.019244467 | 0.831226472 | 0.025589433 | -0.005195567 | -8.193408839 |
| 9221 | Justice, Public Order, and Safety Activi | 1,577 | 0.015996511 | 61,627 | 0.019244467 | 0.831226472 | 0.025589433 | -0.005195567 | -8.193408839 |

| Providence | | | | | | | |
|---|---|---|---|---|---|---|---|
| **NAICS Code** | **Industry Description** | **Employment Providence** | **Employment RI** | **Top Ratio** ri/rt | **Bottom Ratio** si/st | **Quotient Ratio** | **Exported Jobs** |
| ------ | Total | 263,206 | 474,968 | | | | |
| 21---- | Mining | 61 | 215 | 0.000231758 | 0.000452662 | 0.511988187 | -16.49649212 |
| 22---- | Utilities | 1,650 | 1,168 | 0.006268854 | 0.002459113 | 2.549233795 | 1416.551409 |
| 23---- | Construction | 12,459 | 19,709 | 0.047335547 | 0.041494725 | 1.140760585 | 971.8420432 |
| 31---- | Manufacturing | 43,223 | 61,699 | 0.164217381 | 0.129900681 | 1.264176444 | 6327.620607 |
| 42---- | Wholesale trade | 13,904 | 16,410 | 0.052825543 | 0.034549696 | 1.528972745 | 4075.721393 |
| 44---- | Retail trade | 30,150 | 54,800 | 0.11454906 | 0.115375492 | 0.992837027 | -119.6773774 |
| 48---- | Transportation & warehousing | 3,753 | 9,795 | 0.014258793 | 0.020622442 | 0.691421197 | -641.7650887 |
| 51---- | Information | 7,962 | 10,977 | 0.03025007 | 0.023110329 | 1.308941578 | 1363.107061 |
| 52---- | Finance & insurance | 16,117 | 25,501 | 0.061233407 | 0.053689231 | 1.140515619 | 1254.989932 |
| 53---- | Real estate & rental & leasing | 3,617 | 6,120 | 0.013742088 | 0.012884377 | 1.066569861 | 133.4312624 |
| 54---- | Professional, scientific & technical services | 11,357 | 18,810 | 0.043148712 | 0.039601966 | 1.089559852 | 563.648596 |
| 55---- | Management of companies & enterprises | 4,750 | 6,445 | 0.018046701 | 0.013569335 | 1.329962065 | 868.5384655 |
| 56---- | Admin, support, waste mgt, remediation services | 18,083 | 23,879 | 0.068702841 | 0.050275668 | 1.366522699 | 3672.846623 |
| 61---- | Educational services | 14,987 | 16,335 | 0.056940191 | 0.034392492 | 1.655599445 | 5444.83494 |
| 62---- | Health care and social assistance | 47,619 | 69,176 | 0.180919128 | 0.145643496 | 1.242205337 | 6391.391393 |
| 71---- | Arts, entertainment & recreation | 2,826 | 6,756 | 0.010736837 | 0.014224116 | 0.754833354 | -383.941429 |
| 72---- | Accommodation & food services | 18,793 | 39,887 | 0.071400348 | 0.083978289 | 0.850223895 | -1559.804183 |
| 81---- | Other services (except public administration) | 11,382 | 17,701 | 0.043243695 | 0.037268476 | 1.160329053 | 1011.258638 |

**Appendix D: Time Series (County Level)**

The raw data for time series are shown in the tables below. The first two tables contain employment numbers for Worcester County and Massachusetts for each SIC industry sector for the years 1969 to 2000. The third table contains the values for percent changes in employment from the previous year for Worcester County. The fourth table contains values for percent changes in employment for Massachusetts after employment in Worcester County had been subtracted.

## Total full-time and part-time employment by industry – Worcester County

| Code | Item | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Employment by place of work | | | | | | | | | |
| 10 | Total full-time and part-time employment | 271452 | 270169 | 266633 | 272200 | 285542 | 288669 | 276188 | 282355 | 288373 |
| | By type | | | | | | | | | |
| 20 | Wage and salary employment | 245493 | 243768 | 240301 | 245121 | 257260 | 259526 | 246272 | 252526 | 257118 |
| 40 | Proprietors employment | 25959 | 26401 | 26332 | 27079 | 28282 | 29143 | 29916 | 29829 | 31255 |
| 50 | Farm proprietors employment | 1063 | 1047 | 1036 | 1011 | 1011 | 1038 | 1023 | 1098 | 1075 |
| 60 | Nonfarm proprietors employment 2/ | 24896 | 25354 | 25296 | 26068 | 27271 | 28105 | 28893 | 28731 | 30180 |
| | By industry | | | | | | | | | |
| 70 | Farm employment | 1919 | 1921 | 1979 | 1923 | 2046 | 2186 | 2100 | 2302 | 2382 |
| 80 | Nonfarm employment | 269533 | 268248 | 264654 | 270277 | 283496 | 286483 | 274088 | 280053 | 285991 |
| 90 | Private employment | 234060 | 231592 | 227488 | 232050 | 243640 | 245745 | 232949 | 239909 | 246817 |
| 100 | Ag. services, forestry, fishing and other 3/ | 840 | 840 | 910 | 916 | 1062 | 1030 | 1114 | 1084 | 1118 |
| 200 | Mining | 124 | 170 | 168 | 130 | 151 | 159 | 173 | 205 | 207 |
| 300 | Construction | 12079 | 12397 | 12184 | 12620 | 12577 | 11243 | 9810 | 9218 | 9479 |
| 400 | Manufacturing | 100802 | 94451 | 86370 | 87579 | 93826 | 94498 | 83858 | 87205 | 89396 |
| 500 | Transportation and public utilities | 10944 | 11635 | 11918 | 12169 | 12284 | 12057 | 11048 | 11334 | 11468 |
| 610 | Wholesale trade | 9691 | 10031 | 10204 | 10388 | 11788 | 11614 | 11792 | 12927 | 13536 |
| 620 | Retail trade | 38985 | 39871 | 42404 | 42395 | 42787 | 44165 | 42896 | 43944 | 45198 |
| 700 | Finance, insurance, and real estate | 13152 | 13657 | 14177 | 15050 | 16029 | 16103 | 16172 | 16183 | 16831 |
| 800 | Services | 47443 | 48540 | 49153 | 50803 | 53136 | 54876 | 56086 | 57809 | 59584 |
| 900 | Government and government enterprises | 35473 | 36656 | 37166 | 38227 | 39856 | 40738 | 41139 | 40144 | 39174 |
| 910 | Federal, civilian | 3956 | 3835 | 3917 | 3755 | 3874 | 3976 | 3896 | 3718 | 2068 |
| 920 | Military | 5269 | 5505 | 4818 | 4478 | 4214 | 4048 | 3785 | 3445 | 3275 |
| 930 | State and local | 26248 | 27316 | 28431 | 29994 | 31768 | 32714 | 33458 | 32981 | 33831 |
| 931 | State government | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 932 | Local government | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) | | |

| 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 300873 | 311274 | 312318 | 311282 | 303877 | 306945 | 323886 | 336268 | 350984 | 357821 | 372714 | 369667 | 359425 |
| | | | | | | | | | | | | |
| 268474 | 277408 | 276890 | 275727 | 266953 | 269262 | 283913 | 292739 | 304230 | 315539 | 326287 | 323083 | 310615 |
| 32399 | 33866 | 35428 | 35555 | 36924 | 37683 | 39973 | 43529 | 46754 | 42282 | 46427 | 46584 | 48810 |
| 1014 | 1078 | 1091 | 1071 | 1094 | 1212 | 1246 | 1251 | 1302 | 1287 | 1274 | 1222 | 1198 |
| 31385 | 32788 | 34337 | 34484 | 35830 | 36471 | 38727 | 42278 | 45452 | 40995 | 45153 | 45362 | 47612 |
| | | | | | | | | | | | | |
| 2386 | 2437 | 2622 | 2487 | 2406 | 2592 | 2449 | 2186 | 2271 | 2230 | 2165 | 2016 | 2023 |
| 298487 | 308837 | 309696 | 308795 | 301471 | 304353 | 321437 | 334082 | 348713 | 355591 | 370549 | 367651 | 357402 |
| 258830 | 269861 | 270203 | 268552 | 262791 | 265824 | 282316 | 294177 | 307559 | 313055 | 326300 | 323577 | 311596 |
| 1273 | 1182 | 1151 | 1166 | 1275 | 1378 | 1558 | 1897 | 2188 | 2320 | 2508 | 2415 | 2286 |
| 181 | 184 | 228 | 306 | 382 | 407 | 388 | 349 | 322 | 243 | 247 | 305 | 240 |
| 10462 | 11242 | 11123 | 11410 | 11643 | 12314 | 14980 | 17788 | 20577 | 22462 | 23550 | 20514 | 17224 |
| 93794 | 96882 | 94060 | 90723 | 83708 | 78783 | 82006 | 79845 | 77876 | 76211 | 75150 | 74098 | 69097 |
| 11444 | 11785 | 12236 | 12079 | 12162 | 11962 | 12222 | 12860 | 13370 | 13847 | 14964 | 14397 | 14550 |
| 14112 | 14701 | 14916 | 14529 | 13755 | 14916 | 16153 | 17497 | 18860 | 18649 | 18899 | 19945 | 19367 |
| 46737 | 49179 | 49736 | 50425 | 47810 | 50529 | 54150 | 57313 | 60194 | 61818 | 63750 | 64156 | 61193 |
| 17458 | 18547 | 18725 | 18526 | 18673 | 18072 | 19381 | 20800 | 23507 | 24266 | 25129 | 24327 | 23563 |
| 63369 | 66159 | 68028 | 69388 | 73383 | 77463 | 81478 | 85828 | 90665 | 93239 | 102103 | 103420 | 104076 |
| 39657 | 38976 | 39493 | 40243 | 38680 | 38529 | 39121 | 39905 | 41154 | 42536 | 44249 | 44074 | 45806 |
| 2059 | 2156 | 2102 | 2024 | 1988 | 1986 | 2037 | 2205 | 2460 | 2559 | 2728 | 2695 | 2831 |
| 3262 | 3255 | 3179 | 3243 | 3379 | 3515 | 3438 | 3469 | 3439 | 3455 | 3390 | 3373 | 3334 |
| 34336 | 33565 | 34212 | 34976 | 33313 | 33028 | 33646 | 34231 | 35255 | 36522 | 38131 | 38006 | 39641 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (N) | 7315 | 7417 | 10139 | 9865 | 10075 | 10435 | 10635 | 11327 | 12073 | 12832 | 12961 | 15131 |
| (N) | 26250 | 26795 | 24837 | 23448 | 22953 | 23211 | 23596 | 23928 | 24449 | 25299 | 25045 | 24510 |

| 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| 342807 | 352141 | 361403 | 370120 | 372523 | 377214 | 386427 | 393297 | 396785 | 407485 | 406992 |
| | | | | | | | | | | |
| 292837 | 295047 | 303961 | 311037 | 317212 | 320514 | 327429 | 336379 | 337843 | 346381 | 346055 |
| 49970 | 57094 | 57442 | 59083 | 55311 | 56700 | 58998 | 56918 | 58942 | 61104 | 60937 |
| 1186 | 1186 | 1119 | 1068 | 1027 | 999 | 986 | 1000 | 1012 | 1014 | 999 |
| 48784 | 55908 | 56323 | 58015 | 54284 | 55701 | 58012 | 55918 | 57930 | 60090 | 59938 |
| | | | | | | | | | | |
| 1949 | 1884 | 1808 | 1716 | 1607 | 1566 | 1543 | 1549 | 1577 | 1617 | (N) |
| 340858 | 350257 | 359595 | 368404 | 370916 | 375648 | 384884 | 391748 | 395208 | 405868 | (N) |
| 295503 | 303815 | 312025 | 320197 | 321358 | 324576 | 332560 | 338422 | 343518 | 354428 | (N) |
| 2122 | 2209 | 2620 | 2748 | 2665 | 2912 | 3153 | 3201 | 3817 | 4124 | (N) |
| 204 | 291 | 338 | 366 | 283 | 285 | 293 | 322 | 347 | 315 | (N) |
| 14782 | 15499 | 16212 | 17376 | 17105 | 17801 | 19188 | 19568 | 20759 | 21750 | (N) |
| 64093 | 63363 | 62818 | 62511 | 63311 | 63961 | 63905 | 63743 | 60028 | 61381 | (N) |
| 14641 | 14443 | 15565 | 16059 | 15023 | 14862 | 15211 | 15583 | 15634 | 16535 | (N) |
| 18112 | 18649 | 18400 | 19350 | 19586 | 18177 | 18743 | 19164 | 19323 | 19504 | (N) |
| 56682 | 57803 | 58414 | 60034 | 61016 | 61539 | 62364 | 63454 | 64263 | 64753 | (N) |
| 22938 | 23308 | 24644 | 26408 | 25022 | 24994 | 26045 | 26945 | 27330 | 27247 | (N) |
| 101929 | 108250 | 113014 | 115345 | 117347 | 120045 | 123658 | 126442 | 132017 | 138819 | (N) |
| 45355 | 46442 | 47570 | 48207 | 49558 | 51072 | 52324 | 53326 | 51690 | 51440 | (N) |
| 2803 | 2952 | 3374 | 3414 | 2958 | 2880 | 2951 | 3059 | 2984 | 3232 | (N) |
| 3469 | 3392 | 3335 | 2873 | 2854 | 2644 | 2527 | 2435 | 2371 | 2369 | (N) |
| 39083 | 40098 | 40861 | 41920 | 43746 | 45548 | 46846 | 47832 | 46335 | 45839 | (N) |
| 15337 | 16360 | 16428 | 17254 | 18636 | 19070 | 19244 | 20131 | 18269 | 16614 | (N) |
| 23746 | 23738 | 24433 | 24666 | 25110 | 26478 | 27602 | 27701 | 28066 | 29225 | (N) |

## Total full-time and part-time employment by industry -- Massachusetts

| Code | Item | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Employment by place of work | | | | | | | | | |
| 10 | Total full-time and part-time employment | 2678963 | 2679012 | 2643818 | 2696671 | 2786667 | 2811474 | 2727580 | 2755704 | 2833368 |
| | By type | | | | | | | | | |
| 20 | Wage and salary employment | 2426016 | 2419007 | 2382647 | 2425887 | 2503926 | 2519046 | 2425274 | 2453000 | 2518720 |
| 40 | Proprietors employment | 252947 | 260005 | 261171 | 270784 | 282741 | 292428 | 302306 | 302704 | 314648 |
| 50 | Farm proprietors employment | 6207 | 6026 | 5839 | 5627 | 5537 | 5527 | 5546 | 6014 | 5946 |
| 60 | Nonfarm proprietors employment 2/ | 246740 | 253979 | 255332 | 265157 | 277204 | 286901 | 296760 | 296690 | 308702 |
| | By industry | | | | | | | | | |
| 70 | Farm employment | 13595 | 13330 | 13454 | 12733 | 13309 | 13813 | 13125 | 14303 | 14769 |
| 80 | Nonfarm employment | 2665368 | 2665682 | 2630364 | 2683938 | 2773358 | 2797661 | 2714455 | 2741401 | 2818599 |
| 90 | Private employment | 2277673 | 2270017 | 2233761 | 2277614 | 2357220 | 2382437 | 2295936 | 2330038 | 2401351 |
| 100 | Ag. services, forestry, fishing and other 3/ | 13250 | 13530 | 14428 | 14080 | 14910 | 14484 | 15402 | 15924 | 16248 |
| 200 | Mining | 1545 | 1618 | 1466 | 1394 | 1568 | 1524 | 1663 | 1545 | 1765 |
| 300 | Construction | 127714 | 128538 | 130027 | 134437 | 136169 | 126096 | 108203 | 100003 | 99972 |
| 400 | Manufacturing | 688661 | 654812 | 603512 | 608820 | 636728 | 644756 | 586023 | 605599 | 629571 |
| 500 | Transportation and public utilities | 121186 | 124419 | 124273 | 129199 | 130435 | 130840 | 122137 | 121017 | 124060 |
| 610 | Wholesale trade | 128018 | 129580 | 127555 | 130876 | 142214 | 141331 | 138637 | 138293 | 141876 |
| 620 | Retail trade | 428750 | 437273 | 446091 | 446260 | 449315 | 455955 | 448073 | 450930 | 463471 |
| 700 | Finance, insurance, and real estate | 179133 | 182638 | 185366 | 190012 | 196223 | 201208 | 202435 | 204033 | 210220 |
| 800 | Services | 589416 | 597609 | 601043 | 622536 | 649658 | 666243 | 673363 | 692694 | 714168 |
| 900 | Government and government enterprises | 387695 | 395665 | 396603 | 406324 | 416138 | 415224 | 418519 | 411363 | 417248 |
| 910 | Federal, civilian | 67010 | 65352 | 63365 | 64090 | 61371 | 57984 | 57685 | 57544 | 56921 |
| 920 | Military | 79764 | 78410 | 69661 | 62549 | 57708 | 50452 | 46365 | 42833 | 40599 |
| 930 | State and local | 240921 | 251903 | 263577 | 279685 | 297059 | 306788 | 314469 | 310986 | 319728 |
| 931 | State government | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) |
| 932 | Local government | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) |

| 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 2958887 | 3078936 | 3142111 | 3154782 | 3157051 | 3230275 | 3422116 | 3533117 | 3629504 | 3661150 | 3770718 | 3744282 | 3647410 |
| | | | | | | | | | | | | |
| 2635326 | 2735243 | 2778330 | 2789204 | 2772227 | 2839255 | 3009891 | 3086103 | 3151749 | 3235144 | 3306116 | 3283042 | 3162709 |
| 323561 | 343693 | 363781 | 365578 | 384824 | 391020 | 412225 | 447014 | 477755 | 426006 | 464602 | 461240 | 484701 |
| 5646 | 5898 | 5863 | 5718 | 5685 | 6281 | 6425 | 6431 | 6663 | 6569 | 6497 | 6240 | 6105 |
| 317915 | 337795 | 357918 | 359860 | 379139 | 384739 | 405800 | 440583 | 471092 | 419437 | 458105 | 455000 | 478596 |
| | | | | | | | | | | | | |
| 14746 | 14796 | 15753 | 14740 | 13928 | 15195 | 14445 | 12903 | 13683 | 13797 | 13394 | 12304 | 12172 |
| 2944141 | 3064140 | 3126358 | 3140042 | 3143123 | 3215080 | 3407671 | 3520214 | 3615821 | 3647353 | 3757324 | 3731978 | 3635238 |
| 2519849 | 2629280 | 2684617 | 2715812 | 2737082 | 2804471 | 2993031 | 3097070 | 3182453 | 3201854 | 3302047 | 3280144 | 3186646 |
| 17687 | 19332 | 20154 | 20698 | 21303 | 22712 | 25154 | 27824 | 29943 | 29430 | 31221 | 30623 | 29459 |
| 1795 | 1899 | 2082 | 2594 | 2780 | 2919 | 2839 | 2942 | 3061 | 3187 | 3023 | 2818 | 2518 |
| 103444 | 109313 | 108818 | 113638 | 117386 | 121134 | 140268 | 158161 | 180755 | 195131 | 206097 | 189152 | 162367 |
| 666077 | 685245 | 688392 | 680927 | 651634 | 645967 | 686947 | 671639 | 634620 | 610369 | 597811 | 573488 | 533872 |
| 127716 | 131343 | 132353 | 131308 | 131154 | 132103 | 135644 | 138909 | 139798 | 144020 | 148567 | 142386 | 145879 |
| 141586 | 150603 | 156319 | 154927 | 151586 | 157743 | 171174 | 172873 | 180372 | 180305 | 186618 | 190625 | 181634 |
| 480330 | 494907 | 500268 | 505606 | 505621 | 527706 | 562902 | 587923 | 601532 | 607403 | 618908 | 623957 | 595720 |
| 215453 | 230158 | 238807 | 243423 | 247199 | 246782 | 258771 | 271945 | 301182 | 306169 | 315313 | 305690 | 299397 |
| 765761 | 806480 | 837424 | 862691 | 908419 | 947405 | 1009332 | 1064854 | 1111190 | 1125840 | 1194489 | 1221405 | 1235800 |
| 424292 | 434860 | 441741 | 424230 | 406041 | 410609 | 414640 | 423144 | 433368 | 445499 | 455277 | 451834 | 448592 |
| 57783 | 58680 | 58624 | 56527 | 54897 | 54811 | 56307 | 57668 | 58909 | 60506 | 62184 | 61243 | 63251 |
| 41043 | 41348 | 40513 | 40246 | 41667 | 43506 | 42689 | 42223 | 41543 | 41658 | 41238 | 41065 | 39938 |
| 325466 | 334832 | 342604 | 327457 | 309477 | 312292 | 315644 | 323253 | 332916 | 343335 | 351855 | 349526 | 345403 |
| (N) | 90436 | 94167 | 94709 | 90092 | 94714 | 103762 | 106463 | 111104 | 116402 | 119470 | 118287 | 117485 |
| (N) | 244396 | 248437 | 232748 | 219385 | 217578 | 211882 | 216790 | 221812 | 226933 | 232385 | 231239 | 227918 |

| 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| 3480244 | 3512166 | 3579478 | 3651033 | 3686055 | 3752171 | 3845046 | 3928603 | 3992754 | 4104314 | 4117820 |
| | | | | | | | | | | |
| 2988983 | 2966302 | 3018303 | 3072925 | 3142192 | 3192934 | 3272883 | 3350474 | 3410030 | 3498041 | 3496271 |
| 491261 | 545864 | 561175 | 578108 | 543863 | 559237 | 572163 | 578129 | 582724 | 606273 | 621549 |
| 6060 | 6044 | 5843 | 5716 | 5636 | 5592 | 5636 | 5725 | 5788 | 5804 | 5708 |
| 485201 | 539820 | 555332 | 572392 | 538227 | 553645 | 566527 | 572404 | 576936 | 600469 | 615841 |
| | | | | | | | | | | |
| 12032 | 11876 | 11634 | 11631 | 11190 | 10870 | 10650 | 10648 | 10735 | 10903 | (N) |
| 3468212 | 3500290 | 3567844 | 3639402 | 3674865 | 3741301 | 3834396 | 3917955 | 3982019 | 4093411 | (N) |
| 3033445 | 3073756 | 3136812 | 3211116 | 3241048 | 3309766 | 3400375 | 3478032 | 3534620 | 3638406 | (N) |
| 29253 | 29272 | 32531 | 33931 | 32401 | 34896 | 36234 | 36368 | 39151 | 40878 | (N) |
| 2232 | 2337 | 2327 | 2579 | 2378 | 2115 | 2261 | 2301 | 2416 | 2326 | (N) |
| 139167 | 142409 | 150757 | 160556 | 161569 | 164688 | 174471 | 183768 | 195829 | 205991 | (N) |
| 497237 | 479748 | 468185 | 465203 | 460188 | 460699 | 462587 | 462486 | 445925 | 449603 | (N) |
| 139674 | 138273 | 144525 | 149818 | 147534 | 149196 | 152710 | 157190 | 159334 | 164581 | (N) |
| 170952 | 171234 | 167131 | 172056 | 177447 | 178099 | 181556 | 187076 | 188432 | 189520 | (N) |
| 557423 | 564005 | 568756 | 588193 | 593997 | 602109 | 611795 | 618568 | 630931 | 642383 | (N) |
| 285387 | 278705 | 284230 | 300465 | 296928 | 303317 | 310900 | 328463 | 335427 | 349484 | (N) |
| 1212120 | 1267773 | 1318370 | 1338315 | 1368606 | 1414647 | 1467861 | 1501812 | 1537175 | 1593640 | (N) |
| 434767 | 426534 | 431032 | 428286 | 433817 | 431535 | 434021 | 439923 | 447399 | 455005 | (N) |
| 60041 | 59103 | 59593 | 58733 | 58042 | 55257 | 54824 | 54600 | 55277 | 57214 | (N) |
| 40187 | 38448 | 36473 | 31237 | 29901 | 27087 | 25477 | 24369 | 23618 | 23375 | (N) |
| 334539 | 328983 | 334966 | 338316 | 345874 | 349191 | 353720 | 360954 | 368504 | 374416 | (N) |
| 116331 | 114191 | 114502 | 115030 | 117405 | 114726 | 116226 | 119962 | 120533 | 121485 | (N) |
| 218208 | 214792 | 220464 | 223286 | 228469 | 234465 | 237494 | 240992 | 247971 | 252931 | (N) |

**Percent change in full-time and part-time employment by industry – Worcester County**

| Code | Item | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Employment by place of work | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
| 10 | Total full-time and part-time employment | -0.472643414 | -1.30881 | 2.087889 | 4.901543 | 1.09511 | -4.32364 | 2.232899 | 2.131359 |
| | By type | | | | | | | | |
| 20 | Wage and salary employment | -0.702667693 | -1.42225 | 2.005818 | 4.952248 | 0.880821 | -5.107 | 2.539469 | 1.818427 |
| 40 | Proprietors employment | 1.702685003 | -0.26135 | 2.836852 | 4.442557 | 3.044339 | 2.652438 | -0.29081 | 4.780583 |
| 50 | Farm proprietors employment | -1.505174036 | -1.05062 | -2.41313 | 0 | 2.670623 | -1.44509 | 7.331378 | -2.09472 |
| 60 | Nonfarm proprietors employment 2/ | 1.839652956 | -0.22876 | 3.051866 | 4.614853 | 3.058194 | 2.803772 | -0.56069 | 5.043333 |
| | By industry | | | | | | | | |
| 70 | Farm employment | 0.104220948 | 3.019261 | -2.82971 | 6.396256 | 6.84262 | -3.93413 | 9.619048 | 3.475239 |
| 80 | Nonfarm employment | -0.476750528 | -1.3398 | 2.124661 | 4.890908 | 1.05363 | -4.32661 | 2.176308 | 2.120313 |
| 90 | Private employment | -1.054430488 | -1.77208 | 2.005381 | 4.994613 | 0.86398 | -5.20702 | 2.987778 | 2.879425 |
| 100 | Ag. Services, forestry, fishing and other 3/ | 0 | 8.333333 | 0.659341 | 15.93886 | -3.01318 | 8.15534 | -2.693 | 3.136531 |
| 200 | Mining | 37.09677419 | -1.17647 | -22.619 | 16.15385 | 5.298013 | 8.805031 | 18.49711 | 0.97561 |
| 300 | Construction | 2.632668267 | -1.71816 | 3.578464 | -0.34073 | -10.6067 | -12.7457 | -6.03466 | 2.831417 |
| 400 | Manufacturing | -6.300470229 | -8.55576 | 1.399792 | 7.132989 | 0.716219 | -11.2595 | 3.991271 | 2.512471 |
| 500 | Transportation and public utilities | 6.313961988 | 2.432316 | 2.106058 | 0.945024 | -1.84793 | -8.36858 | 2.588704 | 1.182283 |
| 610 | Wholesale trade | 3.508409865 | 1.724654 | 1.803214 | 13.47709 | -1.47608 | 1.532633 | 9.62517 | 4.71107 |
| 620 | Retail trade | 2.272668975 | 6.352988 | -0.02122 | 0.924637 | 3.220604 | -2.87332 | 2.443118 | 2.853632 |
| 700 | Finance, insurance, and real estate | 3.839720195 | 3.807571 | 6.157861 | 6.504983 | 0.461663 | 0.428492 | 0.068019 | 4.004202 |
| 800 | Services | 2.312248382 | 1.262876 | 3.356865 | 4.592248 | 3.274616 | 2.204971 | 3.072068 | 3.070456 |
| 900 | Government and government enterprises | 3.334930792 | 1.391314 | 2.85476 | 4.261386 | 2.212967 | 0.984339 | -2.41863 | -2.4163 |
| 910 | Federal, civilian | -3.058645096 | 2.138201 | -4.13582 | 3.169108 | 2.632938 | -2.01207 | -4.56879 | -44.3787 |
| 920 | Military | 4.479028279 | -12.4796 | -7.05687 | -5.89549 | -3.93925 | -6.49704 | -8.98283 | -4.93469 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 930 | State and local | 4.068881439 | 4.081857 | 5.49752 | 5.914516 | 2.977839 | 2.274256 | -1.42567 | 2.577241 |

| 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.334664 | 3.45694 | 0.335396 | -0.33171 | -2.37887 | 1.009619 | 5.51923 | 3.82295 | 4.376271 | 1.947952 | 4.162137 | -0.81752 | -2.7706 |
| | | | | | | | | | | | | |
| 4.416649 | 3.327697 | -0.18673 | -0.42002 | -3.18213 | 0.864946 | 5.441169 | 3.108699 | 3.92534 | 3.717253 | 3.406235 | -0.98196 | -3.85907 |
| 3.660214 | 4.527918 | 4.612296 | 0.358474 | 3.850373 | 2.055574 | 6.077011 | 8.896005 | 7.408854 | -9.56496 | 9.803226 | 0.338165 | 4.778465 |
| -5.67442 | 6.311637 | 1.205937 | -1.83318 | 2.147526 | 10.78611 | 2.805281 | 0.401284 | 4.076739 | -1.15207 | -1.0101 | -4.08163 | -1.96399 |
| 3.99271 | 4.470288 | 4.724289 | 0.42811 | 3.903259 | 1.789004 | 6.185737 | 9.169313 | 7.507451 | -9.80595 | 10.1427 | 0.462871 | 4.960099 |
| | | | | | | | | | | | | |
| 0.167926 | 2.137469 | 7.591301 | -5.14874 | -3.25694 | 7.730673 | -5.51698 | -10.7391 | 3.888381 | -1.80537 | -2.9148 | -6.88222 | 0.347222 |
| 4.369368 | 3.467488 | 0.27814 | -0.29093 | -2.3718 | 0.955979 | 5.613219 | 3.933897 | 4.379464 | 1.972396 | 4.206518 | -0.78208 | -2.7877 |
| 4.867169 | 4.261871 | 0.126732 | -0.61102 | -2.14521 | 1.154149 | 6.204105 | 4.201321 | 4.548962 | 1.786974 | 4.230886 | -0.83451 | -3.70267 |
| 13.86404 | -7.14847 | -2.62267 | 1.303215 | 9.348199 | 8.078431 | 13.06241 | 21.75866 | 15.34001 | 6.032907 | 8.103448 | -3.70813 | -5.34161 |
| -12.5604 | 1.657459 | 23.91304 | 34.21053 | 24.8366 | 6.544503 | -4.6683 | -10.0515 | -7.73639 | -24.5342 | 1.646091 | 23.48178 | -21.3115 |
| 10.37029 | 7.455553 | -1.05853 | 2.580239 | 2.042068 | 5.763119 | 21.65015 | 18.74499 | 15.67911 | 9.160713 | 4.843736 | -12.8917 | -16.0378 |
| 4.919683 | 3.292321 | -2.91282 | -3.54774 | -7.73233 | -5.88355 | 4.090984 | -2.63517 | -2.46603 | -2.13801 | -1.39219 | -1.39987 | -6.74917 |
| -0.20928 | 2.979727 | 3.826899 | -1.2831 | 0.687143 | -1.64447 | 2.17355 | 5.220095 | 3.965785 | 3.567689 | 8.066729 | -3.78909 | 1.062721 |
| 4.255319 | 4.173753 | 1.462486 | -2.59453 | -5.32728 | 8.440567 | 8.293108 | 8.320436 | 7.789907 | -1.11877 | 1.340554 | 5.534684 | -2.89797 |
| 3.405018 | 5.224982 | 1.132597 | 1.385314 | -5.18592 | 5.687095 | 7.166182 | 5.841182 | 5.026783 | 2.697943 | 3.125303 | 0.636863 | -4.61843 |
| 3.725269 | 6.237828 | 0.959724 | -1.06275 | 0.793479 | -3.21855 | 7.243249 | 7.321604 | 13.01442 | 3.228825 | 3.556416 | -3.19153 | -3.14054 |
| 6.352376 | 4.402784 | 2.825012 | 1.999177 | 5.75748 | 5.559871 | 5.18312 | 5.338864 | 5.63569 | 2.839023 | 9.506751 | 1.289874 | 0.634307 |
| 1.232961 | -1.71723 | 1.326457 | 1.899071 | -3.88391 | -0.39038 | 1.536505 | 2.004039 | 3.129934 | 3.358118 | 4.027177 | -0.39549 | 3.929755 |
| -0.4352 | 4.711025 | -2.50464 | -3.71075 | -1.77866 | -0.1006 | 2.567976 | 8.247423 | 11.56463 | 4.02439 | 6.604142 | -1.20968 | 5.046382 |
| -0.39695 | -0.21459 | -2.33487 | 2.013212 | 4.193648 | 4.024859 | -2.19061 | 0.901687 | -0.8648 | 0.465252 | -1.88133 | -0.50147 | -1.15624 |
| 1.492714 | -2.24546 | 1.927603 | 2.233135 | -4.75469 | -0.85552 | 1.87114 | 1.738691 | 2.991441 | 3.593816 | 4.405564 | -0.32782 | 4.301952 |

| 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|
| -4.6235 | 2.722815 | 2.630196 | 2.411989 | 0.649249 | 1.259251 | 2.44238 | 1.777826 | 0.886862 | 2.696675 |
| | | | | | | | | | |
| -5.72348 | 0.754686 | 3.021214 | 2.32793 | 1.985294 | 1.040944 | 2.157472 | 2.733417 | 0.435223 | 2.527209 |
| 2.376562 | 14.25655 | 0.609521 | 2.856795 | -6.38424 | 2.511255 | 4.05291 | -3.52554 | 3.555993 | 3.668013 |
| -1.00167 | 0 | -5.64924 | -4.55764 | -3.83895 | -2.72639 | -1.3013 | 1.419878 | 1.2 | 0.197628 |
| 2.461564 | 14.60315 | 0.742291 | 3.004101 | -6.4311 | 2.610346 | 4.148938 | -3.6096 | 3.598126 | 3.728638 |
| | | | | | | | | | |
| -3.65793 | -3.33504 | -4.03397 | -5.0885 | -6.35198 | -2.55134 | -1.46871 | 0.388853 | 1.807618 | 2.536462 |
| -4.62896 | 2.757453 | 2.666042 | 2.4497 | 0.68186 | 1.275761 | 2.458685 | 1.783394 | 0.883221 | 2.697314 |
| -5.1647 | 2.812831 | 2.702302 | 2.619021 | 0.362589 | 1.001375 | 2.459825 | 1.762689 | 1.505812 | 3.175962 |
| -7.1741 | 4.099906 | 18.6057 | 4.885496 | -3.02038 | 9.268293 | 8.276099 | 1.52236 | 19.24399 | 8.042966 |
| -15 | 42.64706 | 16.1512 | 8.284024 | -22.6776 | 0.706714 | 2.807018 | 9.897611 | 7.763975 | -9.2219 |
| -14.1779 | 4.850494 | 4.600297 | 7.179867 | -1.55962 | 4.068986 | 7.791697 | 1.980404 | 6.086468 | 4.773833 |
| -7.24199 | -1.13897 | -0.86012 | -0.48871 | 1.279775 | 1.026678 | -0.08755 | -0.2535 | -5.82809 | 2.253948 |
| 0.62543 | -1.35237 | 7.768469 | 3.173787 | -6.45121 | -1.07169 | 2.348271 | 2.445599 | 0.32728 | 5.76308 |
| -6.4801 | 2.964885 | -1.33519 | 5.163043 | 1.219638 | -7.19391 | 3.113825 | 2.246172 | 0.829681 | 0.936708 |
| -7.37176 | 1.9777 | 1.057039 | 2.773308 | 1.63574 | 0.857152 | 1.340613 | 1.747803 | 1.274939 | 0.762492 |
| -2.65246 | 1.613044 | 5.731938 | 7.157929 | -5.24841 | -0.1119 | 4.205009 | 3.455558 | 1.428837 | -0.3037 |
| -2.06292 | 6.201375 | 4.400924 | 2.062576 | 1.735663 | 2.299164 | 3.009705 | 2.251371 | 4.409136 | 5.152367 |
| -0.98459 | 2.396649 | 2.428836 | 1.339079 | 2.802498 | 3.055006 | 2.451441 | 1.914991 | -3.06792 | -0.48365 |
| -0.98905 | 5.315733 | 14.29539 | 1.185536 | -13.3568 | -2.63692 | 2.465278 | 3.659776 | -2.45178 | 8.310992 |
| 4.04919 | -2.21966 | -1.68042 | -13.8531 | -0.66133 | -7.35809 | -4.42511 | -3.64068 | -2.62834 | -0.08435 |
| -1.40763 | 2.597037 | 1.902838 | 2.591713 | 4.355916 | 4.119234 | 2.849741 | 2.104769 | -3.1297 | -1.07047 |

**Percent change in full-time and part-time employment by industry – Massachusetts (after Worcester County employment has been subtracted)**

| Code | Item | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|
| | Employment by place of work | | | | | | | | |
| 10 | Total full-time and part-time employment | 0.05532685 | -1.31424 | 1.989159 | 3.161679 | 0.86681 | -2.8307 | 0.895695 | 2.89672 |
| | By type | | | | | | | | |
| 20 | Wage and salary employment | -0.242327185 | -1.51216 | 1.793361 | 3.021874 | 0.572137 | -3.5635 | 0.985405 | 2.777947 |
| 40 | Proprietors employment | 2.914691526 | 0.528672 | 3.775352 | 4.412712 | 3.468535 | 3.45823 | 0.178054 | 3.854512 |
| 50 | Farm proprietors employment | -3.207620529 | -3.53485 | -3.8934 | -1.94974 | -0.8175 | 0.757407 | 8.688923 | -0.91538 |
| 60 | Nonfarm proprietors employment 2/ | 3.056652422 | 0.617168 | 3.935471 | 4.53555 | 3.54615 | 3.505077 | 0.034345 | 3.942021 |
| | By industry | | | | | | | | |
| 70 | Farm employment | -2.286742035 | 0.578491 | -5.79521 | 4.190564 | 3.231821 | -5.1776 | 8.852608 | 3.216399 |
| 80 | Nonfarm employment | 0.066740823 | -1.32325 | 2.026918 | 3.157071 | 0.856112 | -2.81983 | 0.859748 | 2.895162 |
| 90 | Private employment | -0.253864112 | -1.5773 | 1.958407 | 3.325049 | 1.0935 | -3.44949 | 1.315665 | 3.081389 |
| 100 | Ag. Services, forestry, fishing and other 3/ | 2.256244964 | 6.524823 | -2.61873 | 5.195989 | -2.84518 | 6.1989 | 3.863382 | 1.954178 |
| 200 | Mining | 1.900070373 | -10.3591 | -2.61941 | 12.10443 | -3.66972 | 9.157509 | -10.0671 | 16.26866 |
| 300 | Construction | 0.437583777 | 1.46546 | 3.372283 | 1.457104 | -7.07085 | -14.3314 | -7.73226 | -0.32164 |
| 400 | Manufacturing | -4.677652294 | -7.71271 | 0.792626 | 4.155659 | 1.354941 | -8.74008 | 3.231806 | 4.20163 |
| 500 | Transportation and public utilities | 2.305836251 | -0.38037 | 4.160919 | 0.957874 | 0.534909 | -6.47736 | -1.26565 | 2.652189 |
| 610 | Wholesale trade | 1.032731329 | -1.83858 | 2.673177 | 8.248124 | -0.5436 | -2.21405 | -1.16599 | 2.372254 |
| 620 | Retail trade | 1.959385784 | 1.581522 | 0.044094 | 0.659379 | 1.294376 | -1.60592 | 0.446472 | 2.773314 |
| 700 | Finance, insurance, and real estate | 1.807435791 | 1.306656 | 2.203997 | 2.990364 | 2.725396 | 0.625591 | 0.852021 | 2.948629 |
| 800 | Services | 1.309290315 | 0.513779 | 3.595463 | 4.335765 | 2.488592 | 0.966686 | 2.852528 | 3.102767 |
| 900 | Government and government enterprises | 1.926909733 | 0.119217 | 2.409323 | 2.223599 | -0.4773 | 0.772793 | -1.63257 | 1.846619 |
| 910 | Federal, civilian | -2.437593174 | -3.3633 | 1.49206 | -4.70374 | -6.06814 | -0.4055 | 0.068787 | 1.908 |
| 920 | Military | -2.134371434 | -11.0582 | -10.4437 | -7.88173 | -13.2538 | -8.24067 | -7.49648 | -5.24017 |
| 930 | State and local | 4.618186731 | 4.701519 | 6.185519 | 6.247722 | 3.310704 | 2.531068 | -1.06971 | 2.838798 |

| 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 4.440834 | 4.125185 | 2.244891 | 0.484382 | 0.340215 | 2.458876 | 5.982903 | 3.183075 | 2.554734 | 0.756713 | 2.866048 | -0.68832 | -2.56711 |
| | | | | | | | | | | | | |
| 4.653781 | 3.844051 | 1.774122 | 0.481203 | -0.32636 | 2.58331 | 6.069472 | 2.471994 | 1.938702 | 2.531537 | 2.062745 | -0.66682 | -3.64414 |
| 2.741423 | 6.410521 | 5.979466 | 0.508599 | 5.416895 | 1.562805 | 5.353246 | 8.390284 | 6.819584 | -10.9691 | 8.978068 | -0.84151 | 5.121112 |
| -4.90659 | 4.058722 | -0.99585 | -2.61945 | -1.20508 | 10.41168 | 2.170053 | 0.019309 | 3.494208 | -1.47361 | -1.117 | -3.92495 | -2.21204 |
| 2.875177 | 6.448539 | 6.089696 | 0.55473 | 5.51147 | 1.444471 | 5.399577 | 8.508389 | 6.862831 | -11.0887 | 9.118967 | -0.80251 | 5.210942 |
| | | | | | | | | | | | | |
| -0.21797 | -0.00809 | 6.24646 | -6.68647 | -5.96589 | 9.382052 | -4.81631 | -10.6619 | 6.485024 | 1.358219 | -2.92211 | -8.38009 | -1.35109 |
| 4.46362 | 4.144495 | 2.226942 | 0.517812 | 0.367506 | 2.430804 | 6.029662 | 3.23689 | 2.541514 | 0.754612 | 2.886387 | -0.66281 | -2.57083 |
| 4.942368 | 4.35202 | 2.33087 | 1.360413 | 1.104541 | 2.600988 | 6.777941 | 3.400505 | 2.56881 | 0.48367 | 3.009832 | -0.64454 | -2.75715 |
| 8.486451 | 10.57634 | 4.699725 | 2.783771 | 2.539422 | 6.520871 | 10.60279 | 9.878793 | 7.050565 | -2.32391 | 5.912947 | -1.75879 | -3.66917 |
| 3.594352 | 6.257745 | 8.104956 | 23.40885 | 4.807692 | 4.753962 | -2.42834 | 5.793554 | 5.630544 | 7.484483 | -5.70652 | -9.47406 | -9.35137 |
| 2.750489 | 5.473102 | -0.3834 | 4.639951 | 3.438393 | 2.909885 | 15.13325 | 12.04026 | 14.10884 | 7.7982 | 5.720772 | -7.61941 | -13.9322 |
| 5.944 | 2.809799 | 1.01451 | -0.69456 | -3.77463 | -0.13065 | 6.656923 | -2.17327 | -5.92267 | -4.0568 | -2.15236 | -4.45241 | -6.93146 |
| 3.268438 | 2.826132 | 0.467555 | -0.73928 | -0.19878 | 0.965611 | 2.730958 | 2.12847 | 0.300677 | 2.96216 | 2.634955 | -4.202 | 2.609599 |
| -0.67477 | 6.611544 | 4.04777 | -0.71073 | -1.82837 | 3.624729 | 8.537601 | 0.229001 | 3.94913 | 0.089157 | 3.750557 | 1.765453 | -4.92911 |
| 3.66268 | 2.798708 | 1.077787 | 1.031891 | 0.577792 | 4.23013 | 6.617041 | 4.296396 | 2.021824 | 0.784538 | 1.75463 | 0.836338 | -4.51482 |
| 2.381728 | 6.876941 | 4.0031 | 2.187821 | 1.613628 | 0.080516 | 4.669669 | 4.910397 | 10.56362 | 1.522643 | 2.937535 | -3.0398 | -1.96508 |
| 7.30357 | 5.399976 | 3.92735 | 3.107243 | 5.260663 | 4.180179 | 6.656996 | 5.515092 | 4.238805 | 1.183313 | 5.789748 | 2.343402 | 1.228907 |
| 1.735375 | 2.924591 | 1.607542 | -4.53974 | -4.32983 | 1.284567 | 0.924264 | 2.055821 | 2.341881 | 2.740596 | 2.001424 | -0.79508 | -1.21984 |
| 1.58788 | 1.435647 | -0.00354 | -3.57206 | -2.92461 | -0.15876 | 2.735447 | 2.198268 | 1.777762 | 2.653723 | 2.604104 | -1.52718 | 3.197377 |
| 1.224413 | 0.825812 | -1.99249 | -0.88659 | 3.472691 | 4.447869 | -1.85042 | -1.26621 | -1.67725 | 0.259815 | -0.92925 | -0.41218 | -2.88655 |
| 1.830379 | 3.48195 | 2.365012 | -5.15934 | -5.57882 | 1.122521 | 0.979002 | 2.490798 | 2.989046 | 3.074639 | 2.252512 | -0.70253 | -1.84836 |

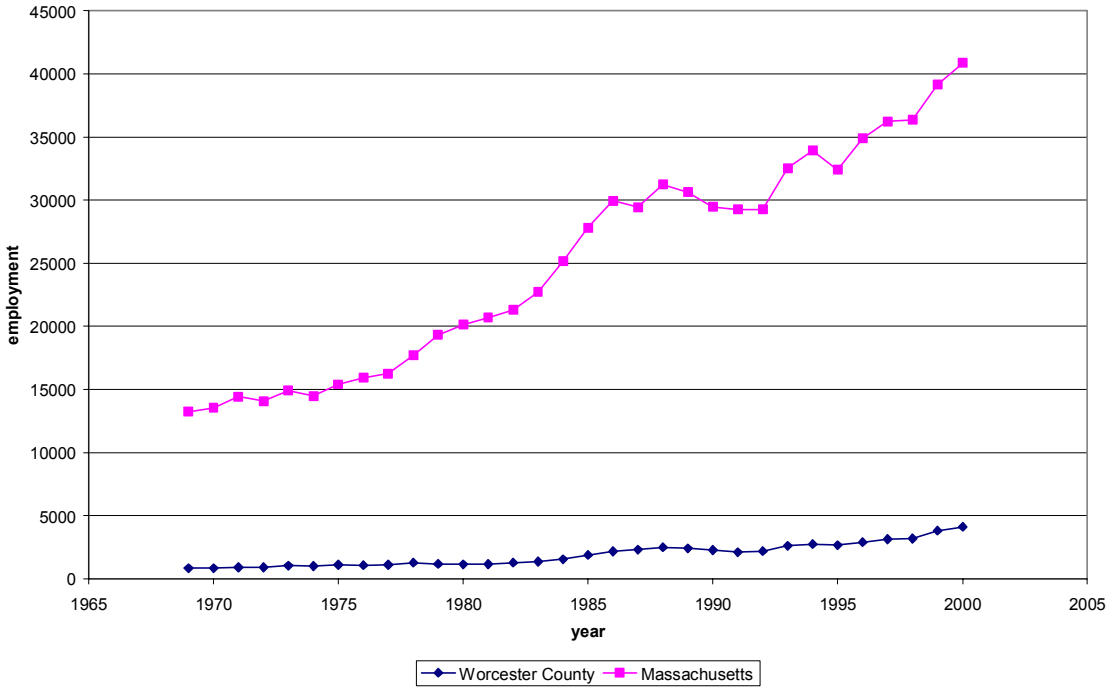
| 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| -4.57873 | 0.719951 | 1.837011 | 1.952658 | 0.994205 | 1.853762 | 2.478906 | 2.217272 | 1.715919 | 2.804807 |
| | | | | | | | | | |
| -5.46784 | -0.92321 | 1.612987 | 1.751658 | 2.284379 | 1.679304 | 2.542595 | 2.330405 | 1.927345 | 2.586854 |
| 1.238842 | 10.75911 | 3.061358 | 3.035735 | -5.8712 | 2.862541 | 2.114869 | 1.567917 | 0.493274 | 4.083187 |
| -0.67251 | -0.32827 | -2.75834 | -1.60881 | -0.83907 | -0.34715 | 1.241019 | 1.612903 | 1.079365 | 0.293132 |
| 1.260604 | 10.88294 | 3.119782 | 3.079704 | -5.91667 | 2.893109 | 2.122929 | 1.567505 | 0.487913 | 4.118064 |
| | | | | | | | | | |
| -0.65031 | -0.90251 | -1.66133 | 0.90576 | -3.34846 | -2.91141 | -2.11737 | -0.08784 | 0.648423 | 1.397685 |
| -4.59089 | 0.725182 | 1.848108 | 1.955864 | 1.007368 | 1.867583 | 2.491612 | 2.223358 | 1.718674 | 2.8084 |
| -4.76889 | 1.168725 | 1.980042 | 2.341132 | 0.99522 | 2.243389 | 2.767831 | 2.340265 | 1.640076 | 2.910468 |
| -0.15457 | -0.25064 | 10.52359 | 4.252616 | -4.64035 | 7.55986 | 3.42984 | 0.259968 | 6.533603 | 4.018792 |
| -10.9745 | 0.887574 | -2.78592 | 11.26194 | -5.33213 | -12.6492 | 7.540984 | 0.558943 | 4.547751 | -2.80329 |
| -14.3018 | 2.029988 | 6.016074 | 6.417927 | 0.896773 | 1.677234 | 5.715959 | 5.742419 | 6.619976 | 5.238476 |
| -6.80566 | -3.86915 | -2.64611 | -0.6599 | -1.44403 | -0.03502 | 0.489996 | 0.0153 | -3.22162 | 0.602492 |
| -4.79407 | -0.96215 | 4.142776 | 3.721309 | -0.93302 | 1.375735 | 2.356068 | 2.987658 | 1.478034 | 3.024356 |
| -5.80956 | -0.16684 | -2.52581 | 2.67261 | 3.375768 | 1.305579 | 1.807756 | 3.131814 | 0.712873 | 0.53634 |
| -6.32073 | 1.090584 | 0.817855 | 3.491188 | 0.912983 | 1.423878 | 1.639196 | 1.034343 | 2.081374 | 1.934466 |
| -4.85256 | -2.687 | 1.640192 | 5.574646 | -0.78487 | 2.360007 | 2.346913 | 5.849643 | 2.181959 | 4.589464 |
| -1.90267 | 4.44356 | 3.952746 | 1.461311 | 2.313139 | 3.463951 | 3.831371 | 2.318623 | 2.165817 | 3.534336 |
| -3.32037 | -2.39335 | 0.886627 | -0.88223 | 1.099771 | -0.98788 | 0.324342 | 1.283741 | 2.356976 | 1.985297 |
| -5.26647 | -1.89909 | 0.121102 | -1.60088 | -0.42481 | -4.91431 | -0.96225 | -0.64002 | 1.459033 | 3.229878 |
| 0.311441 | -4.52639 | -5.47125 | -14.4064 | -4.64321 | -9.62769 | -6.10809 | -4.42702 | -3.13212 | -1.13428 |
| -3.3706 | -2.22402 | 1.806947 | 0.778973 | 1.933899 | 0.501443 | 1.064079 | 2.036015 | 2.889289 | 1.989018 |

## Appendix E: Time Series Graphs

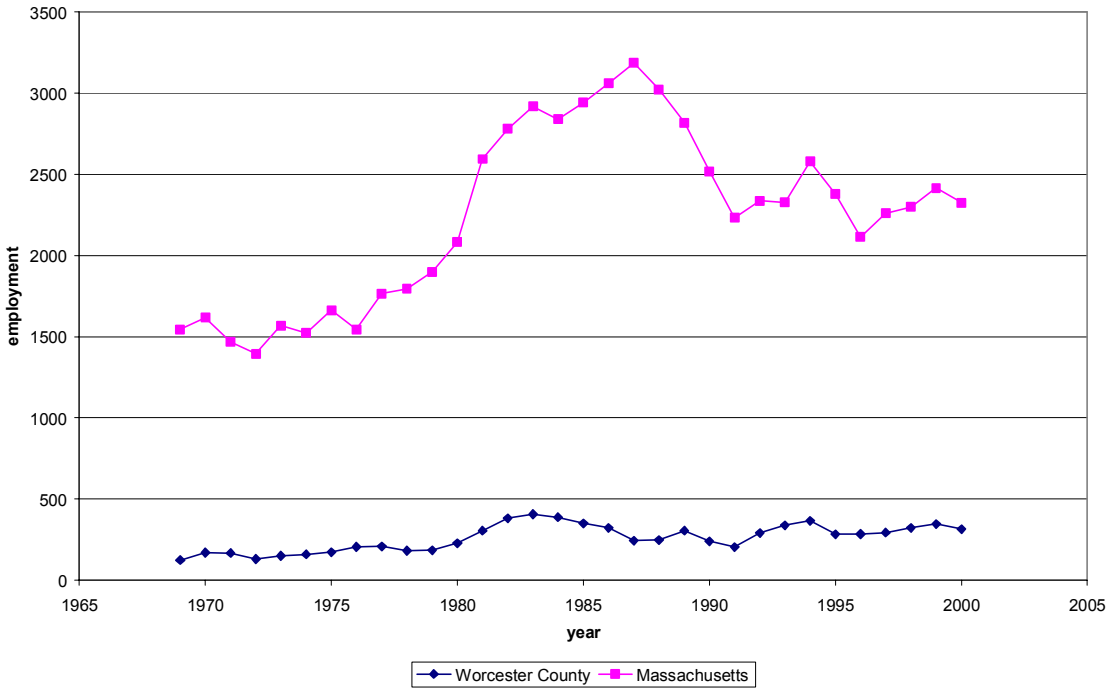
Two series of graphs were constructed using REIS employment data for Worcester County and Massachusetts. The first series of graphs show employment changes for each SIC industry sector versus the year (1969 to 2000) for Worcester and Massachusetts. The second series of graphs show the percent change in employment from the previous year for Worcester County and Massachusetts (after employment from Worcester County had been subtracted). For both series, there are fourteen graphs. The first one shows total employment. The next thirteen show employment changes in the individual SIC industries.

### Employment Change (Number of Employees)

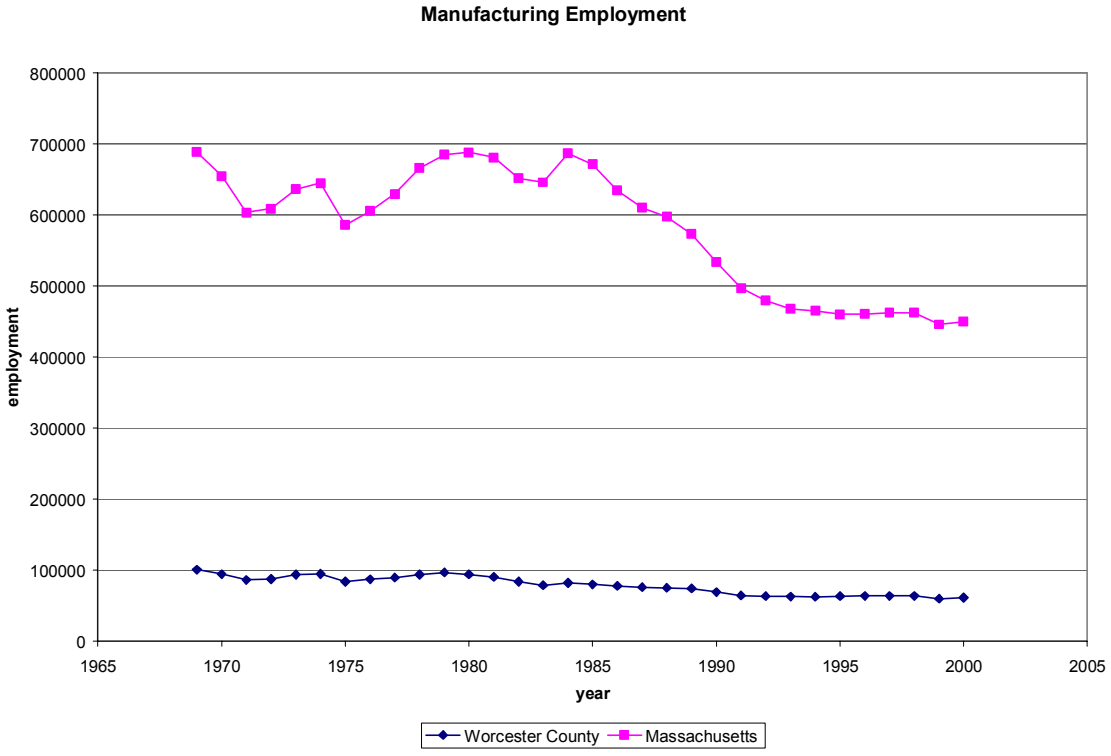
**Ag. Services, Forestry, Fishing etc Employment**

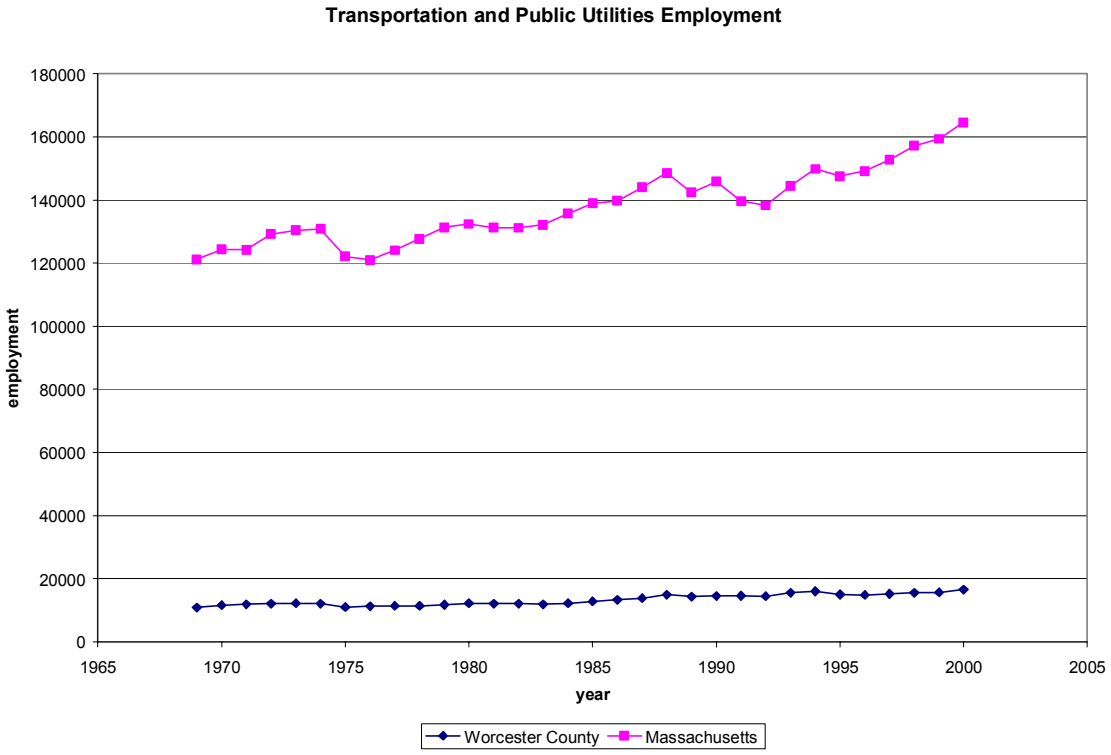



**Mining Employment**



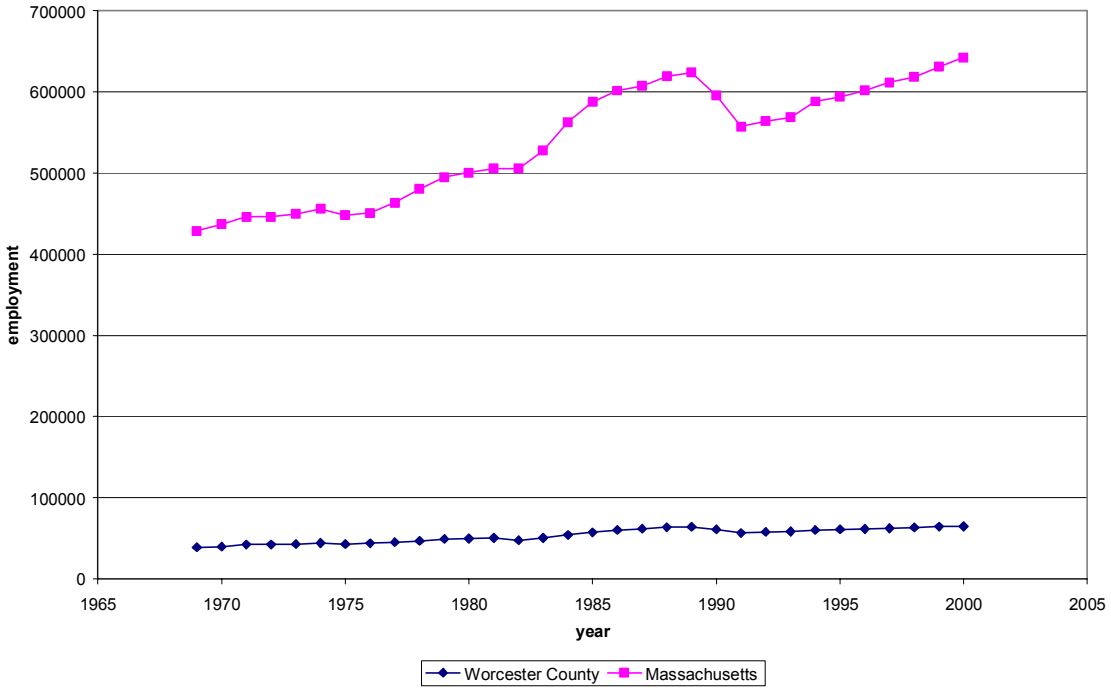

Construction Employment
250000
200000
150000
100000
50000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Worcester County
Massachusetts


Manufacturing Employment
800000
700000
600000
500000
400000
300000
200000
100000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Worcester County
Massachusetts

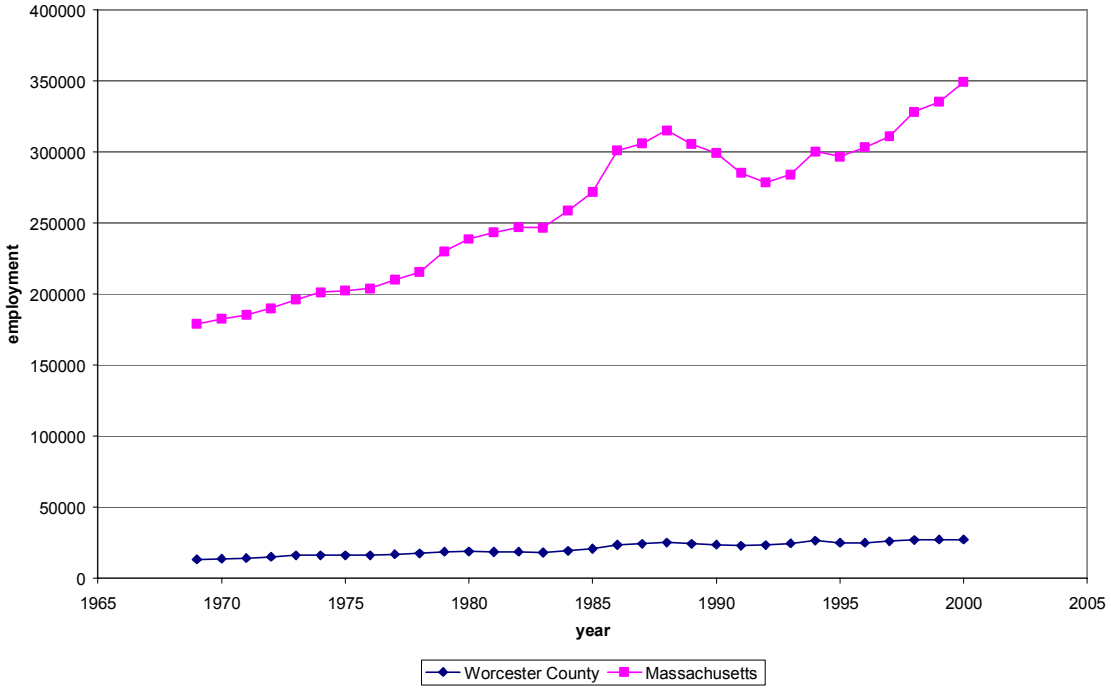

Transportation and Public Utilities Employment
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Worcester County
Massachusetts


Wholesale Trade Employment
250000
200000
150000
100000
50000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Worcester County
Massachusetts

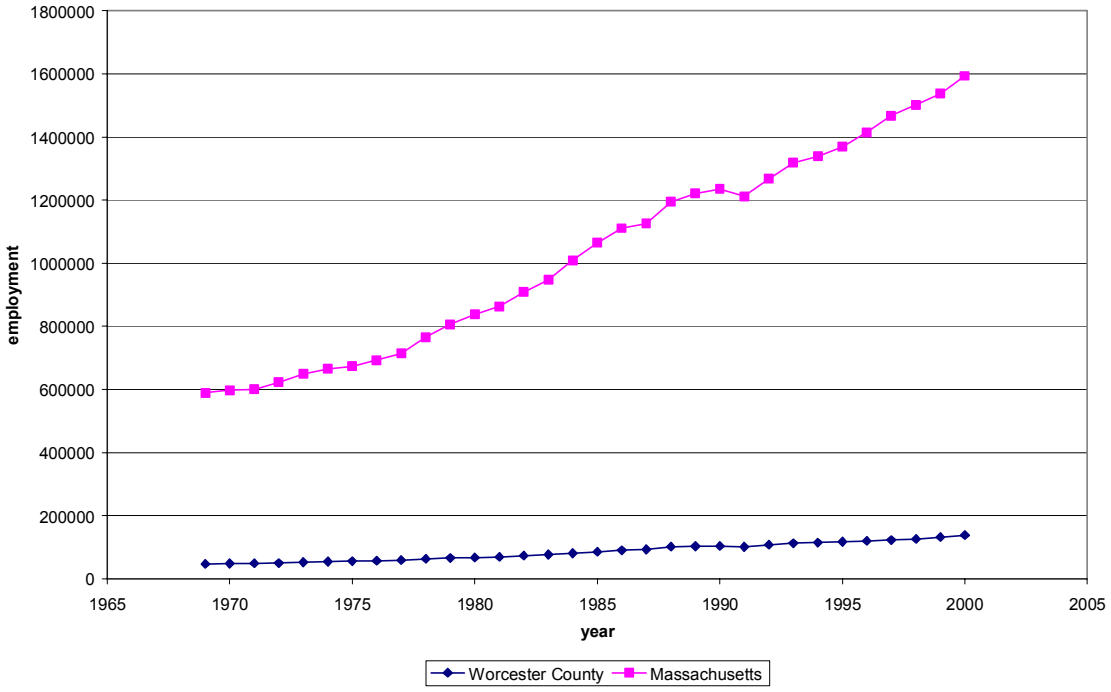
**Retail Trade Employment**



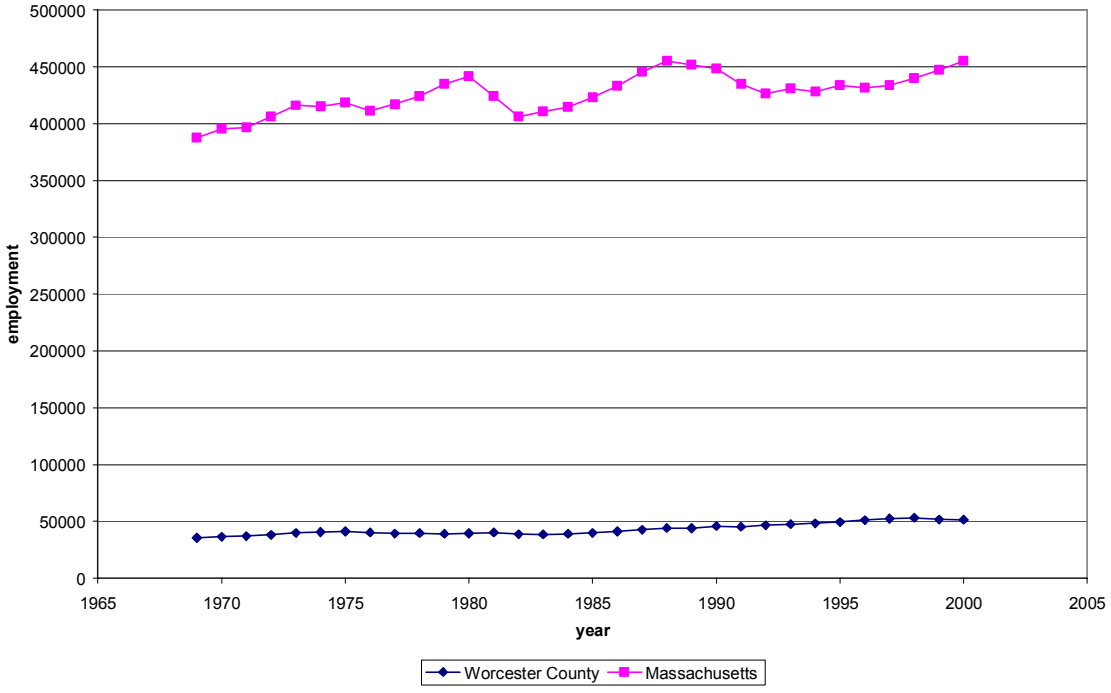

**Finance, Insurance, Real Estate Employment**



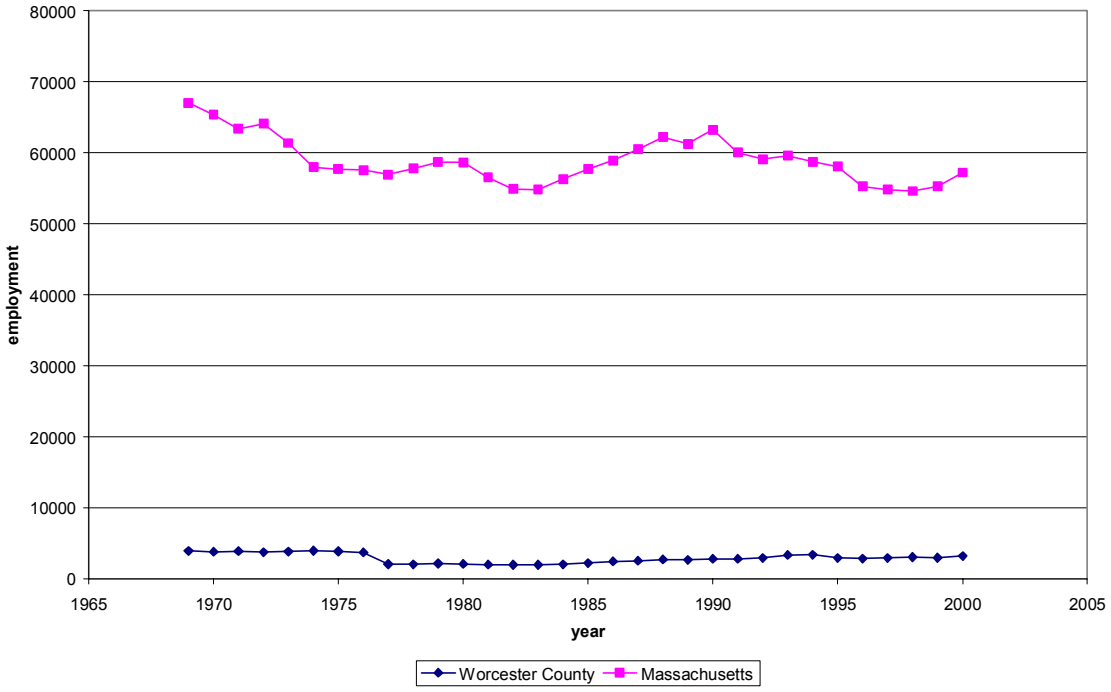
**Services Employment**



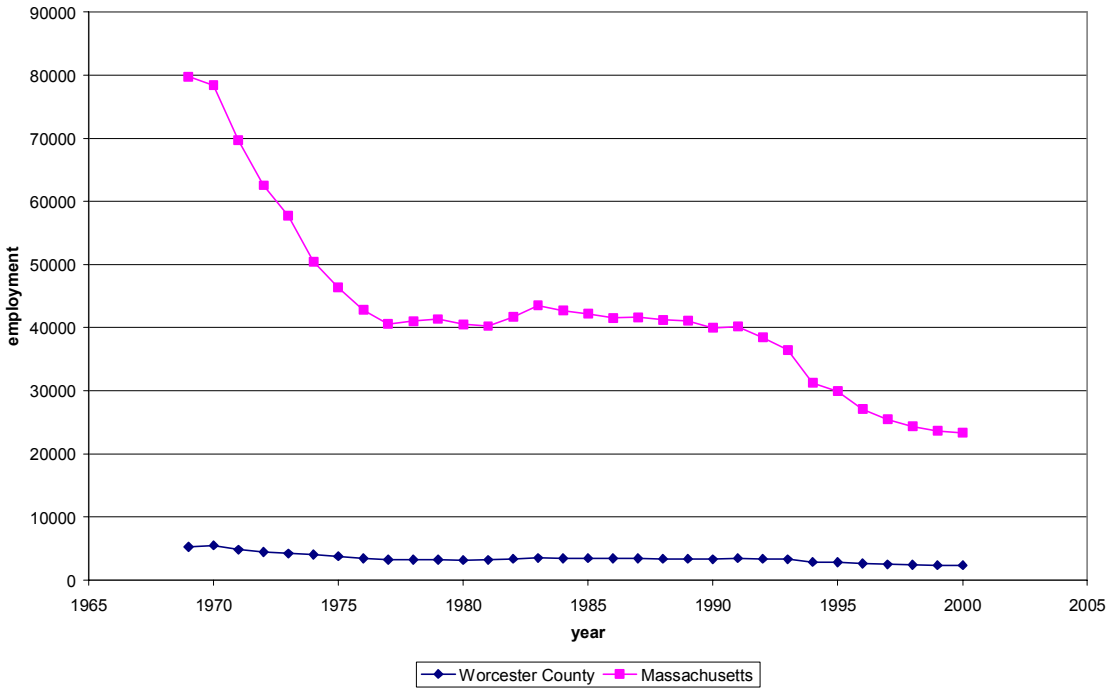

**Government and Government Enterprises Employment**

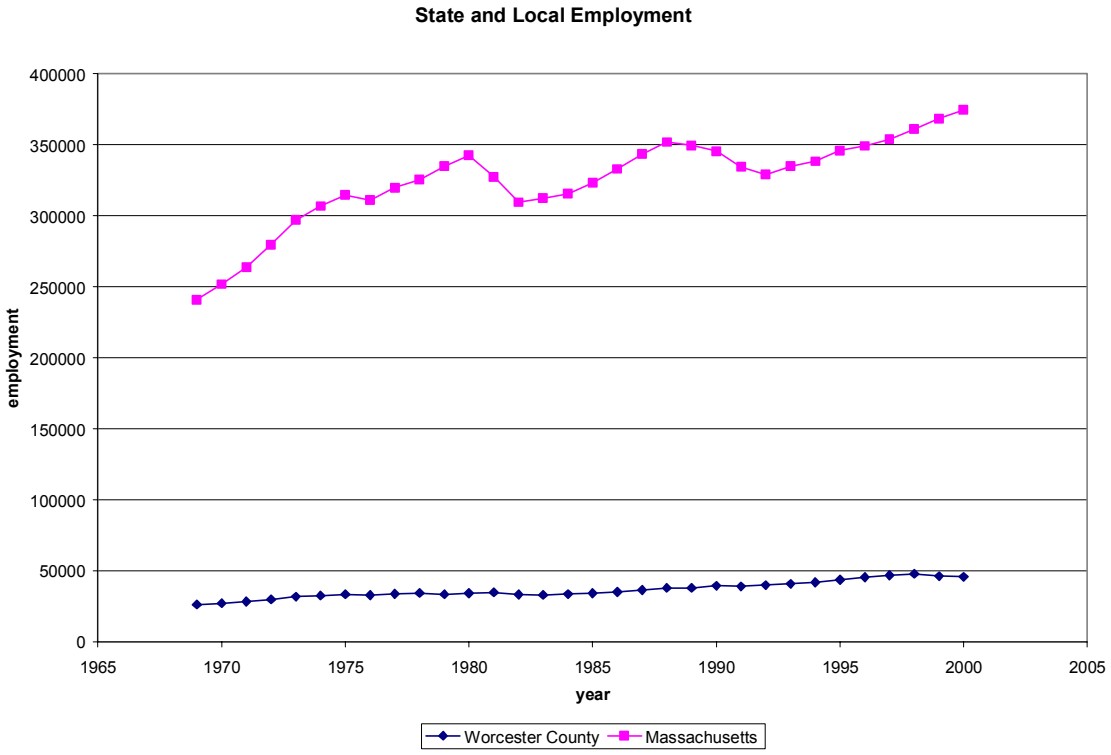


**Federal, Civilian Employment**

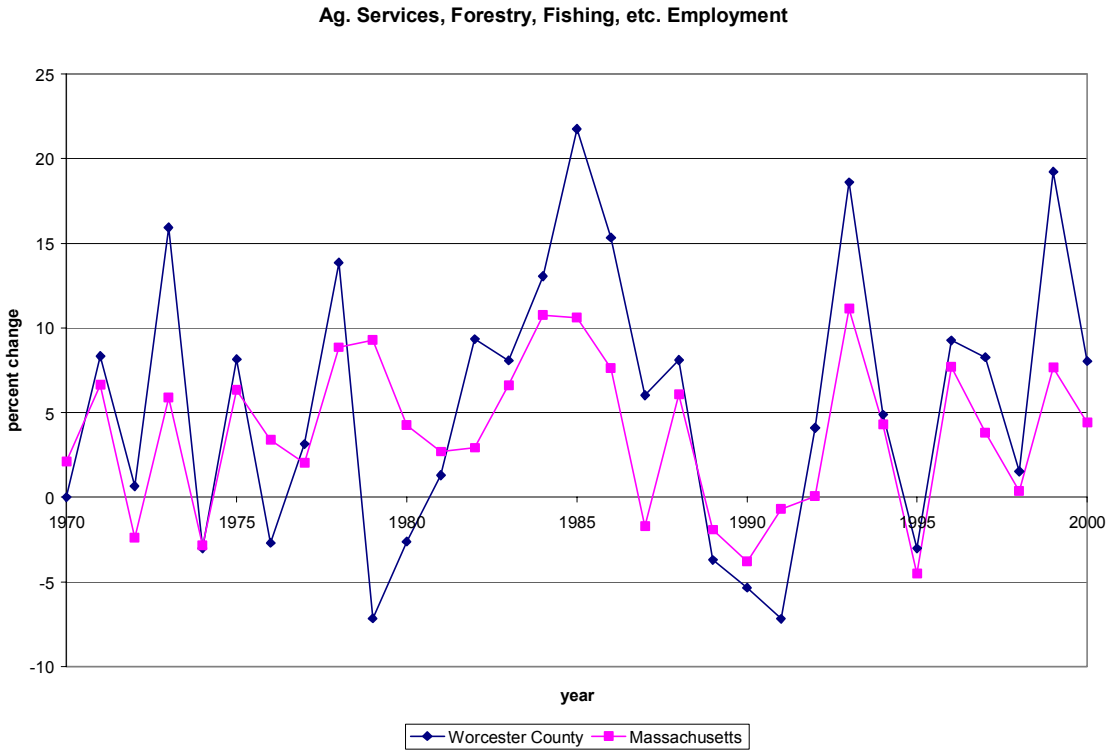



**Military Employment**

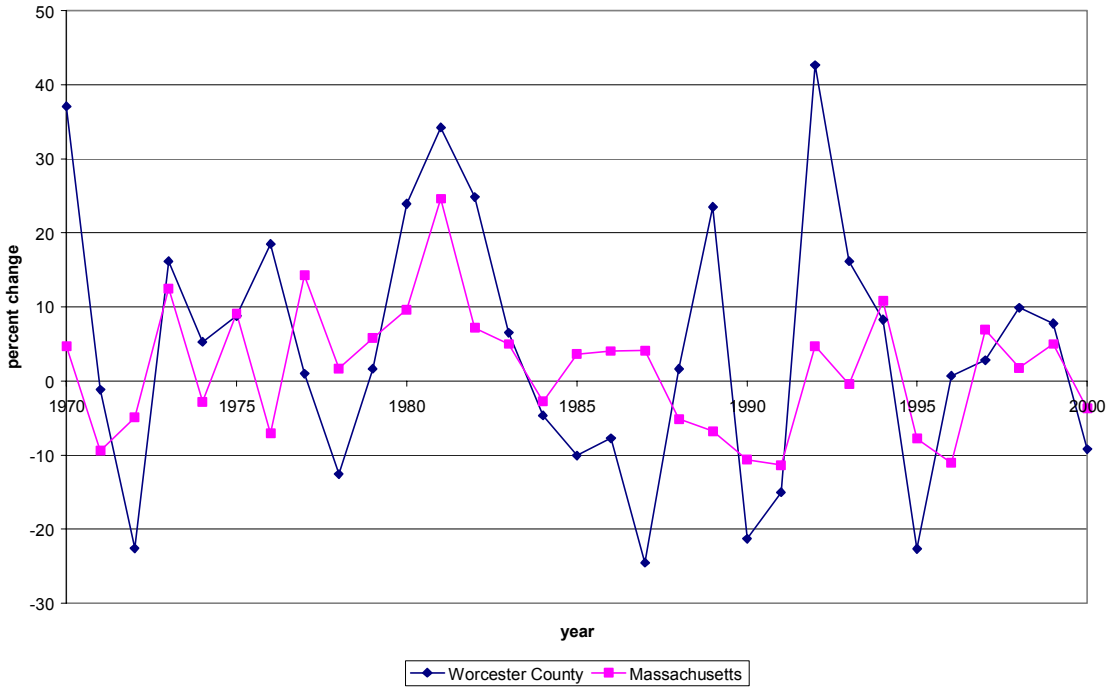



State and Local Employment
400000
350000
300000
250000
200000
150000
100000
50000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Worcester County
Massachusetts

## Employment Change (Percentage)

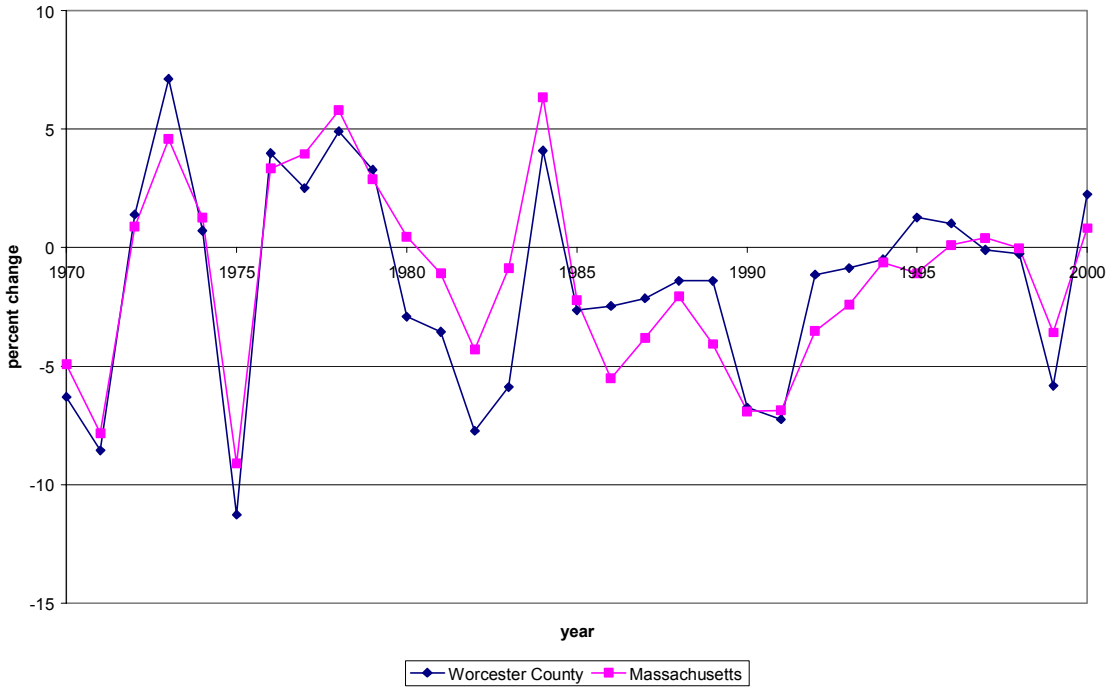



**Mining Employment**

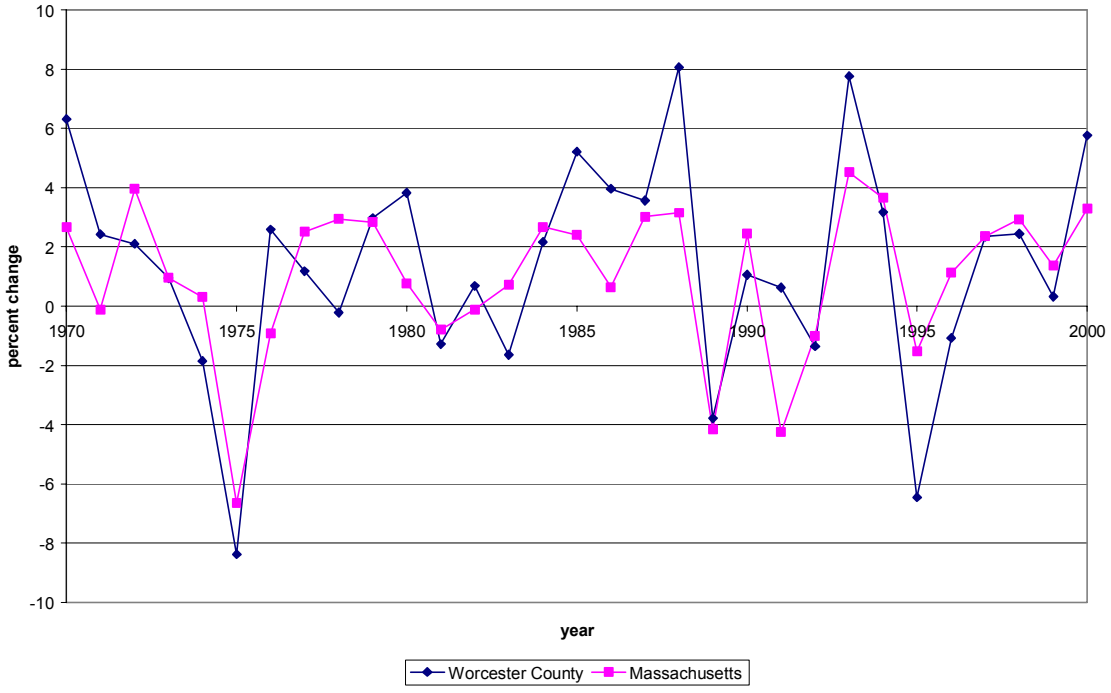



**Construction Employment**

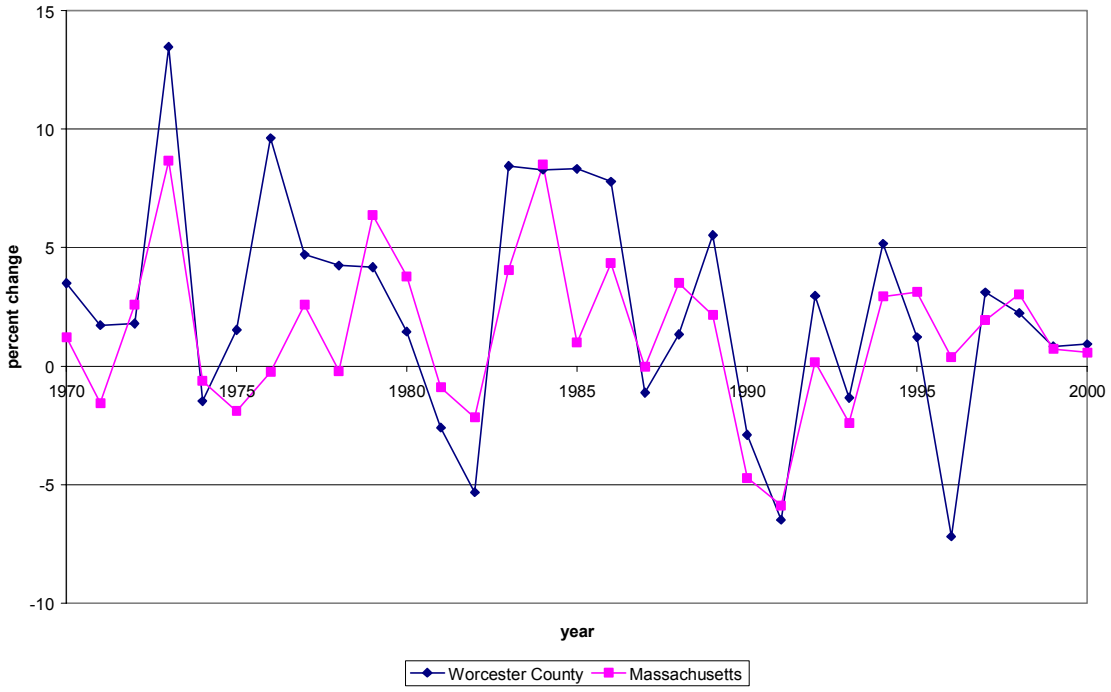
**Manufacturing Employment**




**Transportation and Public Utilites Employment**

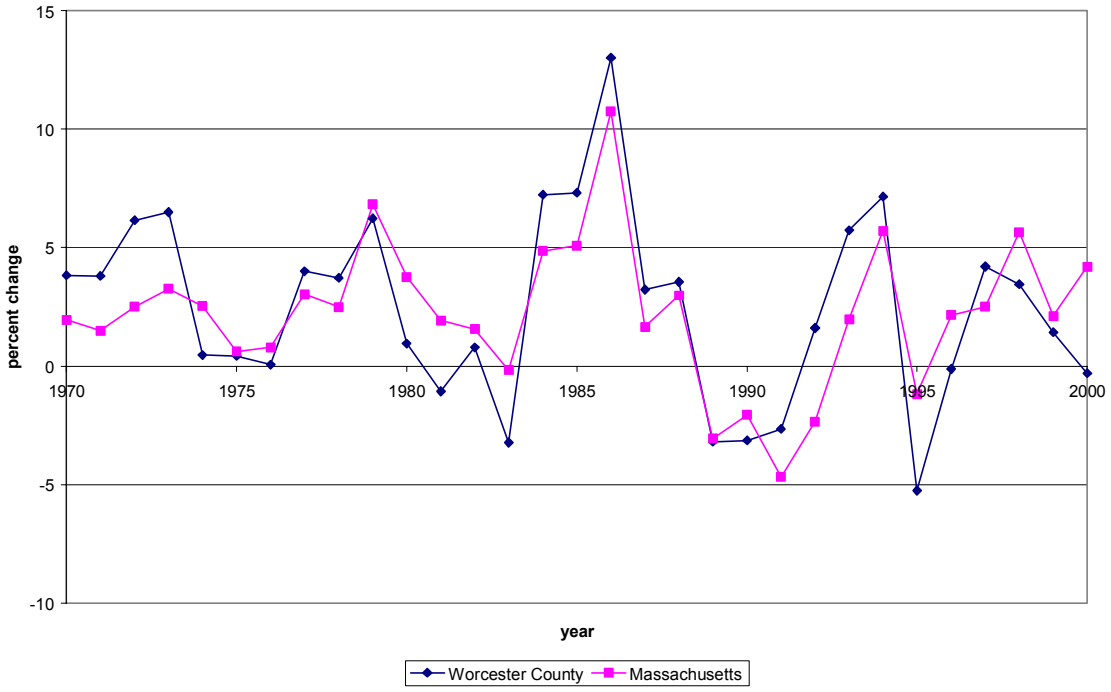


**Wholesale Trade Employment**

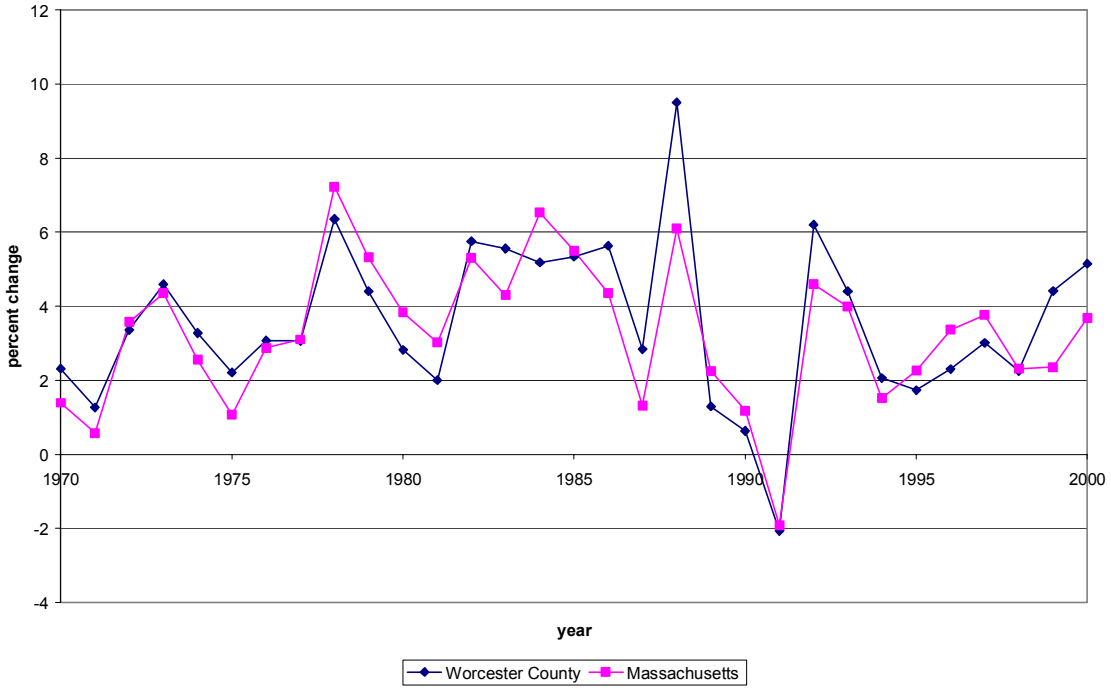



**Retail Trade Employment**

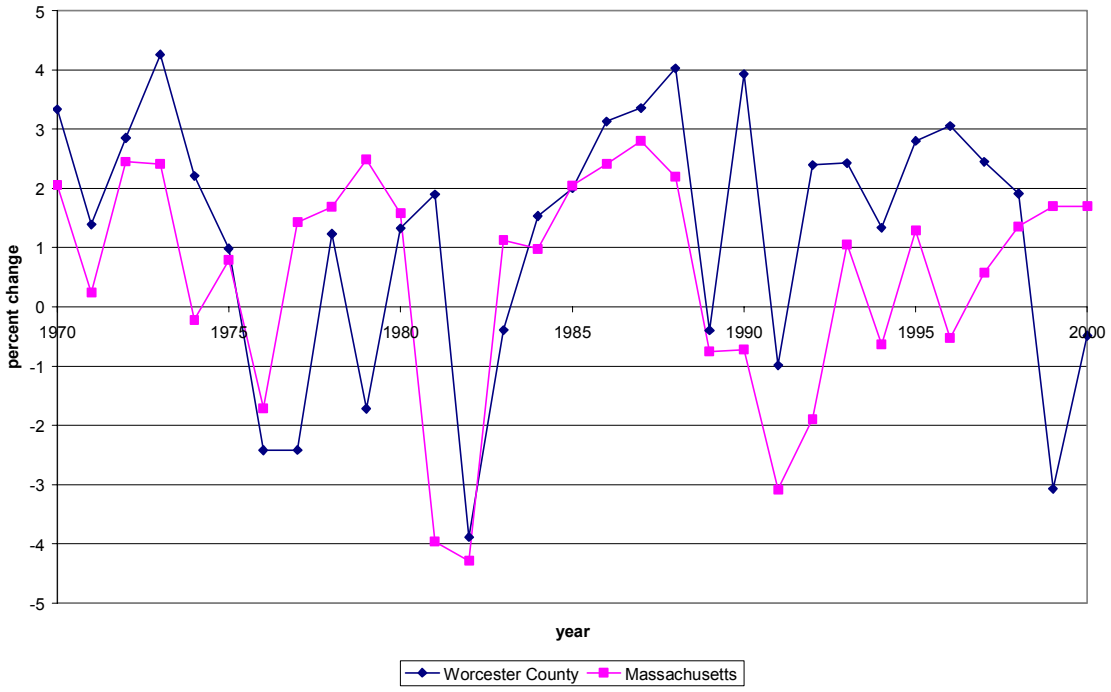
**Finance, Insurance, Real Estate Employment**



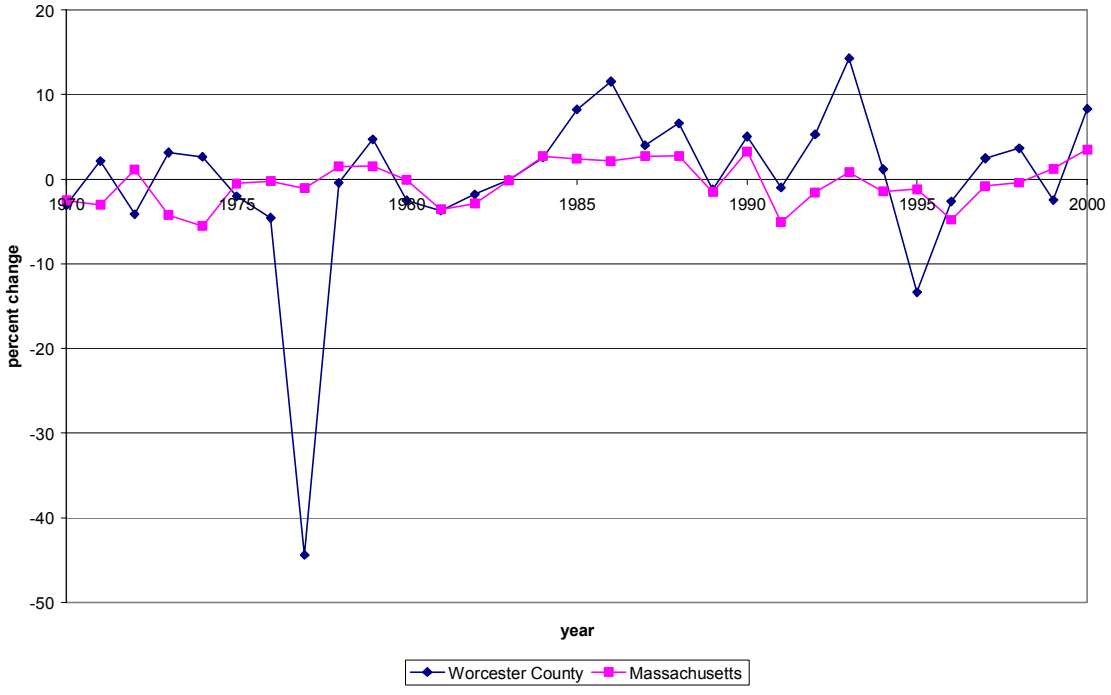

**Services Employment**



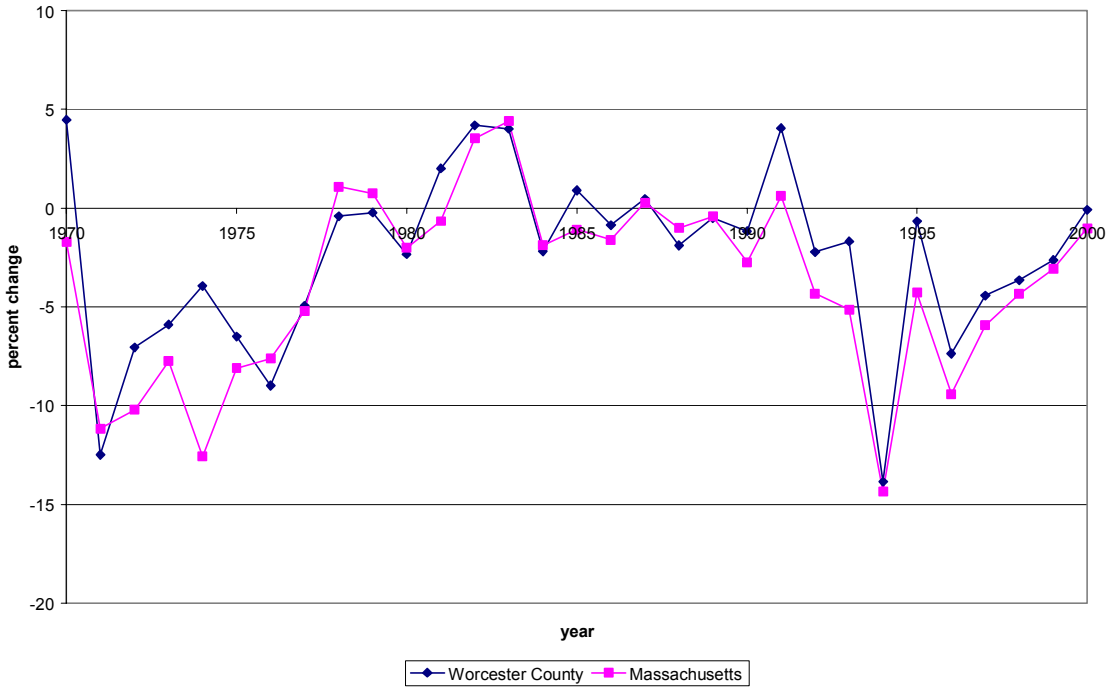
**Government and Government Enterprises Employment**



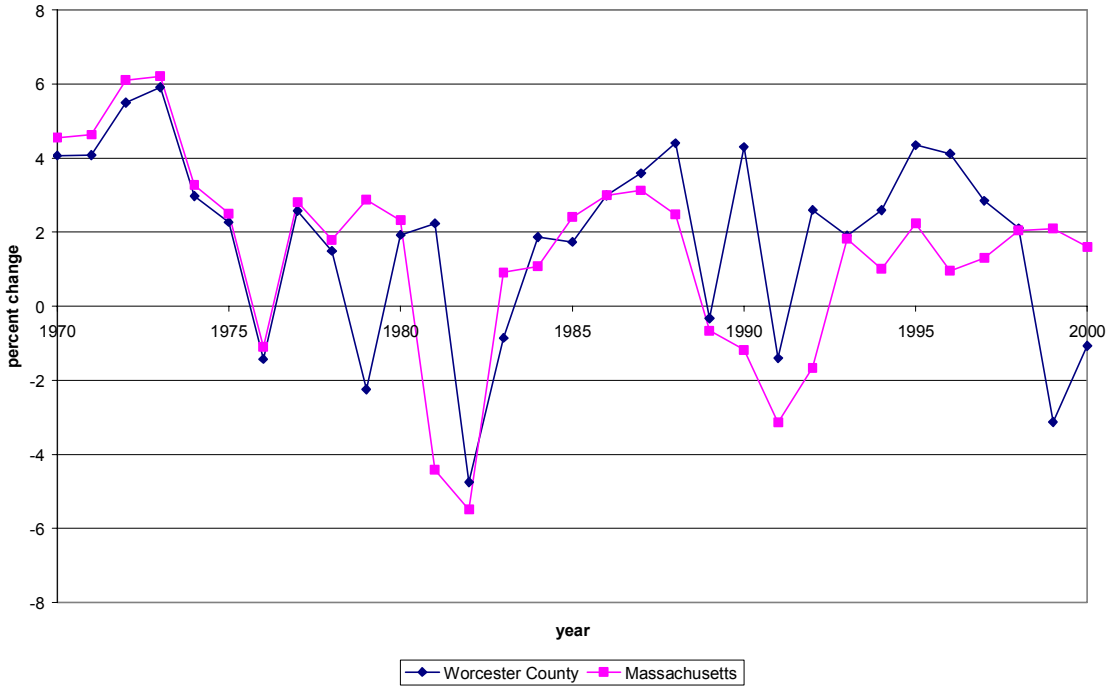

**Federal, Civilian Employment**



**Military Employment**




**State and Local Employment**



**Appendix F: Time Series Raw Data (City Level)**

City level historical ES-202 data was found later during the course of the project, although this data was not very detailed. This data contains employment numbers for Worcester and the similar cities of Massachusetts: Lowell, Springfield, and Cambridge. The data ranges from 1985 to 2001. In order to compare Worcester to Massachusetts, REIS data for Massachusetts was used to create a similar employment chart for the state. The data found contains the following information: total annual payroll, average annual wages, number of establishments, total employment, and employment by SIC industry (although some categories were combined). The last table is one that shows the percent change for each industry from 1985 – 2001.

| Cambridge | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Cambridge Employment | | | | | | | | |
| Year | Total Annual Payroll | Avg Annual Wage | Establish-ments | **Total** | Agriculture, Forestry, Fishing | Govern-ment | Const-ruction | Manufac-turing | TCPU | Trade | FIRE | Services |
| 1985 | 2140904000 | 22571 | 2,929 | 94,848 | 131 | 6,418 | 2,060 | 12,295 | 3,013 | 15,854 | 3,051 | 51,947 |
| 1986 | 2359021250 | 24301 | 3,189 | 97,073 | 122 | 6,512 | 1,915 | 11,331 | 2,785 | 16,704 | 3,270 | 54,363 |
| 1987 | 2580720000 | 26150 | 3,350 | 98,686 | 133 | 6,450 | 1,467 | 10,538 | 2,231 | 17,383 | 3,526 | 56,878 |
| 1988 | 2851780750 | 28341 | 3,428 | 100,621 | 145 | 6,515 | 1,455 | 10,499 | 2,159 | 16,889 | 3,110 | 59,737 |
| 1989 | 3043070374 | 29821 | 3,449 | 102,043 | 139 | 6,672 | 1,362 | 7,819 | 1,847 | 16,720 | 3,612 | 63,741 |
| 1990 | 3205499693 | 31038 | 3,587 | 103,278 | 127 | 6,831 | 1,358 | 7,467 | 2,165 | 15,536 | 3,398 | 66,327 |
| 1991 | 3406492992 | 33622 | 3,533 | 101,317 | 130 | 7,662 | 1,251 | 7,179 | 2,127 | 15,129 | 3,111 | 64,677 |
| 1992 | 3587656660 | 35652 | 3,445 | 100,631 | 138 | 7,704 | 1,446 | 6,555 | 2,006 | 15,342 | 2,579 | 64,797 |
| 1993 | 3754750570 | 37641 | 3,607 | 99,751 | 150 | 7,639 | 1,013 | 6,272 | 2,137 | 14,869 | 2,552 | 65,051 |
| 1994 | 3899765108 | 38620 | 3,717 | 100,978 | 152 | 7,649 | 1,794 | 6,848 | 2,321 | 15,360 | 2,811 | 63,978 |
| 1995 | 4239326728 | 40767 | 3,855 | 103,988 | 170 | 7,547 | 1,515 | 6,407 | 2,147 | 15,843 | 3,085 | 67,204 |
| 1996 | 4486878034 | 41840 | 3,929 | 107,240 | 171 | 7,036 | 1,583 | 5,990 | 2,414 | 16,233 | 3,364 | 70,413 |
| 1997 | 4951645352 | 45199 | 3,827 | 109,553 | conf | 8,053 | 2,319 | 6,422 | 2,321 | 16,557 | 3,503 | 70,168 |
| 1998 | 5363854549 | 47427 | 3,967 | 113,098 | 190 | 7,907 | 2,624 | 6,507 | 2,418 | 17,831 | 3,863 | 71,735 |
| 1999 | 5940670674 | 53363 | 4,033 | 111,325 | 214 | 8,255 | 2,872 | 5,572 | 2,253 | 17,221 | 3,826 | 71,081 |
| 2000 | 6796545302 | 58781 | 4008 | 115625 | 260 | 8784 | 3682 | 5599 | 2194 | 17411 | 3513 | 74148 |
| 2001 | 6527454590 | 57521 | 4009 | 113479 | 290 | 8217 | 4001 | 5644 | 2171 | 17355 | 3384 | 72384 |

| Lowell | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lowell Employment | | | | | | | | |
| Year | Total Annual Payroll | Avg Annual Wage | Establish-ments | **Total** | Agriculture, Forestry, Fishing | Govern-ment | Const-ruction | Manufac-turing | TCPU | Trade | FIRE | Services |
| 1985 | 927137688 | 20425 | 1,592 | 45,391 | 31 | 4,556 | 1,294 | 19,179 | 1,271 | 7,854 | 2,067 | 9,140 |
| 1986 | 1005543875 | 22294 | 1,767 | 45,095 | 33 | 4,660 | 1,337 | 18,723 | 1,327 | 7,495 | 2,302 | 9,218 |
| 1987 | 1049924250 | 23429 | 1,864 | 44,813 | 38 | 4,769 | 1,401 | 18,166 | 1,278 | 7,323 | 2,463 | 9,374 |
| 1988 | 1114217750 | 24791 | 1,810 | 44,944 | 52 | 4,956 | 1,286 | 17,591 | 1,620 | 7,493 | 2,263 | 9,683 |
| 1989 | 1146235850 | 26614 | 1,779 | 43,069 | 41 | 5,015 | 988 | 16,872 | 1,310 | 6,970 | 2,242 | 9,631 |
| 1990 | 1109159371 | 27649 | 1,766 | 40,116 | 51 | 5,192 | 720 | 15,233 | 1,252 | 6,209 | 2,012 | 9,447 |
| 1991 | 1059605493 | 28725 | 1,678 | 36,888 | 47 | 4,723 | 572 | 13,743 | 1,100 | 5,634 | 1,696 | 9,373 |
| 1992 | 1027150810 | 29408 | 1,559 | 34,928 | 50 | 4,652 | 629 | 11,880 | 1,339 | 5,436 | 1,092 | 9,850 |
| 1993 | 978914116 | 29669 | 1,556 | 32,995 | 60 | 4,587 | 665 | 10,774 | 1,117 | 4,899 | 1,044 | 9,849 |
| 1994 | 967663749 | 29880 | 1,562 | 32,385 | 57 | 4,621 | 775 | 8,928 | 1,252 | 4,979 | 1,176 | 10,597 |
| 1995 | 943228877 | 29911 | 1,607 | 31,534 | 72 | 4,712 | 754 | 7,946 | 1,118 | 5,222 | 1,157 | 10,553 |
| 1996 | 904326127 | 29360 | 1,627 | 30,801 | 85 | 4,796 | 639 | 6,711 | 1,180 | 5,137 | 1,223 | 11,030 |
| 1997 | 981494762 | 30628 | 1,617 | 32,046 | 69 | 5,313 | 683 | 6,902 | 1,440 | 5,143 | 1,257 | 11,239 |
| 1998 | 1071705138 | 32571 | 1,648 | 32,904 | 78 | 5,524 | 705 | 6,952 | 1,371 | 5,161 | 1,397 | 11,716 |
| 1999 | 1206039288 | 35942 | 1,697 | 33,555 | 63 | 5,690 | 709 | 6,804 | 1,132 | 5,425 | 1,491 | 12,241 |
| 2000 | 1362386674 | 39269 | 1711 | 34694 | 62 | 5746 | 795 | 6687 | 1087 | 5455 | 1490 | 13372 |
| 2001 | 1344399522 | 38887 | 1772 | 34572 | 61 | 5825 | 845 | 5799 | 1257 | 5703 | 1770 | 13312 |

| Springfield | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Springfield Employment | | | | | | | | |
| Year | Total Annual Payroll | Avg Annual Wage | Establish-ments | **Total** | Agriculture, Forestry, Fishing | Govern-ment | Const-ruction | Manufac-turing | TCPU | Trade | FIRE | Services |
| 1985 | 1483976500 | 17940 | 3,244 | 82,717 | 269 | 12,662 | 2,321 | 13,451 | 3,952 | 19,490 | 8,760 | 21,813 |
| 1986 | 1588084000 | 19021 | 3,424 | 83,490 | 363 | 13,364 | 2,651 | 12,294 | 3,989 | 19,266 | 9,069 | 22,490 |
| 1987 | 1745362750 | 20061 | 3,545 | 87,001 | 276 | 14,023 | 3,066 | 11,851 | 4,565 | 19,716 | 9,748 | 23,753 |
| 1988 | 1901591250 | 21444 | 3,599 | 88,676 | 252 | 14,216 | 3,056 | 11,972 | 4,701 | 19,959 | 9,728 | 24,793 |
| 1989 | 1942179668 | 22647 | 3,585 | 85,759 | 265 | 13,489 | 2,639 | 11,505 | 4,519 | 18,987 | 9,314 | 25,041 |
| 1990 | 1968328785 | 23910 | 3,694 | 82,322 | 245 | 12,840 | 2,145 | 10,888 | 4,593 | 17,010 | 9,355 | 25,246 |
| 1991 | 1914725038 | 25405 | 3,588 | 75,369 | 230 | 10,246 | 1,875 | 10,216 | 4,347 | 15,448 | 8,740 | 24,267 |
| 1992 | 1988729620 | 26433 | 3,374 | 75,238 | 275 | 11,048 | 1,268 | 9,542 | 3,805 | 15,282 | 8,660 | 25,358 |
| 1993 | 2034995869 | 26999 | 3,425 | 75,374 | 192 | 11,185 | 1,425 | 9,007 | 3,853 | 15,147 | 8,349 | 26,216 |
| 1994 | 2073198064 | 27908 | 3,422 | 74,286 | 206 | 11,106 | 1,484 | 8,757 | 4,018 | 14,358 | 8,275 | 26,082 |
| 1995 | 2150815699 | 28705 | 3,405 | 74,928 | 215 | 11,413 | 1,272 | 8,883 | 3,984 | 14,541 | 7,818 | 26,802 |
| 1996 | 2276862478 | 30233 | 3,368 | 75,310 | 221 | 11,509 | 1,605 | 8,663 | 3,890 | 14,718 | 7,099 | 27,605 |
| 1997 | 2384531907 | 31024 | 3,195 | 76,861 | 226 | 11,983 | 1,550 | 8,349 | 3,838 | 14,512 | 7,118 | 29,285 |
| 1998 | 2498580558 | 32350 | 3,188 | 77,236 | 248 | 12,109 | 1,561 | 8,350 | 4,191 | 14,533 | 7,207 | 29,037 |
| 1999 | 2677164252 | 34078 | 3,738 | 78,561 | 254 | 12,493 | 1,688 | 8,190 | 4,212 | 14,498 | 7,607 | 29,619 |
| 2000 | 2804847516 | 35693 | 4048 | 78583 | 257 | 12807 | 1752 | 7768 | 4033 | 14040 | 7902 | 30024 |
| 2001 | 2966429395 | 37104 | 4316 | 79948 | 272 | 13537 | 1979 | 7264 | 3650 | 13693 | 8297 | 31256 |

| Worcester | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Worcester Employment | | | | | | | | |
| Year | Total Annual Payroll | Avg Annual Wage | Establish-ments | **Total** | Agriculture, Forestry, Fishing | Govern-ment | Const-ruction | Manufac-turing | TCPU | Trade | FIRE | Services |
| 1985 | 1817160250 | 18424 | 3,900 | 98,625 | 213 | 10,533 | 3,004 | 22,088 | 3,870 | 22,195 | 8,493 | 28,229 |
| 1986 | 1960781875 | 19305 | 4,137 | 101,567 | 242 | 10,790 | 3,516 | 20,497 | 3,925 | 23,504 | 9,279 | 29,814 |
| 1987 | 2153892000 | 20886 | 4,313 | 103,126 | 184 | 11,061 | 3,979 | 19,605 | 3,182 | 23,387 | 10,344 | 31,382 |
| 1988 | 2325233250 | 21945 | 4,415 | 105,953 | 204 | 11,355 | 4,367 | 18,754 | 3,684 | 23,452 | 10,695 | 33,439 |
| 1989 | 2370344218 | 23245 | 4,399 | 101,971 | 178 | 11,181 | 3,545 | 17,756 | 3,339 | 22,772 | 9,976 | 33,213 |
| 1990 | 2374217307 | 24728 | 4,447 | 96,015 | 136 | 10,418 | 3,019 | 16,284 | 3,197 | 20,674 | 9,680 | 32,598 |
| 1991 | 2307829660 | 25900 | 4,340 | 89,104 | 113 | 10,575 | 2,346 | 15,090 | 2,968 | 18,419 | 9,443 | 30,142 |
| 1992 | 2573728201 | 27387 | 4,093 | 93,977 | 120 | 15,380 | 2,066 | 14,229 | 2,861 | 18,527 | 9,383 | 31,411 |
| 1993 | 2609976096 | 27547 | 4,163 | 94,748 | 125 | 14,457 | 2,170 | 13,379 | 3,026 | 17,804 | 10,569 | 33,218 |
| 1994 | 2761905431 | 28388 | 4,272 | 97,291 | 120 | 14,935 | 2,365 | 13,157 | 2,993 | 17,763 | 11,523 | 34,435 |
| 1995 | 2778917872 | 28623 | 4,330 | 97,086 | 117 | 14,957 | 2,332 | 13,491 | 2,674 | 18,023 | 10,212 | 35,280 |
| 1996 | 3030126242 | 31198 | 4,372 | 97,126 | 147 | 15,788 | 2,378 | 13,650 | 2,532 | 17,454 | 9,543 | 35,634 |
| 1997 | 3176526729 | 32178 | 4,159 | 98,718 | 148 | 16,899 | 2,546 | 13,675 | 2,704 | 17,494 | 9,332 | 35,920 |
| 1998 | 3365065701 | 33545 | 4,176 | 100,316 | 150 | 17,505 | 2,456 | 13,319 | 2,769 | 17,926 | 9,122 | 37,069 |
| 1999 | 3515230787 | 34779 | 4,294 | 101,072 | 144 | 15,241 | 2,728 | 12,901 | 2,715 | 17,789 | 9,060 | 40,494 |
| 2000 | 3645626844 | 35964 | 4243 | 101370 | 142 | 13773 | 3128 | 12677 | 2737 | 17452 | 8561 | 42900 |
| 2001 | 3808105619 | 37703 | 4331 | 101004 | 138 | 14059 | 3485 | 11848 | 2835 | 17042 | 8522 | 43075 |

| Massachusetts (REIS) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Massachusetts Employment (constructed from REIS data) | | | | | | | | |
| Year | Total Annual Payroll | Avg Annual Wage | Establish-ments | **Total** | Agriculture, Forestry, Fishing | Govern-ment | Const-ruction | Manufac-turing | TCPU | Trade | FIRE | Services |
| 1985 | | | | 3533117 | 27824 | 423144 | 158161 | 671639 | 138909 | 760796 | 271945 | 1064854 |
| 1986 | | | | 3629504 | 29943 | 433368 | 180755 | 634620 | 139798 | 781904 | 301182 | 1111190 |
| 1987 | | | | 3661150 | 29430 | 445499 | 195131 | 610369 | 144020 | 787708 | 306169 | 1125840 |
| 1988 | | | | 3770718 | 31221 | 455277 | 206097 | 597811 | 148567 | 805526 | 315313 | 1194489 |
| 1989 | | | | 3744282 | 30623 | 451834 | 189152 | 573488 | 142386 | 814582 | 305690 | 1221405 |
| 1990 | | | | 3647410 | 29459 | 448592 | 162367 | 533872 | 145879 | 777354 | 299397 | 1235800 |
| 1991 | | | | 3480244 | 29253 | 434767 | 139167 | 497237 | 139674 | 728375 | 285387 | 1212120 |
| 1992 | | | | 3512166 | 29272 | 426534 | 142409 | 479748 | 138273 | 735239 | 278705 | 1267773 |
| 1993 | | | | 3579478 | 32531 | 431032 | 150757 | 468185 | 144525 | 735887 | 284230 | 1318370 |
| 1994 | | | | 3651033 | 33931 | 428286 | 160556 | 465203 | 149818 | 760249 | 300465 | 1338315 |
| 1995 | | | | 3686055 | 32401 | 433817 | 161569 | 460188 | 147534 | 771444 | 296928 | 1368606 |
| 1996 | | | | 3752171 | 34896 | 431535 | 164688 | 460699 | 149196 | 780208 | 303317 | 1414647 |
| 1997 | | | | 3845046 | 36234 | 434021 | 174471 | 462587 | 152710 | 793351 | 310900 | 1467861 |
| 1998 | | | | 3928603 | 36368 | 439923 | 183768 | 462486 | 157190 | 805644 | 328463 | 1501812 |
| 1999 | | | | 3992754 | 39151 | 447399 | 195829 | 445925 | 159334 | 819363 | 335427 | 1537175 |
| 2000 | | | | 4104314 | 40878 | 455005 | 205991 | 449603 | 164581 | 831903 | 349484 | 1593640 |
| 2001 | | | | 4117820 | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) |

## Percent Change By Industry

| Total Employment | | | | | | | Agriculture, forestry, and fishing | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Worcester | Cambridge | Lowell | Springfield | Mass | | Year | Worcester | Cambridge | Lowell | Springfield | Mass |
| 1986 | 2.9830165 | 2.3458586 | -0.65211 | 0.934512 | 2.728101 | | 1986 | 13.61502 | -6.87023 | 6.451613 | 34.94424 | 7.615727 |
| 1987 | 1.5349474 | 1.6616361 | -0.62535 | 4.205294 | 0.87191 | | 1987 | -23.9669 | 9.016393 | 15.15152 | -23.9669 | -1.71326 |
| 1988 | 2.7413068 | 1.9607644 | 0.292326 | 1.925265 | 2.992721 | | 1988 | 10.86957 | 9.022556 | 36.84211 | -8.69565 | 6.085627 |
| 1989 | -3.75827 | 1.4132239 | -4.17186 | -3.2895 | -0.70109 | | 1989 | -12.7451 | -4.13793 | -21.1538 | 5.15873 | -1.91538 |
| 1990 | -5.840876 | 1.2102741 | -6.85644 | -4.00774 | -2.5872 | | 1990 | -23.5955 | -8.63309 | 24.39024 | -7.54717 | -3.80106 |
| 1991 | -7.197834 | -1.898759 | -8.04666 | -8.4461 | -4.58314 | | 1991 | -16.9118 | 2.362205 | -7.84314 | -6.12245 | -0.69928 |
| 1992 | 5.4688903 | -0.677083 | -5.31338 | -0.17381 | 0.917235 | | 1992 | 6.19469 | 6.153846 | 6.382979 | 19.56522 | 0.064951 |
| 1993 | 0.8204135 | -0.874482 | -5.53424 | 0.18076 | 1.916538 | | 1993 | 4.166667 | 8.695652 | 20 | -30.1818 | 11.13351 |
| 1994 | 2.6839617 | 1.2300629 | -1.84876 | -1.44347 | 1.999034 | | 1994 | -4 | 1.333333 | -5 | 7.291667 | 4.303587 |
| 1995 | -0.210708 | 2.9808473 | -2.62776 | 0.864227 | 0.959235 | | 1995 | -2.5 | 11.84211 | 26.31579 | 4.368932 | -4.50915 |
| 1996 | 0.0412006 | 3.1272839 | -2.32448 | 0.509823 | 1.793679 | | 1996 | 25.64103 | 0.588235 | 18.05556 | 2.790698 | 7.70038 |
| 1997 | 1.639108 | 2.1568445 | 4.042077 | 2.059487 | 2.475234 | | 1997 | 0.680272 | | -18.8235 | 2.262443 | 3.83425 |
| 1998 | 1.6187524 | 3.2358767 | 2.677401 | 0.487894 | 2.173108 | | 1998 | 1.351351 | | 13.04348 | 9.734513 | 0.369818 |
| 1999 | 0.7536186 | -1.567667 | 1.978483 | 1.715521 | 1.632921 | | 1999 | -4 | 12.63158 | -19.2308 | 2.419355 | 7.652332 |
| 2000 | 0.2948393 | 3.8625646 | 3.394427 | 0.028004 | 2.794061 | | 2000 | -1.38889 | 21.49533 | -1.5873 | 1.181102 | 4.411126 |
| 2001 | -0.361054 | -1.856 | -0.35165 | 1.737017 | 0.329068 | | 2001 | -2.8169 | 11.53846 | -1.6129 | 5.836576 | |

| Government | | | | | | | Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Worcester | Cambridge | Lowell | Springfield | Mass | | Year | Worcester | Cambridge | Lowell | Springfield | Mass |
| 1986 | 2.4399506 | 1.4646307 | 2.282704 | 5.544148 | 2.416199 | | 1986 | 17.04394 | -7.03883 | 3.323029 | 14.21801 | 14.28544 |
| 1987 | 2.5115848 | -0.952088 | 2.339056 | 4.931158 | 2.799238 | | 1987 | 13.16837 | -23.3943 | 4.786836 | 15.65447 | 7.953307 |
| 1988 | 2.6579875 | 1.0077519 | 3.921157 | 1.37631 | 2.194842 | | 1988 | 9.751194 | -0.818 | -8.20842 | -0.32616 | 5.619814 |
| 1989 | -1.532365 | 2.4098235 | 1.190476 | -5.11396 | -0.75624 | | 1989 | -18.823 | -6.39175 | -23.1726 | -13.6453 | -8.22186 |
| 1990 | -6.824077 | 2.3830935 | 3.529412 | -4.81133 | -0.71752 | | 1990 | -14.8378 | -0.29369 | -27.1255 | -18.7192 | -14.1606 |
| 1991 | 1.5070071 | 12.16513 | -9.03313 | -20.2025 | -3.08187 | | 1991 | -22.2921 | -7.87923 | -20.5556 | -12.5874 | -14.2886 |
| 1992 | 45.437352 | 0.5481597 | -1.50328 | 7.827445 | -1.89366 | | 1992 | -11.9352 | 15.58753 | 9.965035 | -32.3733 | 2.329575 |
| 1993 | -6.0013 | -0.843718 | -1.39725 | 1.240043 | 1.054547 | | 1993 | 5.033882 | -29.9447 | 5.72337 | 12.3817 | 5.861989 |
| 1994 | 3.3063568 | 0.1309072 | 0.741225 | -0.7063 | -0.63708 | | 1994 | 8.986175 | 77.09773 | 16.54135 | 4.140351 | 6.499864 |
| 1995 | 0.147305 | -1.333508 | 1.969271 | 2.764272 | 1.291427 | | 1995 | -1.39535 | -15.5518 | -2.70968 | -14.2857 | 0.630933 |
| 1996 | 5.555927 | -6.770902 | 1.782683 | 0.841146 | -0.52603 | | 1996 | 1.972556 | 4.488449 | -15.252 | 26.17925 | 1.930445 |
| 1997 | 7.0369901 | 14.454235 | 10.77982 | 4.118516 | 0.576083 | | 1997 | 7.06476 | 46.494 | 6.885759 | -3.42679 | 5.940324 |
| 1998 | 3.586011 | -1.812989 | 3.971391 | 1.05149 | 1.359842 | | 1998 | -3.53496 | 13.15222 | 3.221083 | 0.709677 | 5.328679 |
| 1999 | -12.93345 | 4.4011635 | 3.005069 | 3.171195 | 1.699388 | | 1999 | 11.07492 | 9.45122 | 0.567376 | 8.13581 | 6.563167 |
| 2000 | -9.631914 | 6.4082374 | 0.984183 | 2.513408 | 1.700049 | | 2000 | 14.66276 | 28.20334 | 12.12976 | 3.791469 | 5.189221 |
| 2001 | 2.0765265 | -6.454918 | 1.374869 | 5.700008 | | | 2001 | 11.41304 | 8.66377 | 6.289308 | 12.95662 | |

| Manufacturing | | | | | | | Transportation, communication, and public utilities | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Worcester | Cambridge | Lowell | Springfield | Mass | | Year | Worcester | Cambridge | Lowell | Springfield | Mass |
| 1986 | -7.203006 | -7.840586 | -2.3776 | -8.60159 | -5.51174 | | 1986 | 1.421189 | -7.56721 | 4.40598 | 0.936235 | 0.639987 |
| 1987 | -4.351856 | -6.9985 | -2.97495 | -3.60338 | -3.82134 | | 1987 | -18.9299 | -19.8923 | -3.69254 | 14.43971 | 3.020072 |
| 1988 | -4.340729 | -0.370089 | -3.16525 | 1.021011 | -2.05744 | | 1988 | 15.77624 | -3.22725 | 26.76056 | 2.979189 | 3.1572 |
| 1989 | -5.321531 | -25.52624 | -4.08732 | -3.90077 | -4.06868 | | 1989 | -9.36482 | -14.4511 | -19.1358 | -3.87152 | -4.16041 |
| 1990 | -8.290155 | -4.501854 | -9.71432 | -5.36289 | -6.9079 | | 1990 | -4.25277 | 17.21711 | -4.42748 | 1.63753 | 2.453191 |
| 1991 | -7.332351 | -3.856971 | -9.7814 | -6.17193 | -6.86213 | | 1991 | -7.16297 | -1.7552 | -12.1406 | -5.35598 | -4.25353 |
| 1992 | -5.705765 | -8.692018 | -13.556 | -6.59749 | -3.51724 | | 1992 | -3.60512 | -5.68876 | 21.72727 | -12.4684 | -1.00305 |
| 1993 | -5.973716 | -4.317315 | -9.30976 | -5.60679 | -2.41022 | | 1993 | 5.767214 | 6.530409 | -16.5795 | 1.261498 | 4.52149 |
| 1994 | -1.659317 | 9.1836735 | -17.1338 | -2.77562 | -0.63693 | | 1994 | -1.09055 | 8.610201 | 12.08594 | 4.282377 | 3.662342 |
| 1995 | 2.5385726 | -6.439836 | -10.9991 | 1.438849 | -1.07802 | | 1995 | -10.6582 | -7.49677 | -10.7029 | -0.84619 | -1.52452 |
| 1996 | 1.1785635 | -6.508506 | -15.5424 | -2.47664 | 0.111042 | | 1996 | -5.3104 | 12.43596 | 5.545617 | -2.35944 | 1.12652 |
| 1997 | 0.1831502 | 7.21202 | 2.846074 | -3.62461 | 0.409812 | | 1997 | 6.793049 | -3.85253 | 22.0339 | -1.33676 | 2.355291 |
| 1998 | -2.603291 | 1.3235752 | 0.724428 | 0.011977 | -0.02183 | | 1998 | 2.403846 | 4.179233 | -4.79167 | 9.197499 | 2.933665 |
| 1999 | -3.138374 | -14.36914 | -2.12888 | -1.91617 | -3.58087 | | 1999 | -1.95016 | -6.82382 | -17.4325 | 0.501074 | 1.363954 |
| 2000 | -1.7363 | 0.4845657 | -1.71958 | -5.15263 | 0.824802 | | 2000 | 0.810313 | -2.61873 | -3.97527 | -4.24976 | 3.293082 |
| 2001 | -6.539402 | 0.8037149 | -13.2795 | -6.48816 | | | 2001 | 3.580563 | -1.04831 | 15.63937 | -9.49665 | |

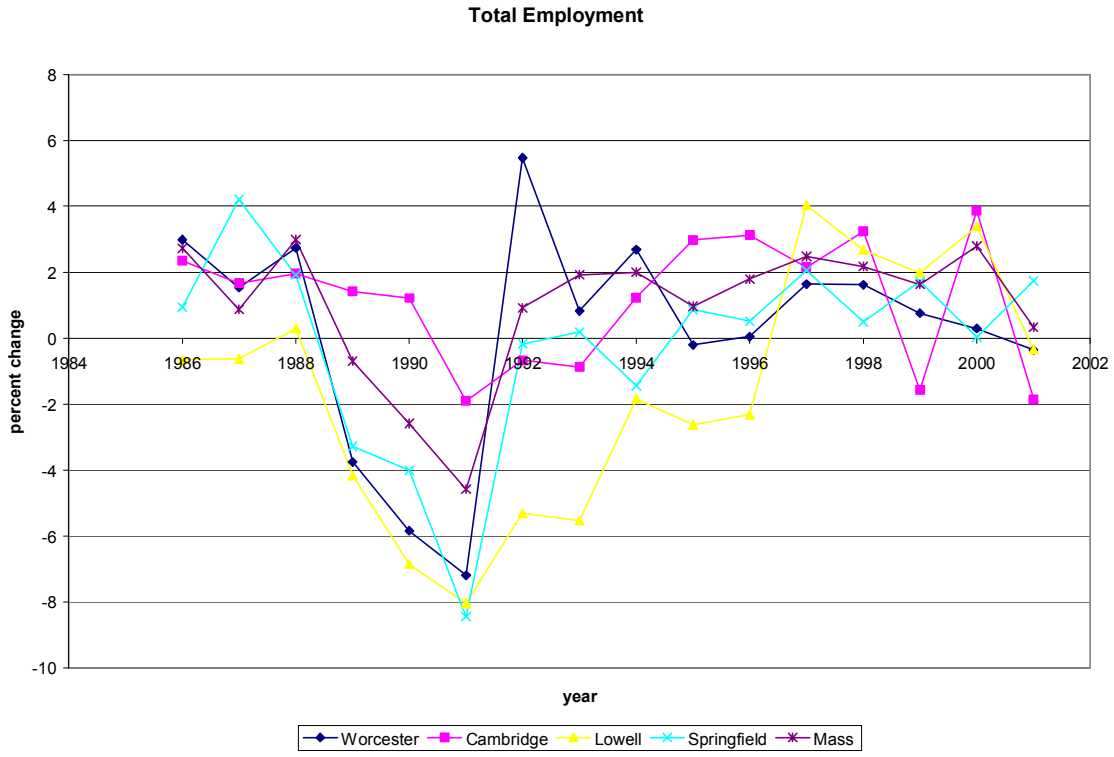
| Trade | | | | | | | Finance, insurance, real estate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Worcester | Cambridge | Lowell | Springfield | Mass | | Year | Worcester | Cambridge | Lowell | Springfield | Mass |
| 1986 | 5.8977247 | 5.361423 | -4.57092 | -1.14931 | 2.774463 | | 1986 | 9.25468 | 7.177974 | 11.36913 | 3.527397 | 10.75107 |
| 1987 | -0.497788 | 4.0648946 | -2.29486 | 2.335721 | 0.742291 | | 1987 | 11.47753 | 7.828746 | 6.993918 | 7.487044 | 1.655809 |
| 1988 | 0.2779322 | -2.841857 | 2.321453 | 1.232502 | 2.262006 | | 1988 | 3.393271 | -11.7981 | -8.12018 | -0.20517 | 2.986586 |
| 1989 | -2.899539 | -1.000651 | -6.97985 | -4.86998 | 1.124234 | | 1989 | -6.72277 | 16.14148 | -0.92797 | -4.25576 | -3.05189 |
| 1990 | -9.213069 | -7.08134 | -10.9182 | -10.4124 | -4.5702 | | 1990 | -2.96712 | -5.9247 | -10.2587 | 0.440198 | -2.05862 |
| 1991 | -10.90742 | -2.619722 | -9.26075 | -9.18283 | -6.30073 | | 1991 | -2.44835 | -8.44614 | -15.7058 | -6.57402 | -4.67941 |
| 1992 | 0.5863511 | 1.4078921 | -3.51438 | -1.07457 | 0.942372 | | 1992 | -0.63539 | -17.1006 | -35.6132 | -0.91533 | -2.34138 |
| 1993 | -3.902413 | -3.08304 | -9.87859 | -0.88339 | 0.088135 | | 1993 | 12.63988 | -1.04692 | -4.3956 | -3.59122 | 1.982383 |
| 1994 | -0.230285 | 3.3021723 | 1.632986 | -5.20895 | 3.310563 | | 1994 | 9.026398 | 10.1489 | 12.64368 | -0.88633 | 5.711923 |
| 1995 | 1.4637167 | 3.1445313 | 4.880498 | 1.274551 | 1.472544 | | 1995 | -11.3772 | 9.747421 | -1.61565 | -5.52266 | -1.17718 |
| 1996 | -3.157077 | 2.461655 | -1.62773 | 1.217248 | 1.136051 | | 1996 | -6.55112 | 9.04376 | 5.704408 | -9.19673 | 2.1517 |
| 1997 | 0.2291738 | 1.9959342 | 0.1168 | -1.39965 | 1.684551 | | 1997 | -2.21104 | 4.131986 | 2.780049 | 0.267643 | 2.500025 |
| 1998 | 2.4694181 | 7.6946307 | 0.34999 | 0.144708 | 1.549503 | | 1998 | -2.25032 | 10.27691 | 11.13763 | 1.250351 | 5.649083 |
| 1999 | -0.764253 | -3.421008 | 5.115288 | -0.24083 | 1.702861 | | 1999 | -0.67968 | -0.9578 | 6.728704 | 5.55016 | 2.120178 |
| 2000 | -1.894429 | 1.1033041 | 0.552995 | -3.15906 | 1.530457 | | 2000 | -5.50773 | -8.18087 | -0.06707 | 3.878007 | 4.190778 |
| 2001 | -2.349301 | -0.321636 | 4.546288 | -2.47151 | | | 2001 | -0.45555 | -3.67208 | 18.79195 | 4.998734 | |

| Services | | | | | |
|---|---|---|---|---|---|
| Year | Worcester | Cambridge | Lowell | Springfield | Mass |
| 1986 | 5.6147933 | 4.6508942 | 0.853392 | 3.103654 | 4.351395 |
| 1987 | 5.2592742 | 4.6263083 | 1.692341 | 5.615829 | 1.318406 |
| 1988 | 6.5547129 | 5.0265481 | 3.296352 | 4.378394 | 6.09758 |
| 1989 | -0.675858 | 6.7027136 | -0.53702 | 1.000282 | 2.253349 |
| 1990 | -1.851685 | 4.0570433 | -1.9105 | 0.818657 | 1.178561 |
| 1991 | -7.534205 | -2.487675 | -0.78332 | -3.87784 | -1.91617 |
| 1992 | 4.2100723 | 0.1855374 | 5.089086 | 4.495817 | 4.591377 |
| 1993 | 5.7527618 | 0.3919935 | -0.01015 | 3.383548 | 3.991014 |
| 1994 | 3.6636763 | -1.649475 | 7.59468 | -0.51114 | 1.512853 |
| 1995 | 2.4538986 | 5.0423583 | -0.41521 | 2.760524 | 2.263368 |
| 1996 | 1.0034014 | 4.7750134 | 4.520042 | 2.996045 | 3.36408 |
| 1997 | 0.8026043 | -0.347947 | 1.894832 | 6.085854 | 3.761645 |
| 1998 | 3.1987751 | 2.2332117 | 4.24415 | -0.84685 | 2.312957 |
| 1999 | 9.2395263 | -0.911689 | 4.481052 | 2.004339 | 2.354689 |
| 2000 | 5.941621 | 4.3147958 | 9.239441 | 1.367366 | 3.673297 |
| 2001 | 0.4079254 | -2.379026 | -0.4487 | 4.103384 | |

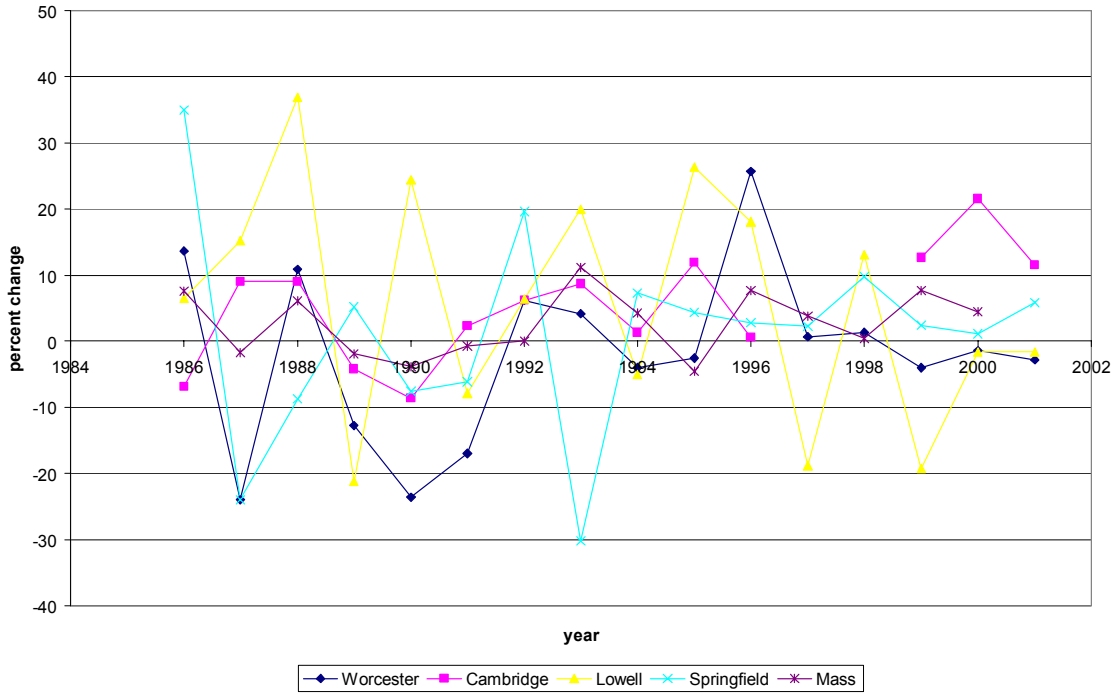
## Appendix G: Time Series Graphs (City Level)

One series of graphs was constructed showing percent changes in employment from the previous year for each city and the state. In this series there are nine graphs, one showing changes in total employment and eight showing employment changes in each SIC industry category. Another series of graphs was construction showing employment versus the year for Worcester. There are ten graphs for this series: one showing total employment, eight showing employment in each category, and one showing employment in each SIC category on one graph. Similar graphs could not be constructed for Providence because the information was not available. A few abbreviations are used in the charts. TCPU stands for transportation, communication, and public utilites. FIRE stands for finance, insurance, and real estate. Conf stands for suppressed data due to confidentiality.

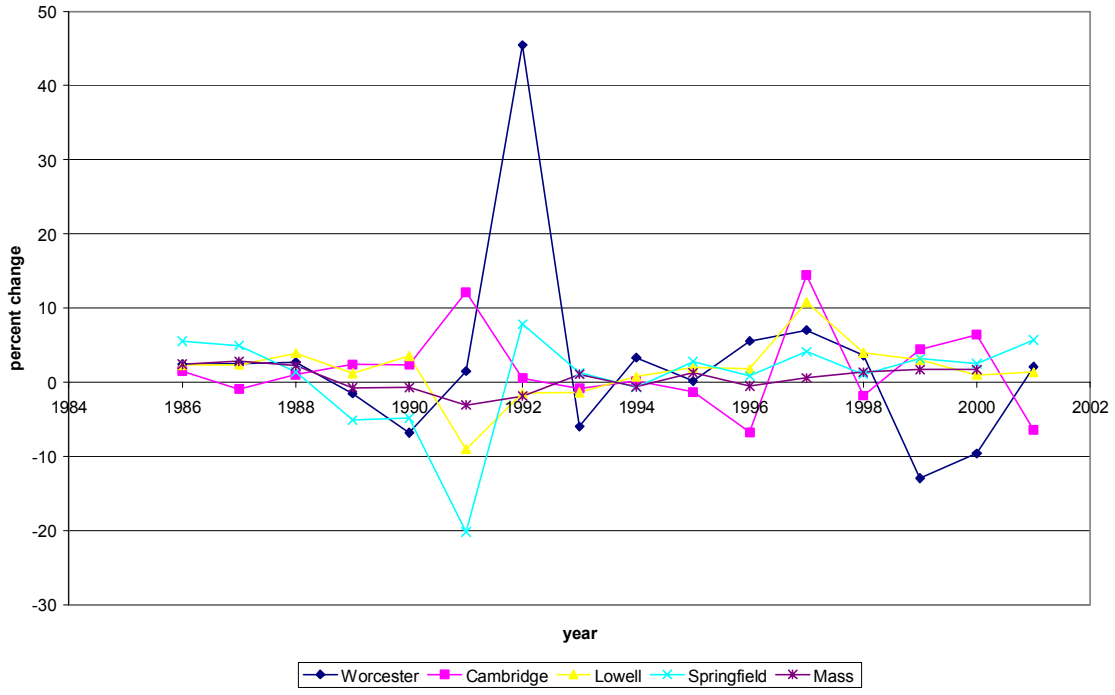
### Percent Change in Employment



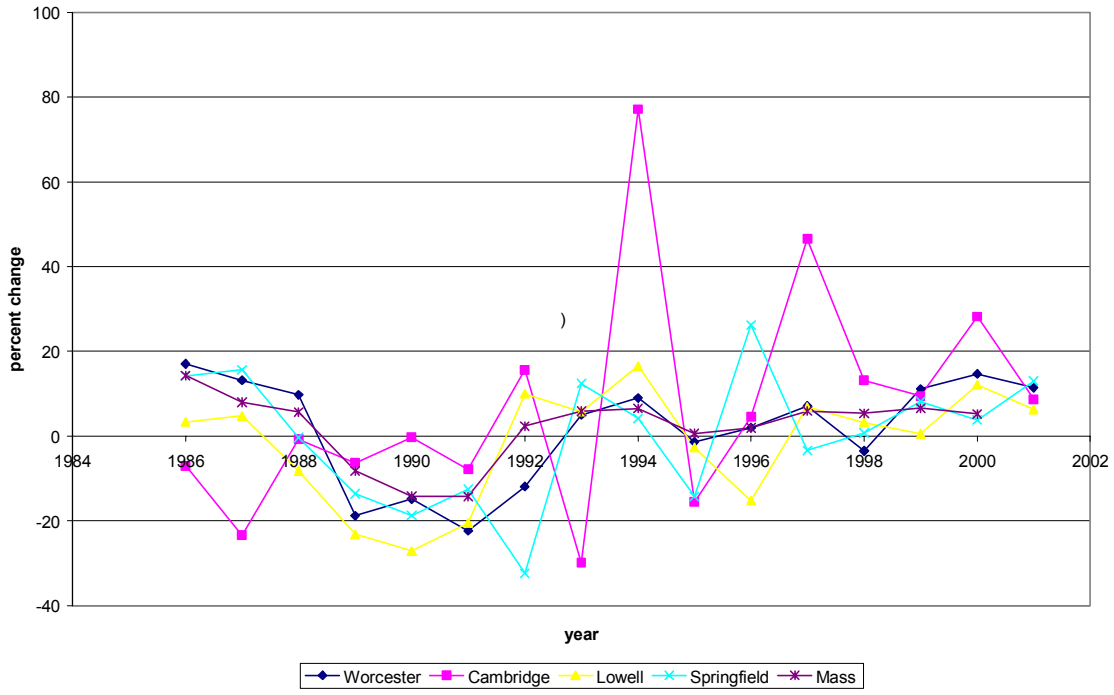
**Agriculture, Forestry, Fishing**



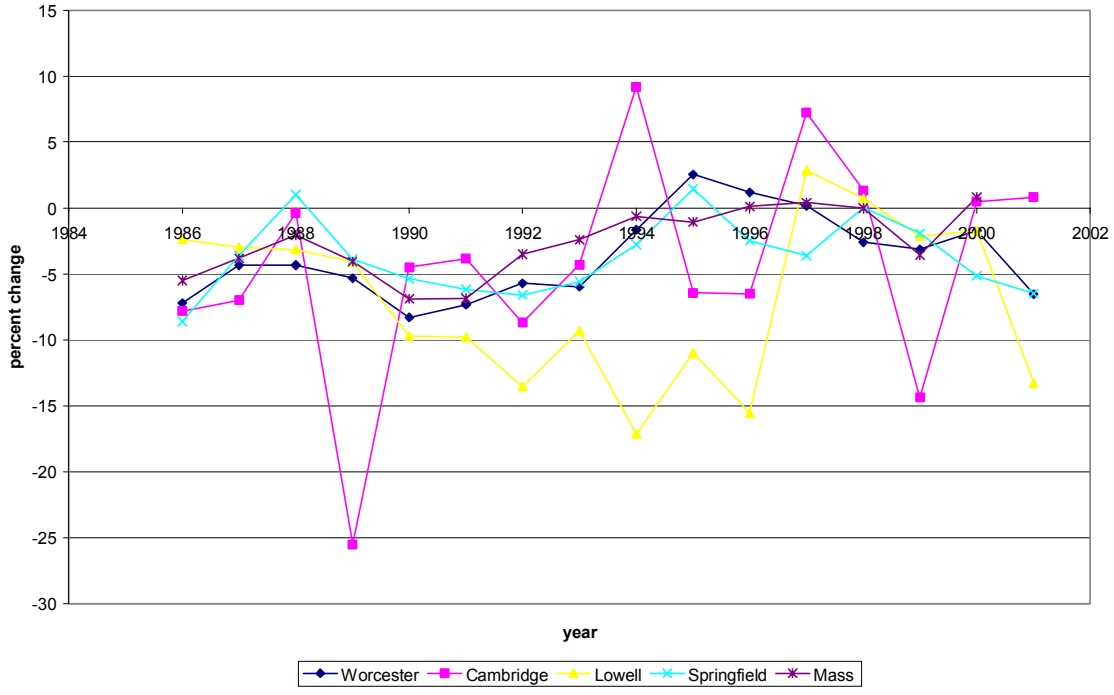

**Government**

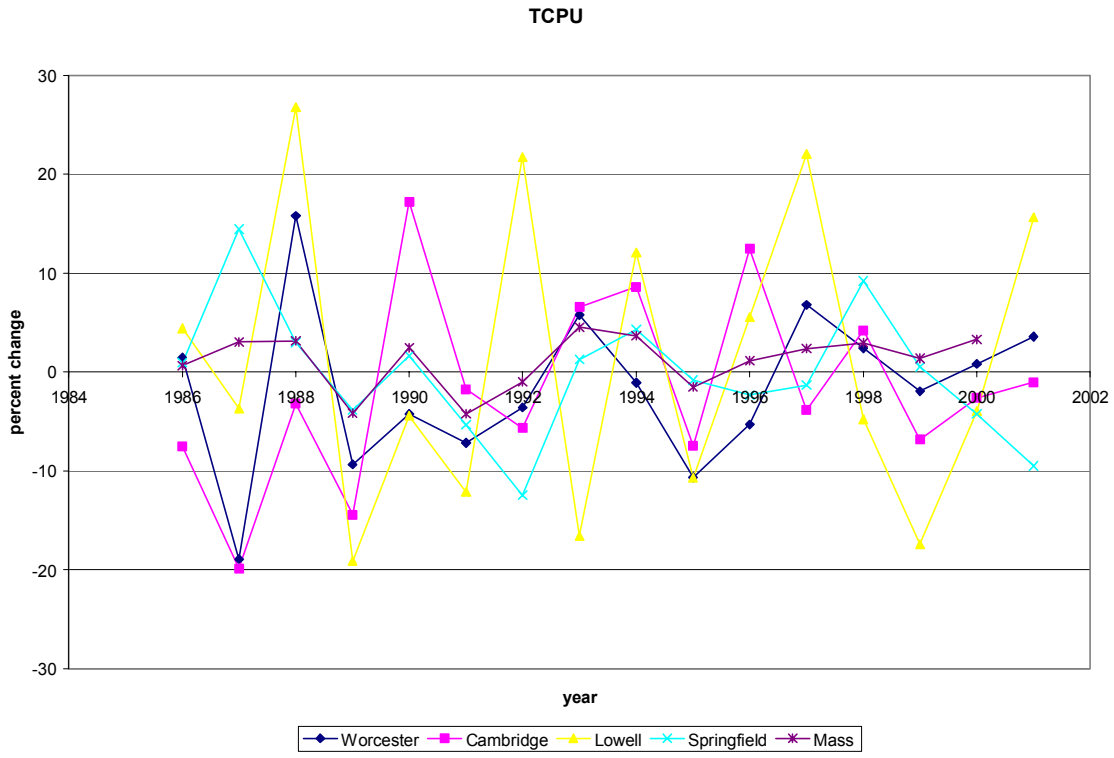


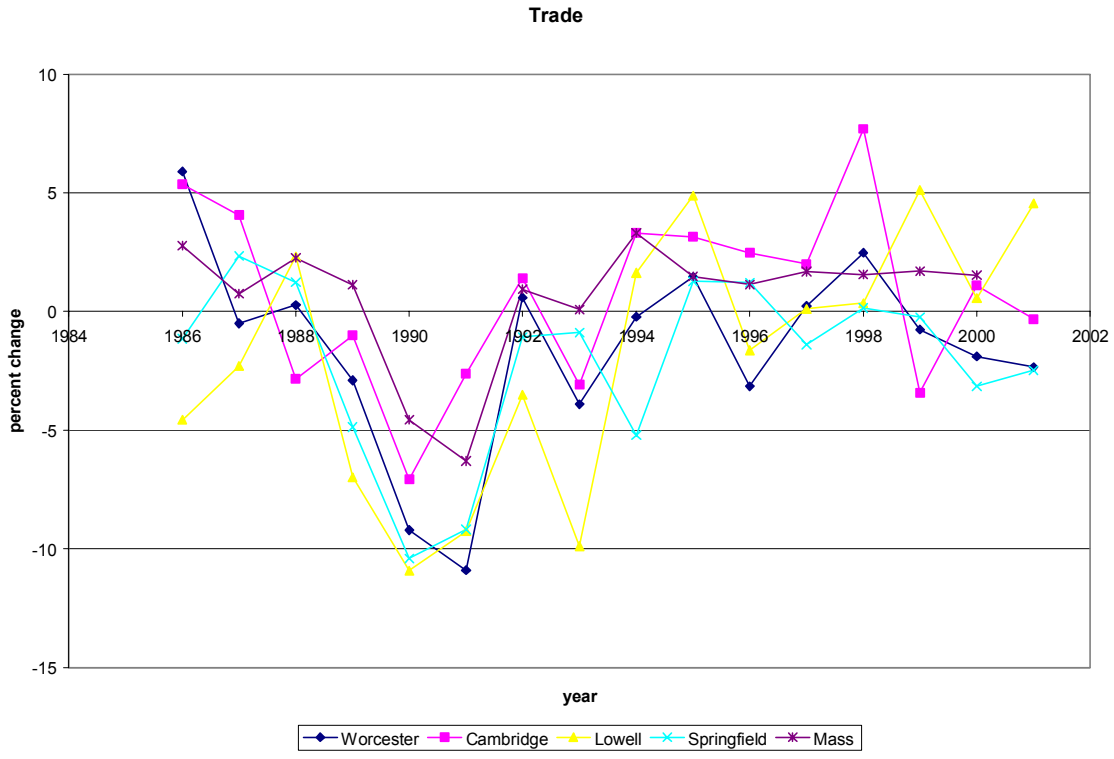
**Construction**



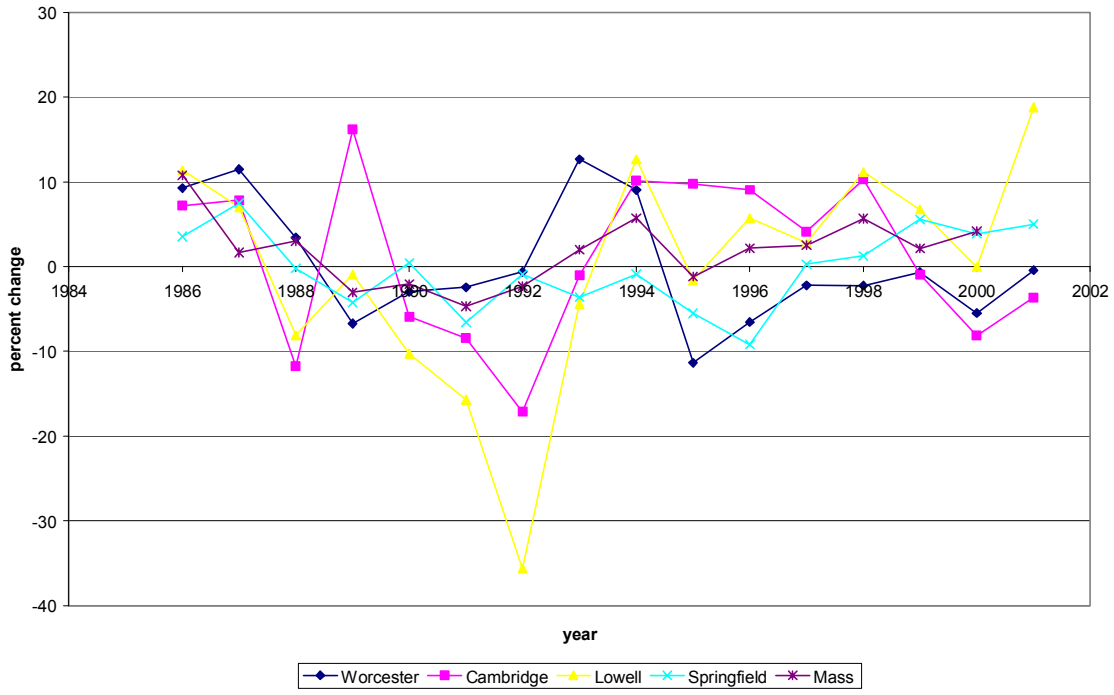

**Manufacturing**



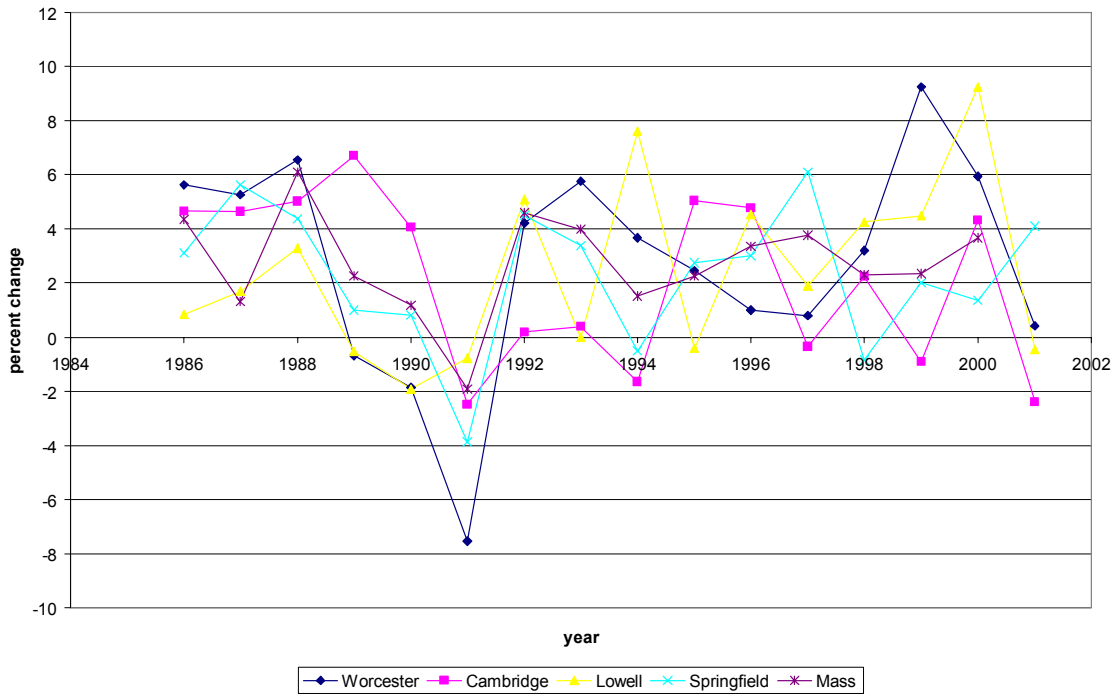

TCPU
30
20
10
0
-10
-20
-30
percent change
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year
Worcester
Cambridge
Lowell
Springfield
Mass


Trade
10
5
0
-5
-10
-15
percent change
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year
Worcester
Cambridge
Lowell
Springfield
Mass

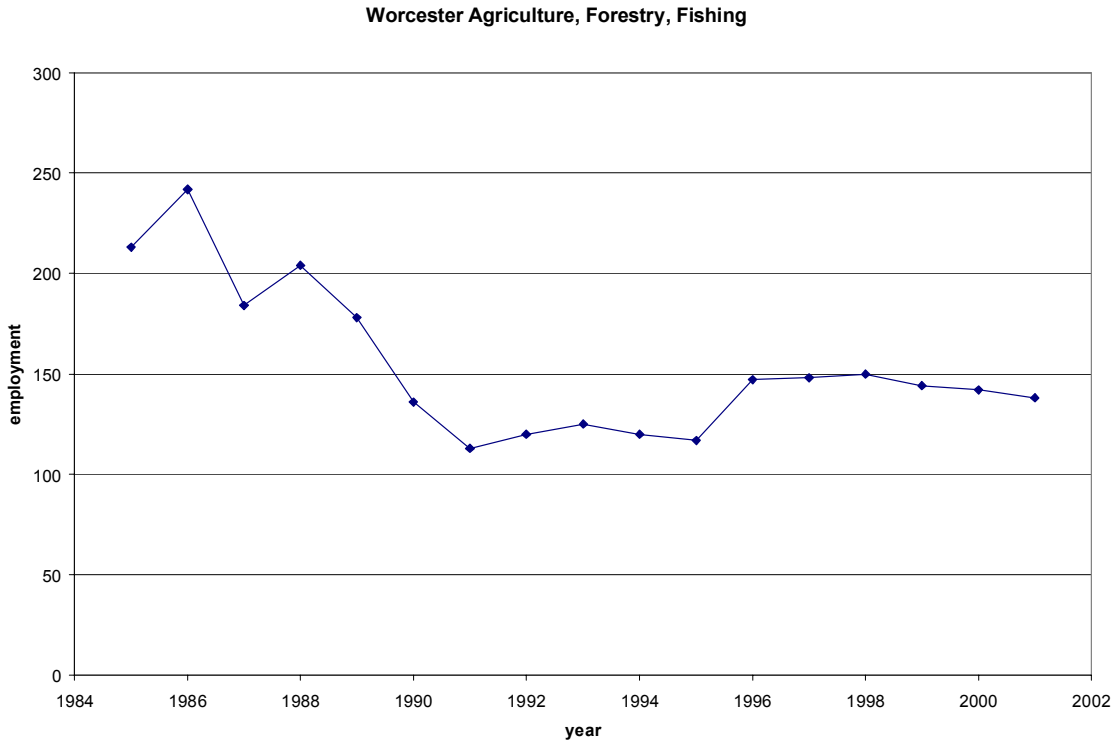
**FIRE**



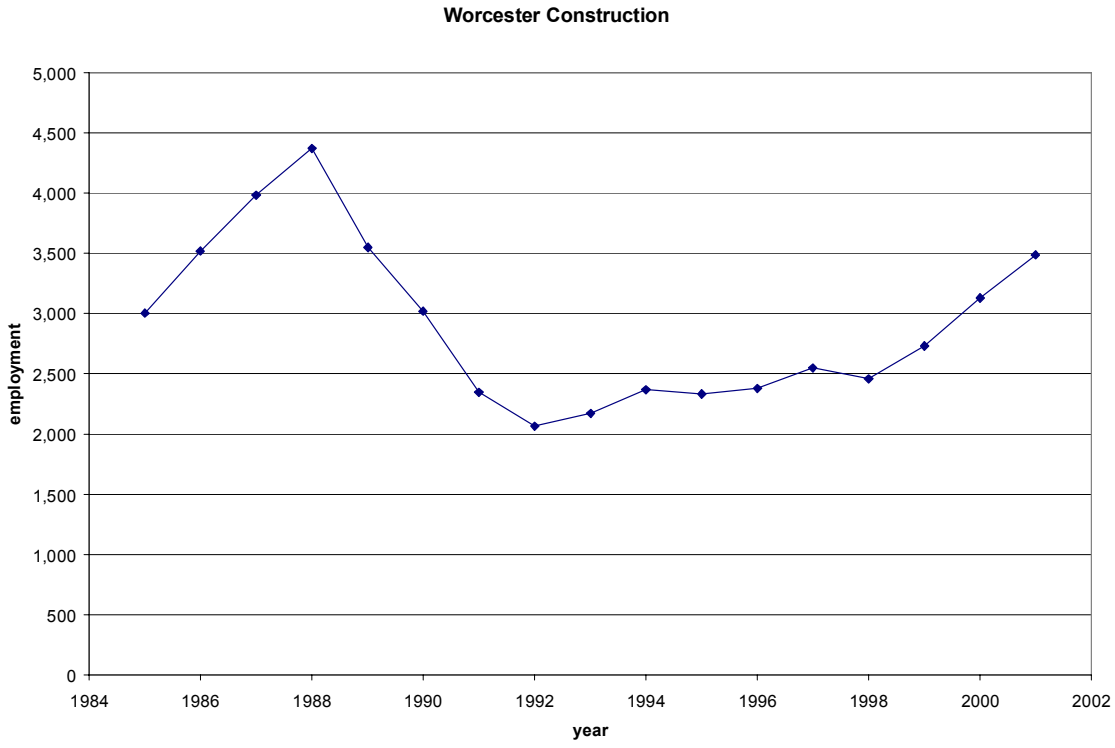

**Services**

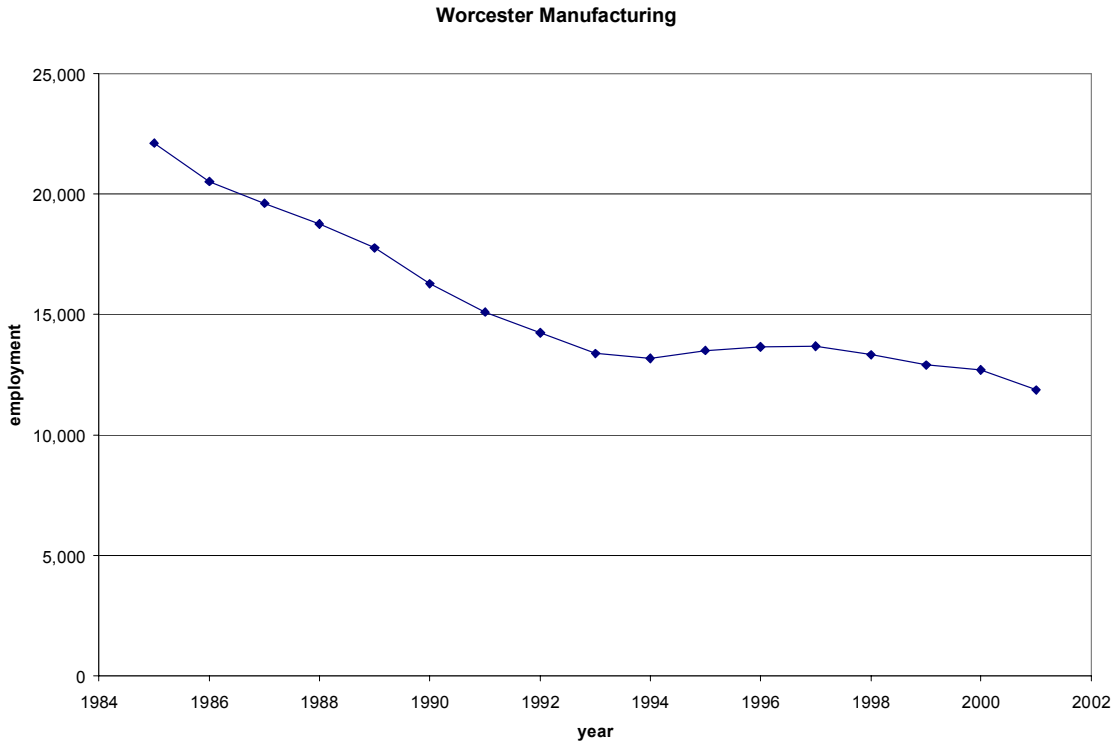


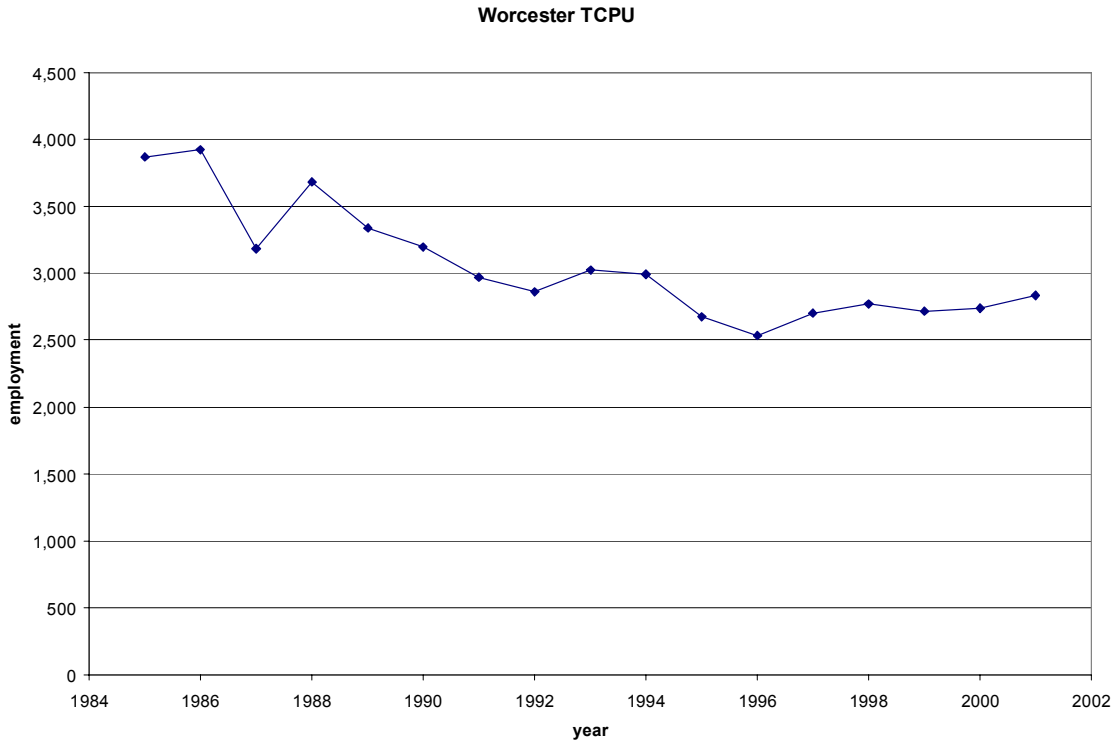
## Employment Versus Time

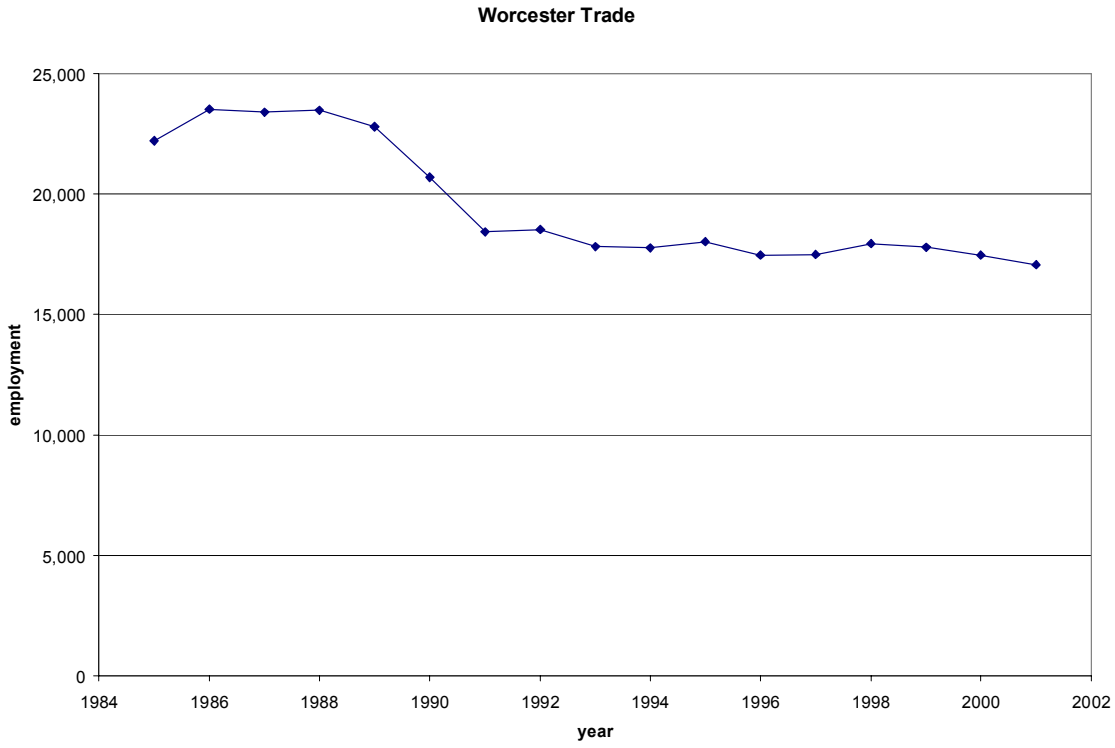



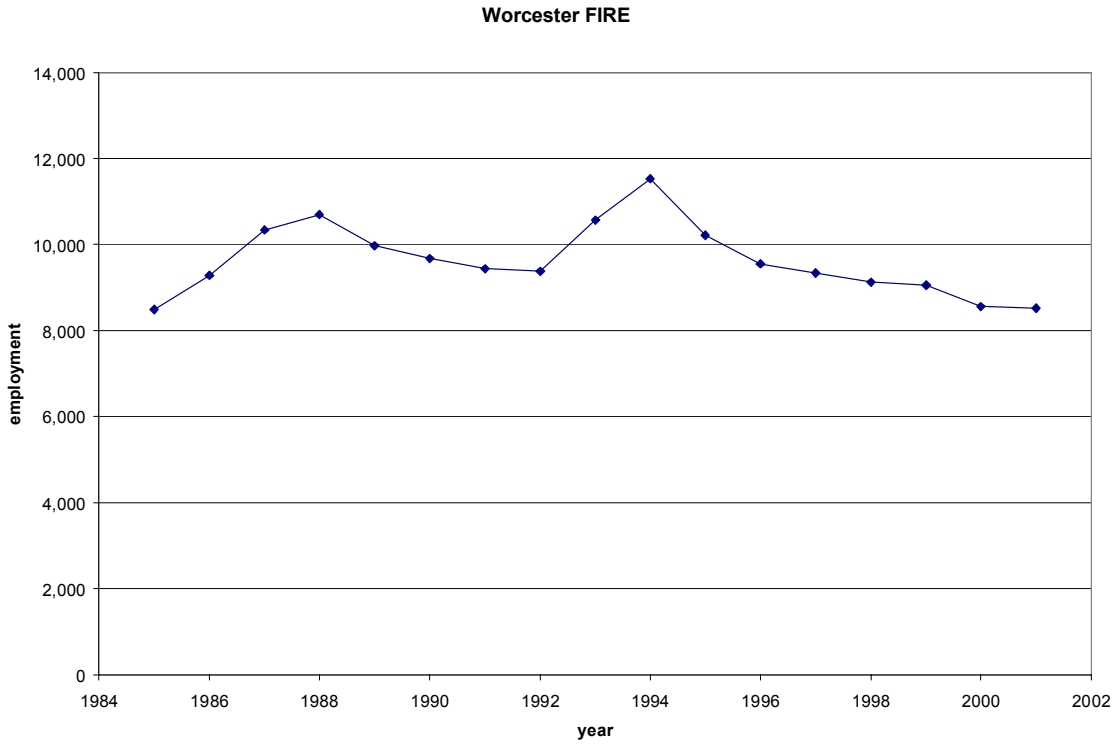

Worcester Government
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
employment
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year

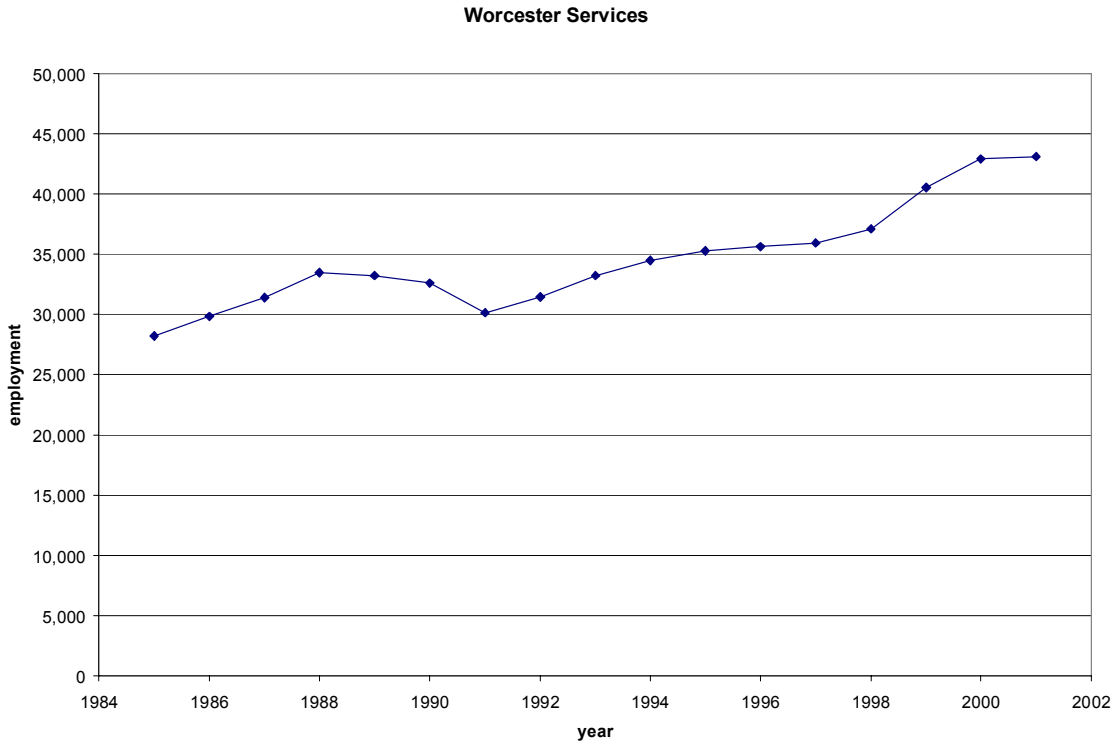

Worcester Construction
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
employment
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year


Worcester Manufacturing
25,000
20,000
15,000
10,000
5,000
0
employment
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year

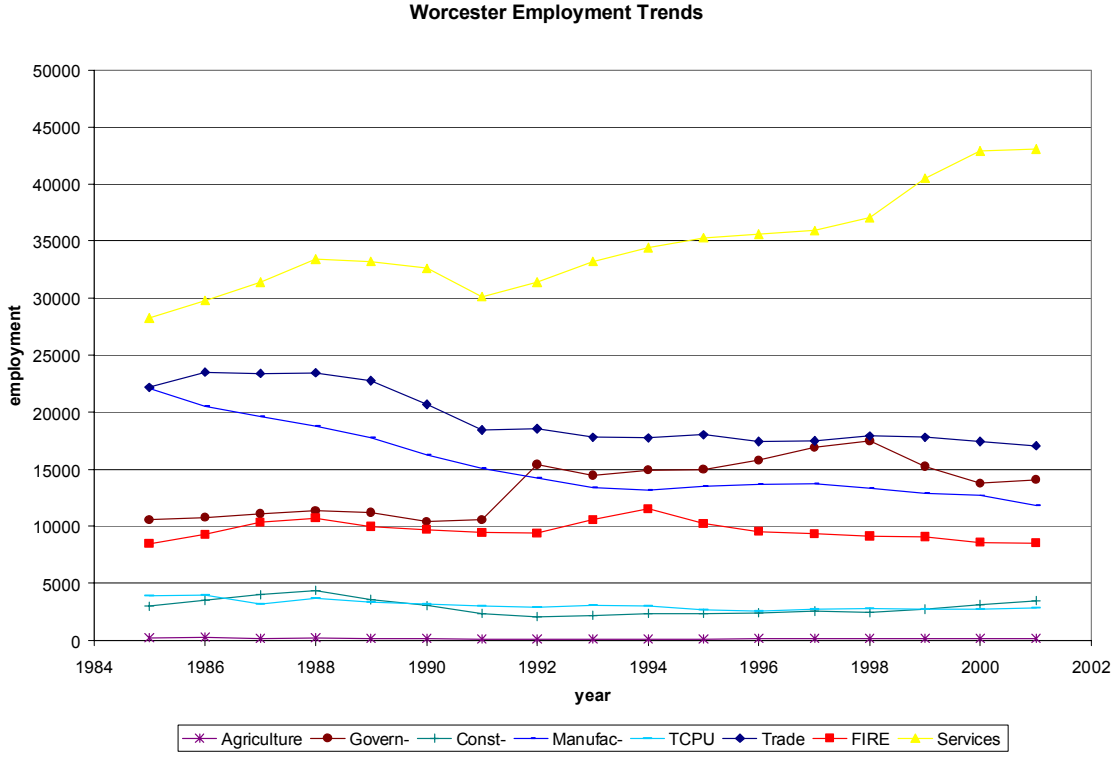

Worcester TCPU
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
employment
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year


Worcester Trade
25,000
20,000
15,000
10,000
5,000
0
employment
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year


Worcester FIRE
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
employment
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
year




## Employment Using SIC Data



## Appendix H: Employment Statistics for Worcester versus BCMA

The first table contains statistics for the labor force, employment, unemployment, and unemployment rate for each of the ten primary metropolitan areas located within Boston's Consolidated Metropolitan area. These statistics were found on the Bureau of Labor Statistic's website. In order to determine these values for the overall area, an additional row is included in the chart. To obtain values for labor force, employment, and unemployment for the overall area, the values from each of the ten consolidated metropolitan areas were added together. In order to obtain the unemployment rate for the greater area, the calculated unemployment value was divided by the labor force value and multiplied by 100. The second table simply summarizes the information found in the comparison with similar cities appendix and the table just described. It contains statistics for the labor force, employment, unemployment, and unemployment rate for the city of Worcester and Boston's CMA. It also compares the unemployment rates of the city and the CMA to that of Massachusetts. The information gathered for the third chart was found on the Census Bureau's website. The third table shows the estimated income distribution of Boston's CMA, as well as the upper and lower bound values of this estimate. Estimates for median household income and per capita income are located at the bottom of the table.

2002 annual employment information for the PMA's located within Boston's CMA (including compiled values for the larger CMA)

| PMSA | labor force | employment | unemployment | unemployment rate |
|---|---|---|---|---|
| Boston | 1922942 | 1829918 | 93024 | 4.8 |
| Brockton | 142856 | 135186 | 7670 | 5.4 |
| Fitchburg-Leominster | 71865 | 66616 | 5249 | 7.3 |
| Lawrence | 222918 | 205394 | 17524 | 7.9 |
| Lowell | 184658 | 172706 | 11952 | 6.5 |
| New Bedford | 84808 | 78504 | 6304 | 7.4 |
| Worcester | 267977 | 252372 | 15605 | 5.8 |
| Manchester | 112924 | 107707 | 5217 | 4.6 |
| Nashua | 107588 | 100882 | 6706 | 6.2 |
| Portsmouth-Rochester | 134394 | 128516 | 5878 | 4.4 |
| Boston's CMA | 3252930 | 3077801 | 175129 | 5.383730975 |

Summary employment information for the city of Worcester and Boston's CMA

| 2002 Annual | labor force | employment | unemployment | unemployment rate | mass rate |
|---|---|---|---|---|---|
| Worcester | 82,945 | 77,436 | 5,509 | 6.6 | 5.3 |
| Boston's CMA | 3,252,930 | 3,077,801 | 175,129 | 5.4 | 5.3 |

2002 income distribution, median household income, and per capita income (2001 inflation-adjusted dollars) for Boston--Worcester--Lawrence, MA--NH--ME--CT CMA

| | Estimate | Lower Bound | Upper Bound |
|---|---|---|---|
| Household Income | | | |
| Total: | 2,227,417 | 2,215,936 | 2,238,898 |
| Less than $10,000 | 165,338 | 153,262 | 177,414 |
| $10,000 to $14,999 | 107,336 | 98,855 | 115,817 |
| $15,000 to $19,999 | 105,116 | 95,287 | 114,945 |
| $20,000 to $24,999 | 107,461 | 97,972 | 116,950 |
| $25,000 to $29,999 | 92,427 | 83,090 | 101,764 |
| $30,000 to $34,999 | 105,686 | 96,565 | 114,807 |
| $35,000 to $39,999 | 107,475 | 99,152 | 115,798 |
| $40,000 to $44,999 | 102,358 | 92,866 | 111,850 |
| $45,000 to $49,999 | 95,210 | 85,810 | 104,610 |
| $50,000 to $59,999 | 182,565 | 169,116 | 196,014 |
| $60,000 to $74,999 | 260,568 | 247,427 | 273,709 |
| $75,000 to $99,999 | 297,518 | 281,554 | 313,482 |
| $100,000 to $124,999 | 187,238 | 174,667 | 199,809 |
| $125,000 to $149,999 | 112,945 | 104,964 | 120,926 |
| $150,000 to $199,999 | 100,427 | 92,852 | 108,002 |
| $200,000 or more | 97,749 | 89,979 | 105,519 |
| Median household income | 56,481 | 55,438 | 57,524 |
| Per capita income | 29,789 | 29,236 | 30,342 |

**Appendix I: Quotient Analysis Data for Worcester versus BNECMA**

A two step approach was used in completing the quotient analysis for the city of Worcester to Boston's New England Consolidated Metropolitan Area. First, a quotient analysis comparing Worcester County to Boston's NECMA was done using REIS data. Second, a quotient analysis comparing the city of Worcester to Worcester County was done using ES-202 data. After both analyses were completed and the corresponding exported job values were calculated for each industry, the two analyses were compared. The first table shows all calculations necessary to complete the quotient analysis comparing Worcester County to Boston's NECMA. The first two columns contain the industry code and description. The next two contain employment numbers for Boston's NECMA and Worcester County. The next three contain calculations and the location quotient ratio. The final three contains calculations and the exported job values. The second table is laid out in the exact same way, except that there is only one column for industry code and description and the employment numbers are for Worcester City and Worcester County. The third table compares the contributions of Worcester County to Boston's NECMA and the contributions of Worcester City to Worcester County. The highlighted value in the table for health care and social assistance indicates that Worcester city contributes that industry to the county (it has a positive exported job value), and the county contributes that industry to the NECMA. Therefore, Worcester City contributes that industry to Boston's NECMA.

| Calculations for Quotient Ratio (Worcester Contributions to New England Consolidated Metropolitan Area) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Boston's NECMA Employment | Worcester County Employment | top ratio | bottom ratio | LQR | ri/si | ri/si - rt/st | Exported Jobs |
| Code | Item | 2001 | 2001 | | | | rt/st = 0.10192 | | |
| 10 | Total employment | 3993306 | 406992 | | | | | | |
| 20 | Wage and salary employment | 3410113 | 346055 | 0.850275 | 0.853957 | 0.995688 | 0.101479 | -0.00044 | -152.2497014 |
| 40 | Proprietors employment | 583193 | 60937 | 0.149725 | 0.146043 | 1.025216 | 0.104489 | 0.00257 | 156.581615 |
| 50 | Farm proprietors employment | 4446 | 999 | 0.002455 | 0.001113 | 2.204666 | 0.224696 | 0.122777 | 122.6545789 |
| 60 | Nonfarm proprietors employment 2/ | 578747 | 59938 | 0.147271 | 0.144929 | 1.016156 | 0.103565 | 0.001646 | 98.66488117 |
| 70 | Farm employment | 8743 | 1612 | 0.003961 | 0.002189 | 1.809053 | 0.184376 | 0.082457 | 132.9208005 |
| 80 | Nonfarm employment | 3984563 | 405380 | 0.996039 | 0.997811 | 0.998225 | 0.101738 | -0.00018 | -73.52338458 |
| 90 | Private employment | 3563376 | 353379 | 0.86827 | 0.892337 | 0.973029 | 0.09917 | -0.00275 | -971.5378344 |
| 100 | Forestry, fishing, related activities, and other 3/ | 9,574 | 676 | 0.001661 | 0.002398 | 0.692787 | 0.070608 | -0.03131 | -21.16630604 |
| 200 | Mining | 2,037 | 328 | 0.000806 | 0.00051 | 1.5799 | 0.161021 | 0.059102 | 19.38549191 |
| 300 | Utilities | 12,107 | 2216 | 0.005445 | 0.003032 | 1.795891 | 0.183035 | 0.081116 | 179.7521875 |
| 400 | Construction | 208668 | 22658 | 0.055672 | 0.052254 | 1.065399 | 0.108584 | 0.006665 | 151.0149063 |
| 500 | Manufacturing | 412229 | 52286 | 0.128469 | 0.10323 | 1.244496 | 0.126837 | 0.024918 | 1302.876542 |
| 600 | Wholesale trade | 159033 | 15663 | 0.038485 | 0.039825 | 0.96635 | 0.098489 | -0.00343 | -53.72420198 |
| 700 | Retail trade | 409830 | 45966 | 0.112941 | 0.102629 | 1.100474 | 0.112159 | 0.01024 | 470.6780478 |
| 800 | Transportation and warehousing | 101,824 | 10210 | 0.025086 | 0.025499 | 0.983835 | 0.100271 | -0.00165 | -16.82550886 |
| 900 | Information | 123598 | 6793 | 0.016691 | 0.030951 | 0.539258 | 0.05496 | -0.04696 | -318.9895235 |
| 1000 | Finance and insurance | 240095 | 18688 | 0.045917 | 0.060124 | 0.763706 | 0.077836 | -0.02408 | -450.0657831 |
| 1100 | Real estate and rental and leasing | 114904 | 9627 | 0.023654 | 0.028774 | 0.822058 | 0.083783 | -0.01814 | -174.5954255 |
| 1200 | Professional and technical services | 366631 | 23834 | 0.058561 | 0.091811 | 0.637844 | 0.065008 | -0.03691 | -879.7333967 |
| 1300 | Management of companies and enterprises | 72015 | 8244 | 0.020256 | 0.018034 | 1.123212 | 0.114476 | 0.012557 | 103.5211512 |
| 1400 | Administrative and waste services | 212787 | 20133 | 0.049468 | 0.053286 | 0.928347 | 0.094616 | -0.0073 | -147.0364832 |
| 1500 | Educational services | 168720 | 12657 | 0.031099 | 0.042251 | 0.736056 | 0.075018 | -0.0269 | -340.4887297 |
| 1600 | Health care and social assistance | 453650 | 53231 | 0.130791 | 0.113603 | 1.151305 | 0.117339 | 0.01542 | 820.8411052 |
| 1700 | Arts, entertainment, and recreation | 78541 | 7297 | 0.017929 | 0.019668 | 0.91158 | 0.092907 | -0.00901 | -65.76137108 |
| 1800 | Accommodation and food services | 237078 | 23115 | 0.056795 | 0.059369 | 0.956642 | 0.0975 | -0.00442 | -102.1554225 |
| 1900 | Other services, except public administration | 178549 | 19757 | 0.048544 | 0.044712 | 1.085701 | 0.110653 | 0.008734 | 172.5595748 |
| 2000 | Government and government enterprises | 421187 | 52001 | 0.127769 | 0.105473 | 1.211389 | 0.123463 | 0.021544 | 1120.308238 |
| 2001 | Federal, civilian | 49907 | 3001 | 0.007374 | 0.012498 | 0.589999 | 0.060132 | -0.04179 | -125.4032515 |
| 2002 | Military | 21423 | 2297 | 0.005644 | 0.005365 | 1.052028 | 0.107221 | 0.005302 | 12.17917832 |
| 2010 | State and local | 349857 | 46703 | 0.114752 | 0.087611 | 1.309788 | 0.133492 | 0.031573 | 1474.539049 |
| 2011 | State government | 112141 | 16472 | 0.040473 | 0.028082 | 1.441215 | 0.146887 | 0.044968 | 740.7048074 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2012 | Local government | 237716 | 30231 | 0.074279 | 0.059529 | 1.247788 | 0.127173 | 0.025254 | 763.4464419 |

| Calculations for Quotient Ratio (Worcester City Contributions to Worcester County) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Worcester (County) Employment | Worcester (City) Employment | top ratio | bottom ratio | LQR | ri/si | ri/si - rt/st | exported jobs |
| Total | 316,503 | 98,584 | | | | rt/st = 0.31148 | | |
| 11 - Agriculture, Forestry, Fishing & Hunting | 530 | 23 | 0.0008891 | 0.004076578 | 0.218096 | 0.050633 | -0.26085 | -1.043383874 |
| 23 - Construction | 14,654 | 3,639 | 0.0624583 | 0.1123897 | 0.55573 | 0.129017 | -0.18246 | -51.27166262 |
| 31-33 - Manufacturing | 47,149 | 9,178 | 0.0551234 | 0.06558646 | 0.840469 | 0.195122 | -0.11636 | -28.85651834 |
| DUR - Durable Goods Manufacturing | 30,477 | 6,721 | 0.036008 | 0.042417049 | 0.848904 | 0.19708 | -0.1144 | -18.53257126 |
| NONDUR - Non-Durable Goods Manufacturing | 16,672 | 2,458 | 0.0191154 | 0.02316941 | 0.825026 | 0.191537 | -0.11994 | -10.31502332 |
| 22 - Utilities | 2,172 | 401 | 0.0011114 | 0.003405748 | 0.326318 | 0.075758 | -0.23572 | -1.178606521 |
| 42 - Wholesale Trade | 13,155 | 3,253 | 0.0531229 | 0.063677176 | 0.834254 | 0.193679 | -0.1178 | -28.15414924 |
| 44-45 - Retail Trade | 38,022 | 8,732 | 0.1375861 | 0.134475463 | 1.023132 | 0.237529 | -0.07395 | -45.77511206 |
| 48-49 - Transportation and Warehousing | 9,865 | 1,424 | 0.0202267 | 0.027916817 | 0.724535 | 0.168207 | -0.14327 | -13.03773889 |
| 51 - Information | 6,347 | 1,740 | 0.0133363 | 0.018318799 | 0.728012 | 0.169014 | -0.14246 | -8.54788773 |
| 52 - Finance and Insurance | 13,475 | 7,124 | 0.0551234 | 0.042933072 | 1.283937 | 0.298077 | -0.0134 | -3.323685317 |
| 53 - Real Estate and Rental and Leasing | 3,280 | 961 | 0.0342298 | 0.031374168 | 1.091019 | 0.253289 | -0.05819 | -8.961168573 |
| 54 - Professional and Technical Services | 14,048 | 4,589 | 0.1118026 | 0.101037205 | 1.106549 | 0.256895 | -0.05458 | -27.45579697 |
| 55 - Management of Companies and Enterprises | 7,890 | 2,935 | 0.0066681 | 0.005263429 | 1.266883 | 0.294118 | -0.01736 | -0.520836988 |
| 56 - Administrative and Waste Services | 14,050 | 4,346 | 0.0482329 | 0.053047113 | 0.909247 | 0.211089 | -0.10039 | -21.78449673 |
| 61 - Educational Services | 33,666 | 12,022 | 0.0128918 | 0.015067857 | 0.85558 | 0.19863 | -0.11285 | -6.545227095 |
| 62 - Health Care and Social Assistance | 47,303 | 23,686 | 0.123583 | 0.089013881 | 1.388357 | 0.322319 | 0.01084 | 6.027018082 |
| 71 - Arts, Entertainment, and Recreation | 4,964 | 1,397 | 0.0102245 | 0.013674596 | 0.7477 | 0.173585 | -0.13789 | -6.34312282 |
| 72 - Accommodation and Food Services | 22,026 | 5,604 | 0.0840187 | 0.076113319 | 1.103863 | 0.256271 | -0.05521 | -20.86850817 |
| 81 - Other Services, Ex. Public Admin | 11,232 | 4,203 | 0.1580351 | 0.119201197 | 1.325785 | 0.307792 | -0.00369 | -2.62122394 |
| 92 - Public Administration | 12,429 | 3,326 | 0.0113359 | 0.022601785 | 0.501547 | 0.116438 | -0.19504 | -9.947066716 |

| **Contributions of Worcester City to Worcester County** vs. **Contributions of Worcester County to BNECMA** | | | | |
|---|---|---|---|---|
| Worcester County's Contributions to Boston's NECMA (exported jobs) | Exported | | Worcester City's Contributions to Worcester County (exported jobs) | Exported |
| Manufacturing | 1302.877 | | **Health care and social assistance** | **6.027018** |
| **Health care and social assistance** | **820.8411** | | Management of companies and enterprises | -0.52084 |
| Retail trade | 470.678 | | Forestry, fishing, related activities, and other 3/ | -1.04338 |
| Utilities | 179.7522 | | Utilities | -1.17861 |
| Other services, except public administration | 172.5596 | | Other services, except public administration | -2.62122 |
| Construction | 151.0149 | | Finance and insurance | -3.32369 |
| Management of companies and enterprises | 103.5212 | | Arts, entertainment, and recreation | -6.34312 |
| Transportation and warehousing | -16.8255 | | Educational services | -6.54523 |
| Forestry, fishing, related activities, and other 3/ | -21.1663 | | Real estate and rental and leasing | -8.96117 |
| Wholesale trade | -53.7242 | | Transportation and warehousing | -13.0377 |
| Arts, entertainment, and recreation | -65.7614 | | Accommodation and food services | -20.8685 |
| Accommodation and food services | -102.155 | | Administrative and waste services | -21.7845 |
| Administrative and waste services | -147.036 | | Professional and technical services | -27.4558 |
| Real estate and rental and leasing | -174.595 | | Wholesale trade | -28.1541 |
| Educational services | -340.489 | | Manufacturing | -28.8565 |
| Finance and insurance | -450.066 | | Retail trade | -45.7751 |
| Professional and technical services | -879.733 | | Construction | -51.2717 |

## Appendix J: Time Series Analysis Data for Worcester County versus BNECMA

The data for this section are shown in the tables below. The first table contains employment numbers for Boston's NECMA for each SIC industry sector for the years 1969 to 2000 (a similar table for Worcester County can be found in the time series section of the appendix). The second table contains values for percent changes in employment for Boston's NECMA after employment in Worcester County had been subtracted. A table showing the percent change in employment values for Worcester County is available in the general time series section of the appendix.

**Raw Data**

Total full-time and part-time employment by industry -- Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH (NECMA)

| Code | Item | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Employment by place of work | | | | | | | | | |
| 10 | Total full-time and part-time employment | 2477877 | 2481736 | 2448501 | 2498794 | 2585800 | 2610390 | 2533612 | 2573197 | 2653920 |
| | By type | | | | | | | | | |
| 20 | Wage and salary employment | 2249954 | 2247869 | 2213841 | 2255097 | 2330968 | 2346040 | 2260168 | 2297954 | 2367253 |
| 40 | Proprietors employment | 227923 | 233867 | 234660 | 243697 | 254832 | 264350 | 273444 | 275243 | 286667 |
| 50 | Farm proprietors employment | 5054 | 4863 | 4668 | 4452 | 4384 | 4367 | 4374 | 4766 | 4795 |
| 60 | Nonfarm proprietors employment 2/ | 222869 | 229004 | 229992 | 239245 | 250448 | 259983 | 269070 | 270477 | 281872 |
| | By industry | | | | | | | | | |
| 70 | Farm employment | 11286 | 11010 | 10868 | 10242 | 10797 | 11336 | 10606 | 11420 | 11766 |
| 80 | Nonfarm employment | 2466591 | 2470726 | 2437633 | 2488552 | 2575003 | 2599054 | 2523006 | 2561777 | 2642154 |
| 90 | Private employment | 2117589 | 2111917 | 2076689 | 2119025 | 2194201 | 2214688 | 2135571 | 2180608 | 2255535 |
| 100 | Ag. services, forestry, fishing and other 3/ | 11200 | 11433 | 12226 | 12038 | 12825 | 12455 | 13132 | 13760 | 13946 |
| 200 | Mining | 1274 | 1363 | 1287 | 1267 | 1387 | 1394 | 1590 | 1503 | 1675 |
| 300 | Construction | 119129 | 118698 | 120308 | 123835 | 125247 | 115960 | 100642 | 95212 | 96989 |
| 400 | Manufacturing | 646951 | 615049 | 566871 | 574997 | 602831 | 607031 | 550967 | 575482 | 601648 |
| 500 | Transportation and public utilities | 114317 | 117924 | 117665 | 122041 | 122410 | 123160 | 114338 | 113217 | 115508 |
| 610 | Wholesale trade | 123327 | 124604 | 122702 | 126048 | 137012 | 136094 | 133820 | 133866 | 137538 |
| 620 | Retail trade | 394007 | 403850 | 411508 | 410981 | 413327 | 417831 | 411923 | 416433 | 429974 |
| 700 | Finance, insurance, and real estate | 164612 | 168785 | 171295 | 174925 | 180731 | 185621 | 186702 | 189477 | 196275 |
| 800 | Services | 542772 | 550211 | 552827 | 572893 | 598431 | 615142 | 622457 | 641658 | 661982 |
| 900 | Government and government enterprises | 349002 | 358809 | 360944 | 369527 | 380802 | 384366 | 387435 | 381169 | 386619 |
| 910 | Federal, civilian | 63999 | 62621 | 60419 | 60984 | 58474 | 55540 | 55041 | 54835 | 54265 |
| 920 | Military | 67745 | 68807 | 62497 | 56320 | 53554 | 50104 | 46802 | 43085 | 40918 |
| 930 | State and local | 217258 | 227381 | 238028 | 252223 | 268774 | 278722 | 285592 | 283249 | 291436 |
| 931 | State government | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) |
| 932 | Local government | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) | (N) |
| | | | | | | | | | | |

| 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 2780699 | 2900926 | 2965656 | 2987026 | 2998205 | 3074777 | 3265470 | 3381970 | 3479451 | 3517528 | 3622613 | 3595827 | 3497566 |
| | | | | | | | | | | | | |
| 2486014 | 2588222 | 2632769 | 2651616 | 2643742 | 2714826 | 2883861 | 2964684 | 3030900 | 3112905 | 3181156 | 3157566 | 3036244 |
| 294685 | 312704 | 332887 | 335410 | 354463 | 359951 | 381609 | 417286 | 448551 | 404623 | 441457 | 438261 | 461322 |
| 4648 | 4805 | 4857 | 4767 | 4749 | 5175 | 5219 | 5192 | 5216 | 5123 | 5061 | 4832 | 4639 |
| 290037 | 307899 | 328030 | 330643 | 349714 | 354776 | 376390 | 412094 | 443335 | 399500 | 436396 | 433429 | 456683 |
| | | | | | | | | | | | | |
| 11586 | 11740 | 12715 | 12034 | 11542 | 12583 | 11945 | 10673 | 11207 | 11353 | 10957 | 9972 | 9635 |
| 2769113 | 2889186 | 2952941 | 2974992 | 2986663 | 3062194 | 3253525 | 3371297 | 3468244 | 3506175 | 3611656 | 3585855 | 3487931 |
| 2375515 | 2486562 | 2544805 | 2583072 | 2610586 | 2682142 | 2870647 | 2981073 | 3069420 | 3096528 | 3192067 | 3167642 | 3073447 |
| 15128 | 16522 | 17125 | 17821 | 18337 | 19602 | 21838 | 24308 | 26431 | 26446 | 28141 | 27685 | 26557 |
| 1720 | 1822 | 2027 | 2446 | 2613 | 2785 | 2738 | 2879 | 3025 | 3231 | 3135 | 2848 | 2470 |
| 100726 | 107855 | 107027 | 112715 | 119236 | 123811 | 139503 | 158851 | 180521 | 191383 | 200294 | 181475 | 154760 |
| 641025 | 664478 | 670453 | 667095 | 642391 | 640566 | 686059 | 673596 | 635774 | 610437 | 599402 | 574803 | 534014 |
| 119370 | 123195 | 125161 | 124579 | 125143 | 126641 | 130832 | 133650 | 134829 | 138221 | 142955 | 136571 | 139518 |
| 137740 | 146076 | 152571 | 151811 | 147728 | 154449 | 167825 | 171464 | 179262 | 179982 | 186161 | 190334 | 181918 |
| 447997 | 461687 | 466665 | 472611 | 472992 | 494444 | 528997 | 552142 | 567728 | 577815 | 588978 | 593321 | 567676 |
| 201464 | 213762 | 223262 | 227960 | 231805 | 232166 | 245045 | 260345 | 290046 | 301024 | 309379 | 300151 | 293551 |
| 710345 | 751165 | 780514 | 806034 | 850341 | 887678 | 947810 | 1003838 | 1051804 | 1067989 | 1133622 | 1160454 | 1172983 |
| 393598 | 402624 | 408136 | 391920 | 376077 | 380052 | 382878 | 390224 | 398824 | 409647 | 419589 | 418213 | 414484 |
| 55139 | 55843 | 55996 | 53869 | 52096 | 52007 | 53111 | 54350 | 55612 | 57392 | 58956 | 57892 | 59436 |
| 41287 | 41625 | 41090 | 40818 | 42163 | 44000 | 43593 | 43393 | 42813 | 42821 | 42261 | 42107 | 39977 |
| 297172 | 305156 | 311050 | 297233 | 281818 | 284045 | 286174 | 292481 | 300399 | 309434 | 318372 | 318214 | 315071 |
| (N) | 81876 | 85005 | 85631 | 81116 | 84812 | 92882 | 94734 | 98037 | 102602 | 106278 | 105854 | 105044 |
| (N) | 223280 | 226045 | 211602 | 200702 | 199233 | 193292 | 197747 | 202362 | 206832 | 212094 | 212360 | 210027 |

| 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| 3334381 | 3366776 | 3435248 | 3511436 | 3552183 | 3622506 | 3719174 | 3805322 | 3869309 | 3982362 | 3993306 |
| | | | | | | | | | | |
| 2867743 | 2849335 | 2903253 | 2965074 | 3038288 | 3094920 | 3177502 | 3258603 | 3320227 | 3410952 | 3410113 |
| 466638 | 517441 | 531995 | 546362 | 513895 | 527586 | 541672 | 546719 | 549082 | 571410 | 583193 |
| 4598 | 4594 | 4452 | 4353 | 4323 | 4309 | 4355 | 4456 | 4488 | 4502 | 4446 |
| 462040 | 512847 | 527543 | 542009 | 509572 | 523277 | 537317 | 542263 | 544594 | 566908 | 578747 |
| | | | | | | | | | | |
| 9375 | 9487 | 9317 | 9371 | 8931 | 8742 | 8616 | 8637 | 8570 | 8697 | (N) |
| 3325006 | 3357289 | 3425931 | 3502065 | 3543252 | 3613764 | 3710558 | 3796685 | 3860739 | 3973665 | (N) |
| 2924366 | 2965931 | 3031974 | 3110723 | 3146563 | 3218867 | 3311936 | 3392605 | 3450245 | 3555515 | (N) |
| 25,748 | 25,428 | 28709 | 29946 | 28607 | 30704 | 31945 | 31,206 | 32,940 | (D) | (N) |
| 2,093 | 2,294 | 2286 | 2512 | 2294 | 1984 | 2118 | 1,969 | 2,084 | (D) | (N) |
| 132081 | 136256 | 143604 | 153329 | 155350 | 158405 | 167978 | 177009 | 188077 | 197600 | (N) |
| 497858 | 481844 | 471769 | 470348 | 466164 | 469565 | 473151 | 474136 | 457672 | 461279 | (N) |
| 133857 | 134158 | 141023 | 146470 | 143678 | 145402 | 148539 | 152961 | 155370 | 160103 | (N) |
| 171503 | 172680 | 169717 | 174570 | 180152 | 181808 | 186816 | 192669 | 194144 | 196057 | (N) |
| 530318 | 538197 | 544439 | 564845 | 571089 | 576987 | 587195 | 594987 | 608508 | 620758 | (N) |
| 279832 | 271896 | 277913 | 293913 | 291003 | 297994 | 306994 | 324895 | 330990 | 344266 | (N) |
| 1150553 | 1202734 | 1252514 | 1274790 | 1308226 | 1356018 | 1407200 | 1441461 | 1478699 | 1537189 | (N) |
| 400640 | 391358 | 393957 | 391342 | 396689 | 394897 | 398622 | 404080 | 410494 | 418150 | (N) |
| 55902 | 54577 | 55366 | 54843 | 54242 | 51905 | 51500 | 51114 | 51450 | 53131 | (N) |
| 37931 | 36152 | 34051 | 29338 | 28014 | 25552 | 24131 | 23133 | 22412 | 22238 | (N) |
| 306807 | 300629 | 304540 | 307161 | 314433 | 317440 | 322991 | 329833 | 336632 | 342781 | (N) |
| 103453 | 101797 | 102148 | 102913 | 105863 | 103461 | 105593 | 108643 | 102,710 | 102,607 | (N) |
| 203354 | 198832 | 202392 | 204248 | 208570 | 213979 | 217398 | 221190 | 224,079 | 229,374 | (N) |

Percent change in full-time and part-time employment by industry -- Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH (NECMA) subtracting Worcester County

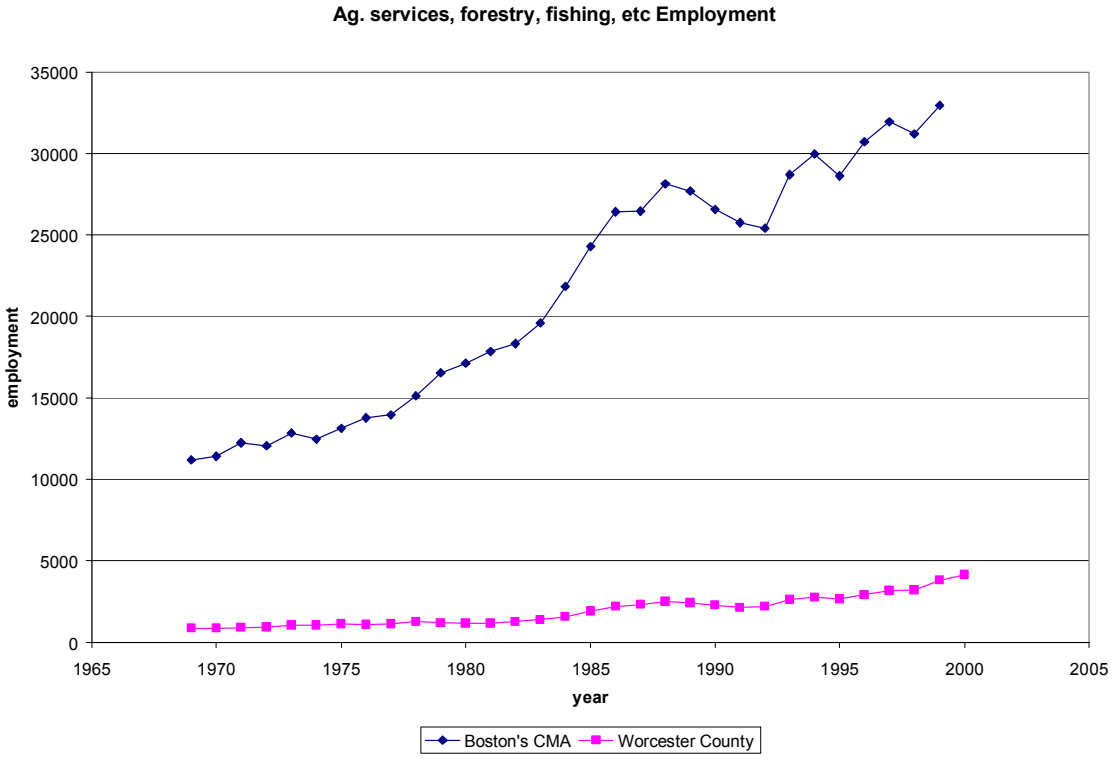
| Code | Item | | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Employment by place of work | | | | | | | | | |
| 10 | Total full-time and part-time employment | | 0.233047 | -1.34289 | 2.049895 | 3.308371 | 0.933069 | -2.76937 | 1.48036 | 3.261028 |
| | By type | | | | | | | | | |
| 20 | Wage and salary employment | | -0.01796 | -1.52492 | 1.846226 | 3.170784 | 0.617541 | -3.48035 | 1.565721 | 3.163494 |
| 40 | Proprietors employment | | 2.724248 | 0.41549 | 3.979302 | 4.58503 | 3.821232 | 3.537735 | 0.774449 | 4.073932 |
| 50 | Farm proprietors employment | | -4.38487 | -4.8218 | -5.25881 | -1.97617 | -1.30448 | 0.660859 | 9.459863 | 1.417666 |
| 60 | Nonfarm proprietors employment 2/ | | 2.867563 | 0.513626 | 4.143217 | 4.690938 | 3.898699 | 3.579037 | 0.653268 | 4.114236 |
| | By industry | | | | | | | | | |
| 70 | Farm employment | | -2.96787 | -2.20046 | -6.41242 | 5.192932 | 4.559479 | -7.03825 | 7.194921 | 2.917306 |
| 80 | Nonfarm employment | | 0.246694 | -1.33936 | 2.084512 | 3.301304 | 0.91922 | -2.75248 | 1.458746 | 3.262402 |
| 90 | Private employment | | -0.17011 | -1.65525 | 2.04272 | 3.369732 | 0.942396 | -3.36836 | 2.001291 | 3.504871 |
| 100 | Ag. services, forestry, fishing and other 3/ | | 2.249035 | 6.825262 | -1.71439 | 5.763352 | -2.87342 | 5.190372 | 5.475121 | 1.199116 |
| 200 | Mining | | 3.73913 | -6.20285 | 1.608579 | 8.707124 | -0.08091 | 14.73684 | -8.39802 | 13.09707 |
| 300 | Construction | | -0.69967 | 1.714942 | 2.858755 | 1.308277 | -7.05867 | -13.2595 | -5.32632 | 1.762914 |
| 400 | Manufacturing | | -4.67839 | -7.7021 | 1.439539 | 4.428848 | 0.693117 | -8.86265 | 4.531705 | 4.910123 |
| 500 | Transportation and public utilities | | 2.820853 | -0.50993 | 3.90082 | 0.231178 | 0.887166 | -7.03221 | -1.36218 | 2.117134 |
| 610 | Wholesale trade | | 0.824563 | -1.81107 | 2.810717 | 8.269064 | -0.59414 | -1.96979 | -0.89242 | 2.532682 |
| 620 | Retail trade | | 2.522942 | 1.408048 | -0.14034 | 0.530134 | 0.843634 | -1.24148 | 0.938143 | 3.298621 |
| 700 | Finance, insurance, and real estate | | 2.421762 | 1.282812 | 1.754732 | 3.019234 | 2.924069 | 0.596987 | 1.620829 | 3.548882 |
| 800 | Services | | 1.280361 | 0.399266 | 3.656333 | 4.444636 | 2.745486 | 1.089661 | 3.085963 | 3.17702 |
| 900 | Government and government enterprises | | 2.750623 | 0.504419 | 2.323197 | 2.911561 | 0.786635 | 0.776421 | -1.52211 | 1.88256 |
| 910 | Federal, civilian | | -2.0935 | -3.88528 | 1.28668 | -4.59382 | -5.56044 | -0.81258 | -0.05475 | 2.1128 |
| 920 | Military | | 1.322108 | -8.88282 | -10.1198 | -4.8262 | -6.65586 | -6.59849 | -7.85038 | -5.03784 |
| 930 | State and local | | 4.740589 | 4.764452 | 6.026804 | 6.649447 | 3.798216 | 2.490163 | -0.74008 | 2.931657 |

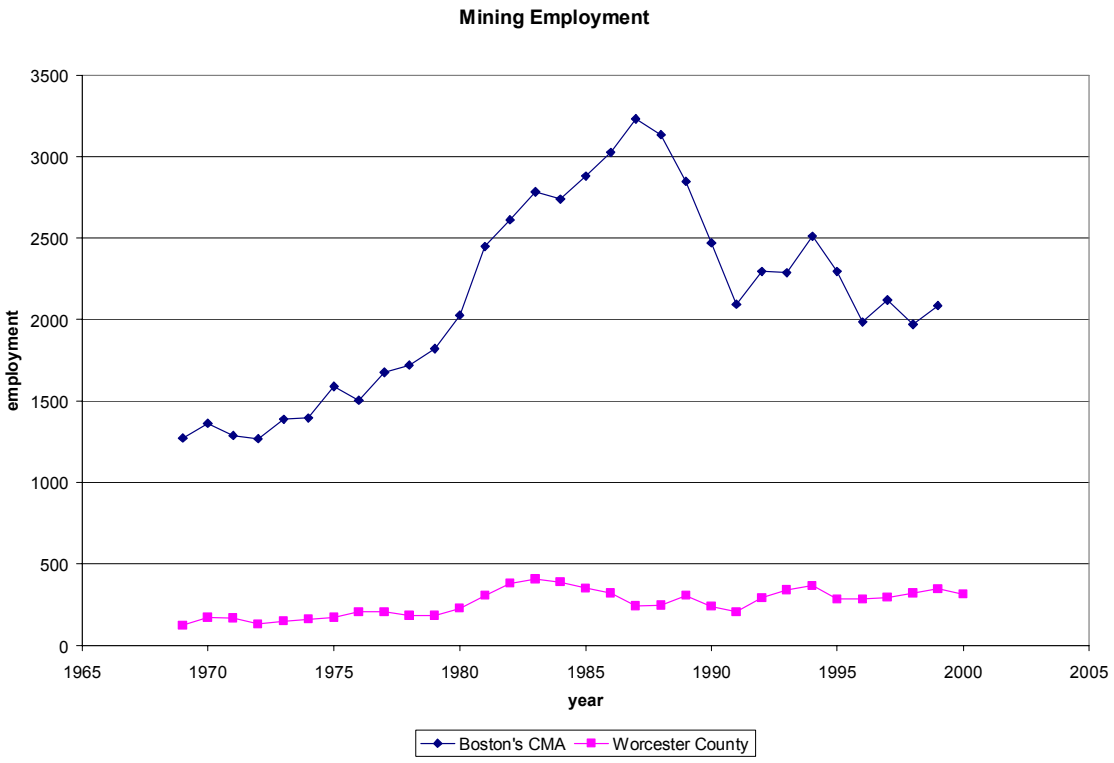
| 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 4.830976 | 4.428778 | 2.459249 | 0.844446 | 0.694536 | 2.728101 | 6.277549 | 3.539522 | 2.717436 | 0.998572 | 2.854442 | -0.73045 | -2.72829 |
| | | | | | | | | | | | | |
| 5.089959 | 4.206192 | 1.950179 | 0.849365 | 0.037881 | 2.89361 | 6.312818 | 2.769171 | 2.048133 | 2.59276 | 2.055612 | -0.71408 | -3.84035 |
| 2.691338 | 6.310669 | 6.678071 | 0.805489 | 5.897517 | 1.489266 | 6.009905 | 9.402112 | 7.502201 | -9.81988 | 9.021612 | -0.8488 | 5.319434 |
| -2.31183 | 2.559163 | 1.046418 | -1.85874 | -1.10931 | 8.426813 | 0.252334 | -0.80544 | -0.68511 | -1.99285 | -1.27737 | -4.67388 | -4.68144 |
| 2.765285 | 6.363376 | 6.754365 | 0.839652 | 5.984961 | 1.408482 | 6.081588 | 9.522216 | 7.58945 | -9.89688 | 9.131811 | -0.81177 | 5.412467 |
| | | | | | | | | | | | | |
| -1.96078 | 1.119565 | 8.491884 | -5.40969 | -4.30502 | 9.358581 | -4.95446 | -10.6255 | 5.290444 | 2.092659 | -3.62819 | -9.50864 | -4.32378 |
| 4.858026 | 4.441101 | 2.4375 | 0.868327 | 0.712438 | 2.705542 | 6.31824 | 3.585397 | 2.710246 | 0.995438 | 2.873213 | -0.70664 | -2.72435 |
| 5.374921 | 4.725124 | 2.612035 | 1.754944 | 1.437663 | 2.918611 | 7.118806 | 3.808052 | 2.790022 | 0.782516 | 2.956522 | -0.75728 | -2.89072 |
| 8.005925 | 10.71815 | 4.132986 | 4.263178 | 2.443711 | 6.810456 | 11.28183 | 10.50789 | 8.174557 | -0.48261 | 6.246373 | -1.41614 | -3.9533 |
| 4.836512 | 6.432749 | 9.82906 | 18.95497 | 4.252336 | 6.588974 | -1.17746 | 7.659574 | 6.837945 | 10.54384 | -3.34672 | -11.946 | -12.3083 |
| 3.147069 | 7.033812 | -0.73386 | 5.631673 | 6.206999 | 3.628489 | 11.68283 | 13.28269 | 13.3848 | 5.612589 | 4.631159 | -8.92986 | -14.5532 |
| 6.828475 | 3.721463 | 1.54987 | -0.00364 | -3.06902 | 0.554876 | 7.524258 | -1.70548 | -6.03839 | -4.24307 | -1.867 | -4.49154 | -7.14752 |
| 3.735102 | 3.228138 | 1.359842 | -0.37636 | 0.427556 | 1.502908 | 3.427829 | 1.837956 | 0.553854 | 2.399987 | 2.908164 | -4.54485 | 2.286902 |
| -0.30161 | 6.26638 | 4.780209 | -0.27097 | -2.41037 | 4.15009 | 8.699734 | 1.513134 | 4.179467 | 0.580417 | 3.675008 | 1.869522 | -4.60006 |
| 4.284051 | 2.80317 | 1.071737 | 1.260886 | 0.70964 | 4.405878 | 6.968001 | 4.208092 | 2.567554 | 1.667474 | 1.788964 | 0.749579 | -4.28638 |
| 2.542297 | 6.091649 | 4.775248 | 2.394188 | 1.765711 | 0.451363 | 5.404168 | 6.151181 | 11.26886 | 3.833961 | 2.707058 | -2.96429 | -2.11584 |
| 7.400091 | 5.878116 | 4.011644 | 3.390944 | 5.472371 | 4.280412 | 6.926186 | 5.96515 | 4.698097 | 1.416132 | 5.823955 | 2.473537 | 1.123237 |
| 1.869648 | 2.742547 | 1.373581 | -4.60228 | -4.06054 | 1.222892 | 0.654129 | 1.908907 | 2.098373 | 2.639584 | 2.241556 | -0.31998 | -1.45962 |
| 1.691668 | 1.143557 | 0.385568 | -3.80191 | -3.35037 | -0.17362 | 2.105116 | 2.096957 | 1.931154 | 3.162628 | 2.544088 | -1.83361 | 2.550863 |
| 1.014797 | 0.907298 | -1.19625 | -0.88629 | 3.217565 | 4.385829 | -0.81512 | -0.57527 | -1.37762 | -0.02032 | -1.25743 | -0.35245 | -5.39836 |
| 2.030628 | 3.330974 | 1.931949 | -5.26698 | -5.24371 | 1.010845 | 0.601951 | 2.265887 | 2.669506 | 2.929729 | 2.685481 | -0.01178 | -1.70516 |

| 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| -4.6705 | 0.770865 | 1.964085 | 2.195003 | 1.220635 | 2.06412 | 2.694827 | 2.378758 | 1.773111 | 2.94751 | 0.319927 |
| | | | | | | | | | | |
| -5.52984 | -0.80073 | 1.7619 | 2.10615 | 2.525926 | 1.959886 | 2.727323 | 2.531549 | 2.058706 | 2.755748 | |
| 1.007486 | 10.48293 | 3.085933 | 2.681681 | -5.88882 | 2.682606 | 2.503366 | 1.476566 | 0.069212 | 4.114335 | |
| -0.84278 | -0.11723 | -2.2007 | -1.44014 | 0.334855 | 0.424757 | 1.782477 | 2.582369 | 0.578704 | 0.345224 | |
| 1.02305 | 10.57045 | 3.125362 | 2.710836 | -5.93107 | 2.698951 | 2.508469 | 1.468793 | 0.065591 | 4.141256 | |
| | | | | | | | | | | |
| -2.44351 | 2.383517 | -1.23635 | 1.944333 | -4.32397 | -2.02075 | -1.43534 | 0.212074 | -1.34029 | 1.244101 | |
| -4.67592 | 0.766852 | 1.972177 | 2.195617 | 1.234179 | 2.073551 | 2.70398 | 2.383366 | 1.779592 | 2.950947 | |
| -4.81518 | 1.264919 | 2.172445 | 2.594791 | 1.242741 | 2.445345 | 2.939753 | 2.510828 | 1.720395 | 3.03728 | |
| -2.65749 | -1.72268 | 12.36057 | 4.250834 | -4.61799 | 7.131293 | 3.598158 | -2.7334 | 3.992144 | | |
| -15.2915 | 6.034939 | -2.74588 | 10.16427 | -6.29077 | -15.5147 | 7.416127 | -9.75342 | 5.464481 | | |
| -14.714 | 2.948022 | 5.494505 | 6.720202 | 1.685877 | 1.706391 | 5.822025 | 5.814235 | 6.273461 | 5.099272 | |
| -6.70055 | -3.52357 | -2.27728 | -0.2724 | -1.22206 | 0.682879 | 0.89792 | 0.280272 | -3.10653 | 0.566839 | |
| -4.60278 | 0.418568 | 4.797227 | 3.947935 | -1.34651 | 1.465159 | 2.135744 | 3.037622 | 1.716432 | 2.742314 | |
| -5.63515 | 0.417234 | -1.76198 | 2.579353 | 3.444144 | 1.908872 | 2.714645 | 3.231929 | 0.75848 | 0.990728 | |
| -6.48531 | 1.426834 | 1.172163 | 3.865233 | 1.04237 | 1.053771 | 1.820358 | 1.276982 | 2.391573 | 2.160792 | |
| -4.84985 | -3.23324 | 1.883035 | 5.620901 | -0.56971 | 2.63891 | 2.911722 | 6.051276 | 1.916429 | 4.399328 | |
| -1.89755 | 4.37335 | 4.112988 | 1.750329 | 2.711125 | 3.786615 | 3.848709 | 2.452355 | 2.407798 | 3.838174 | |
| -3.63271 | -2.9185 | 0.426481 | -0.93883 | 1.164556 | -0.95238 | 0.719261 | 1.286753 | 2.295056 | 2.203431 | |
| -6.1938 | -2.77595 | 0.710896 | -1.08286 | -0.28194 | -4.40488 | -0.97093 | -1.01753 | 0.85527 | 2.956712 | |
| -5.95202 | -4.93877 | -6.23932 | -13.8397 | -4.93104 | -8.95072 | -5.69233 | -4.19367 | -3.17422 | -0.85824 | |
| -2.79781 | -2.68672 | 1.208302 | 0.592387 | 2.053227 | 0.445164 | 1.564224 | 2.120625 | 2.941834 | 2.289035 | |

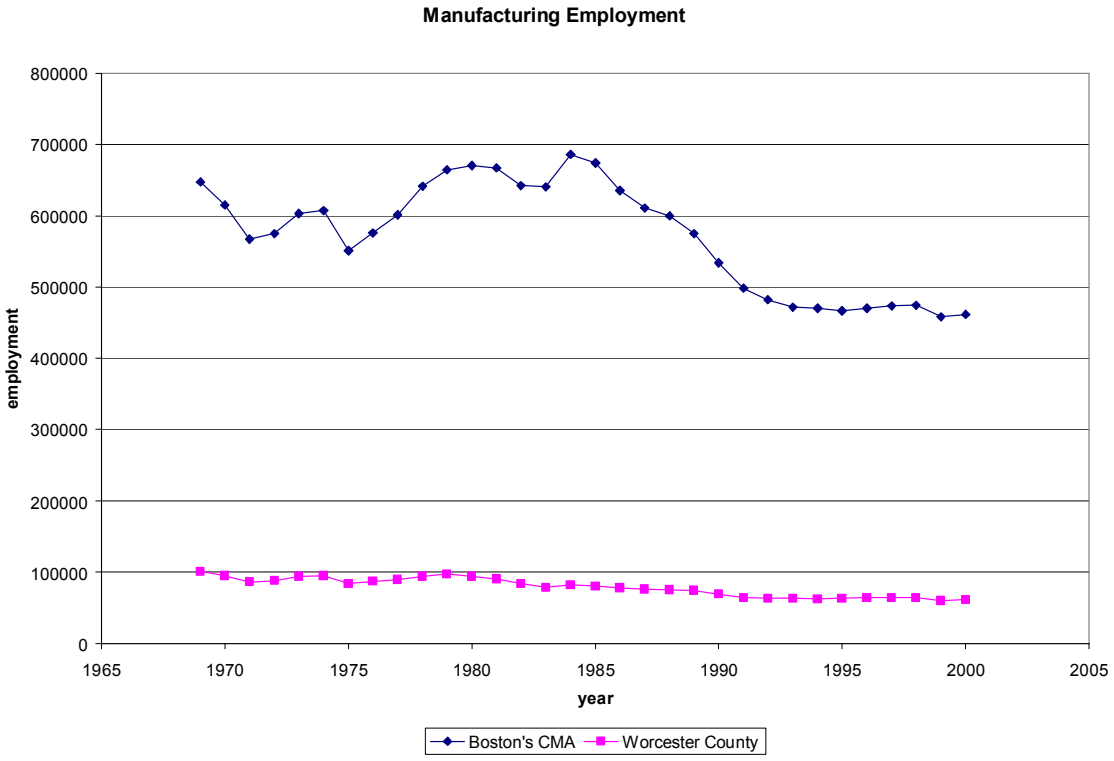
## Appendix K: Time Series Graphs for Worcester versus BNECMA

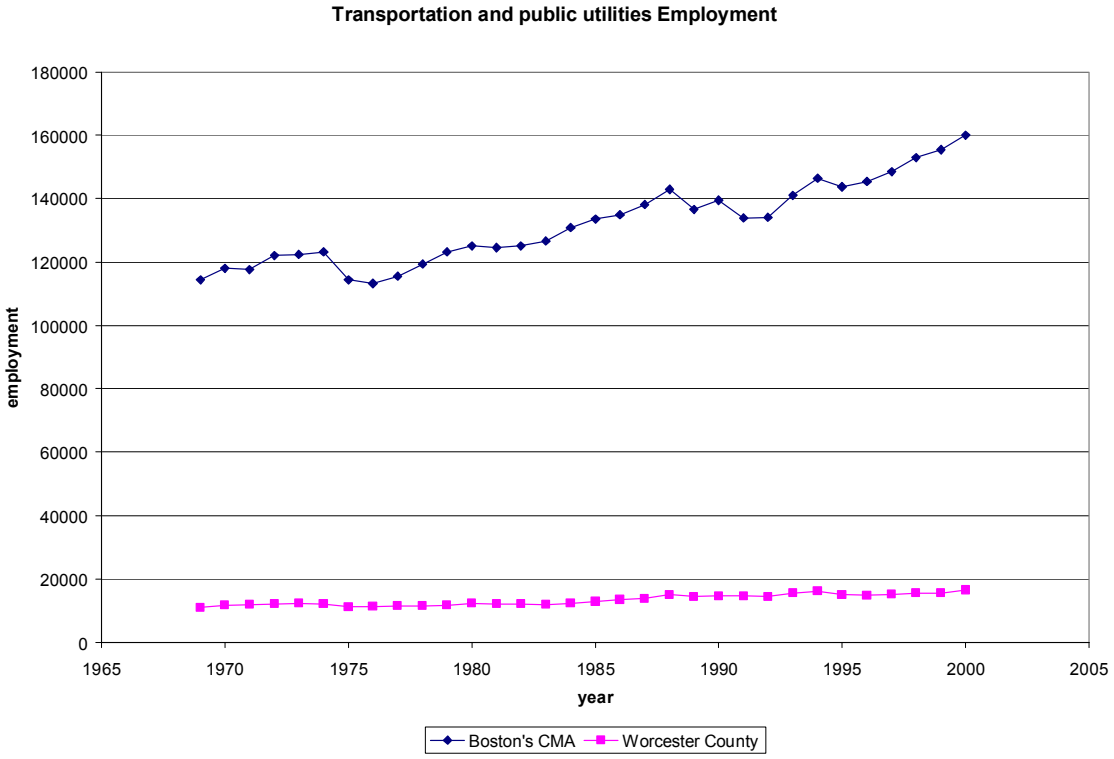
Two series of graphs were constructed using REIS employment data for Worcester County and Boston's New England Consolidated Metropolitan area. The first series of graphs show employment changes for each SIC industry sector versus the year (1969 to 2000) for Worcester County and Boston's NECMA. The second series of graphs show the percent change in employment from the previous year for Worcester County and Boston's NECMA (after employment from Worcester County had been subtracted). For both series, there are fourteen graphs. The first one shows total employment. The next thirteen show employment changes in the individual SIC industries.

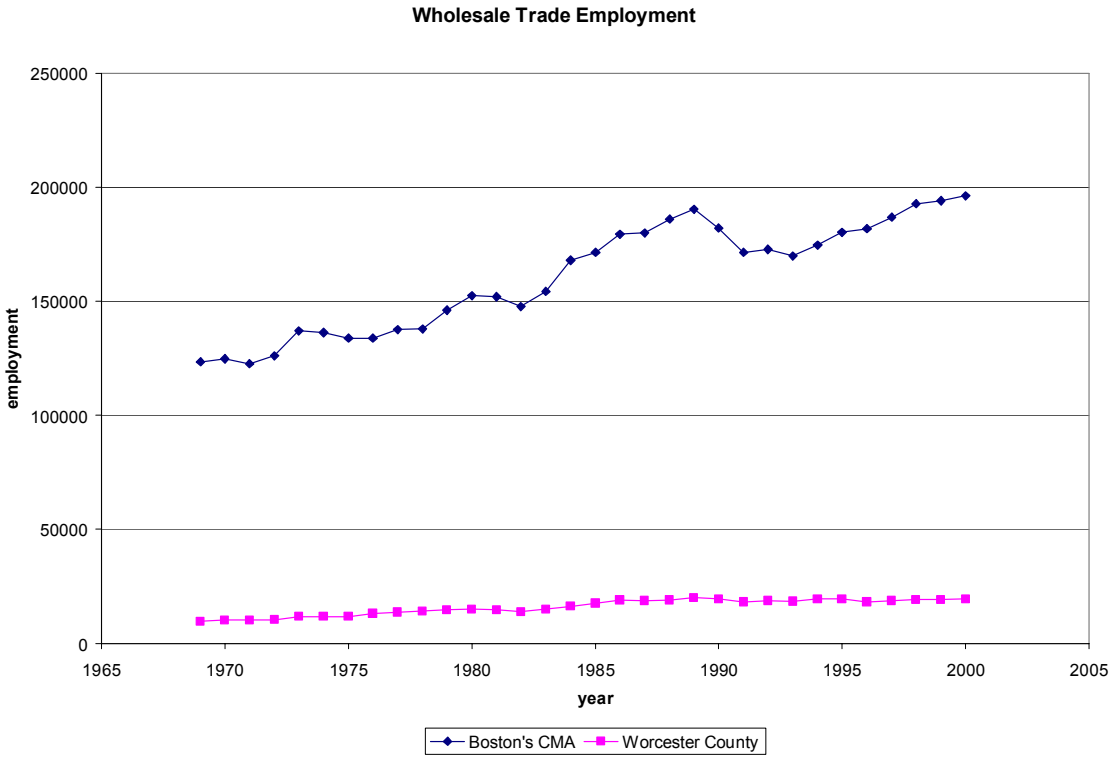

Ag. services, forestry, fishing, etc Employment
35000
30000
25000
20000
15000
10000
5000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

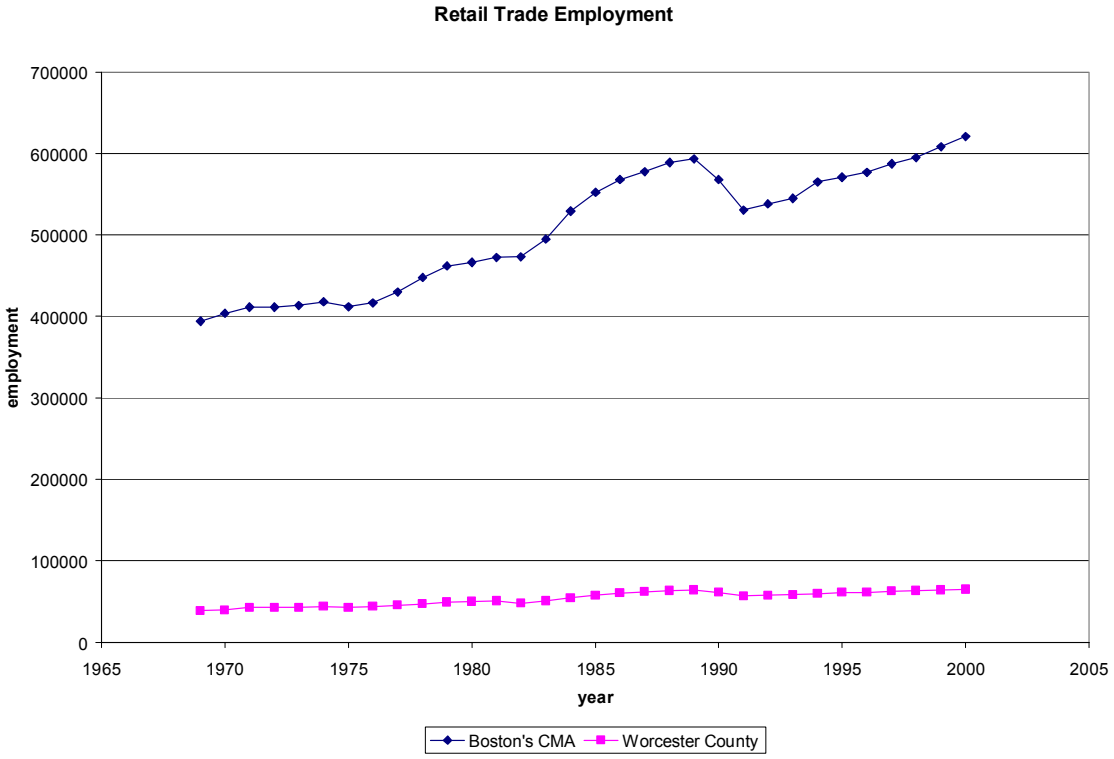

Mining Employment
3500
3000
2500
2000
1500
1000
500
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

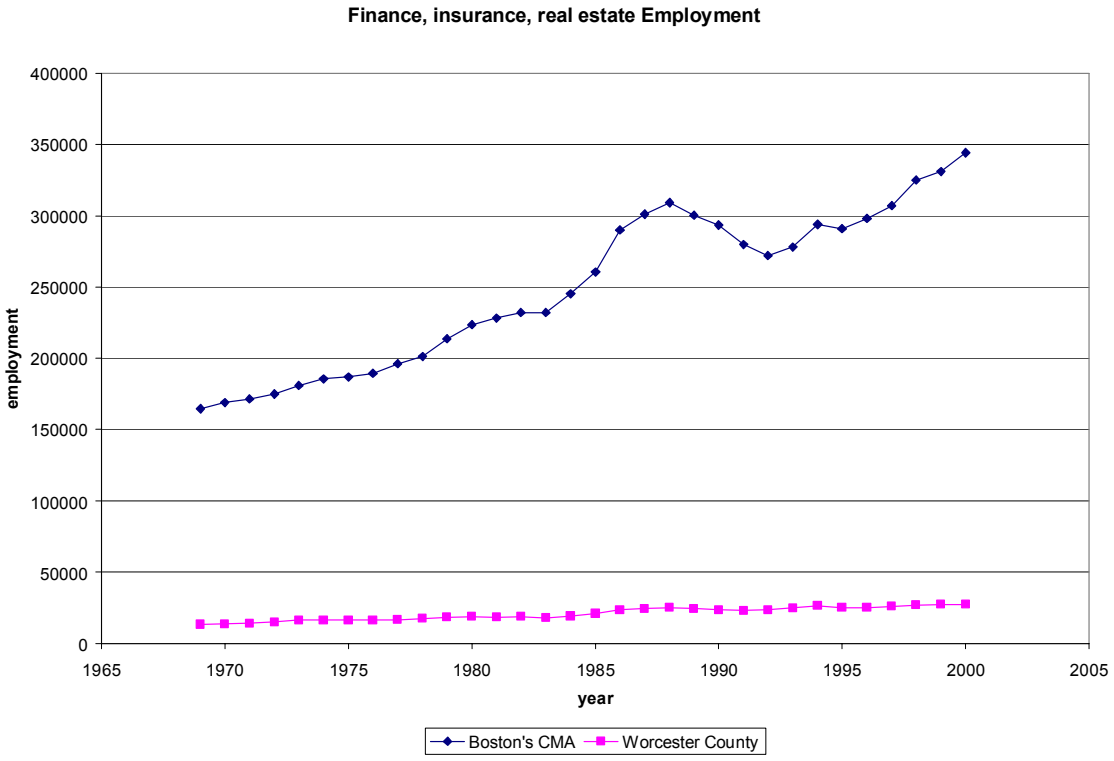

Construction Employment
250000
200000
150000
100000
50000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County


Manufacturing Employment
800000
700000
600000
500000
400000
300000
200000
100000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

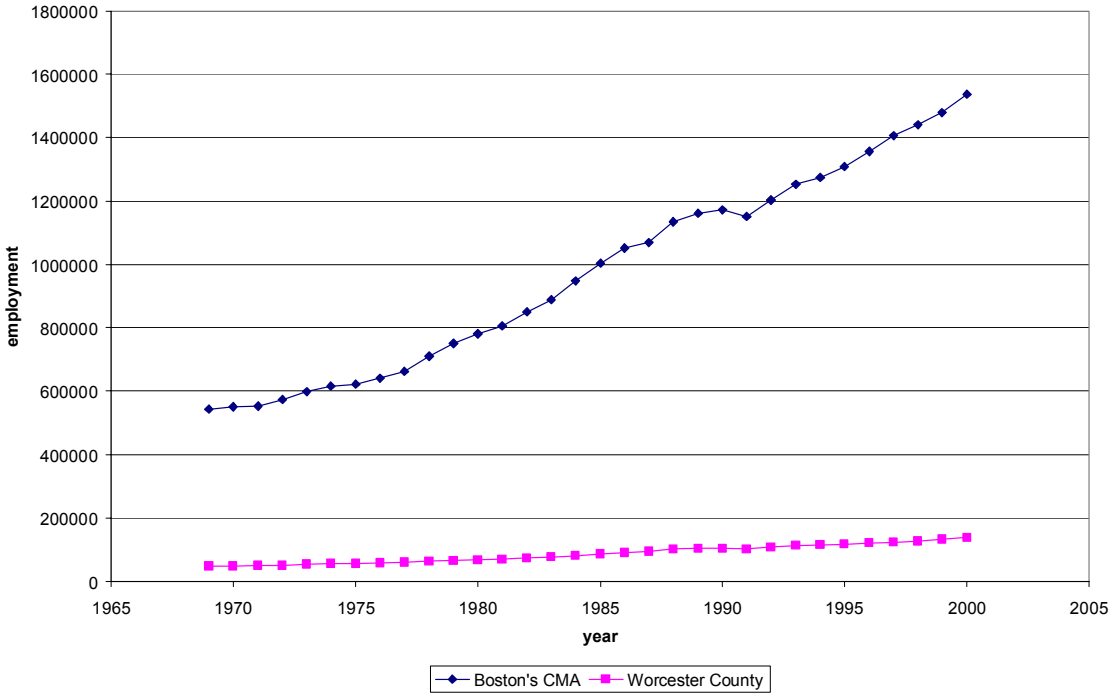

Transportation and public utilities Employment
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County


Wholesale Trade Employment
250000
200000
150000
100000
50000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

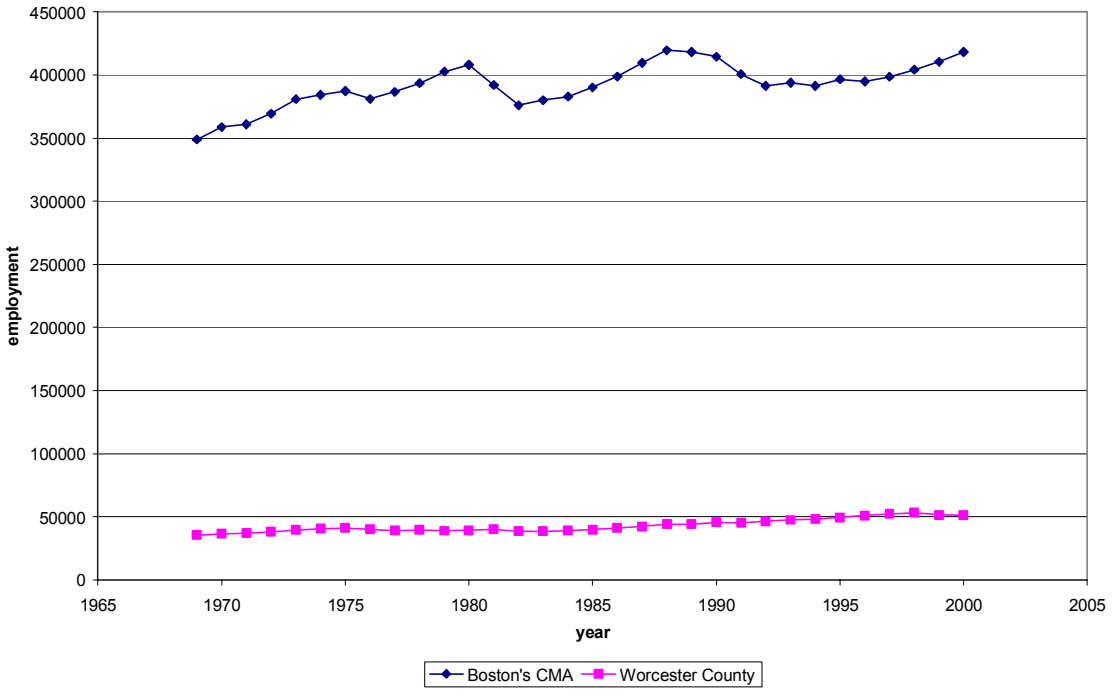

Retail Trade Employment
700000
600000
500000
400000
300000
200000
100000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

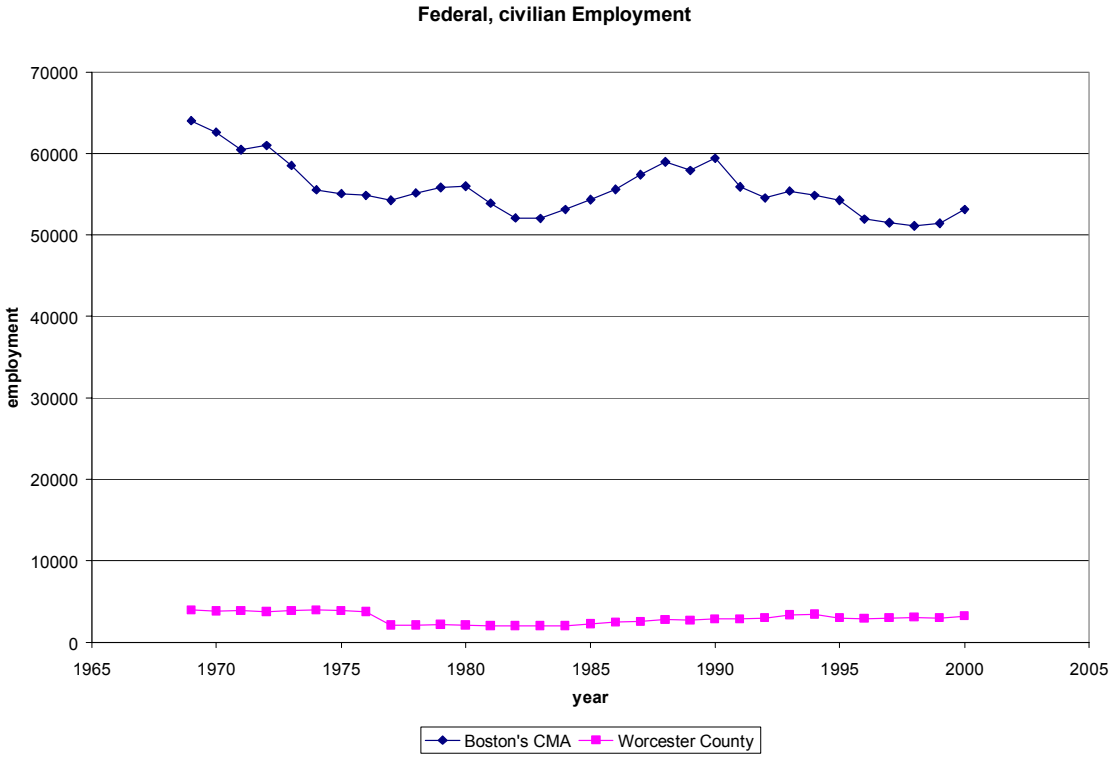

Finance, insurance, real estate Employment
400000
350000
300000
250000
200000
150000
100000
50000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

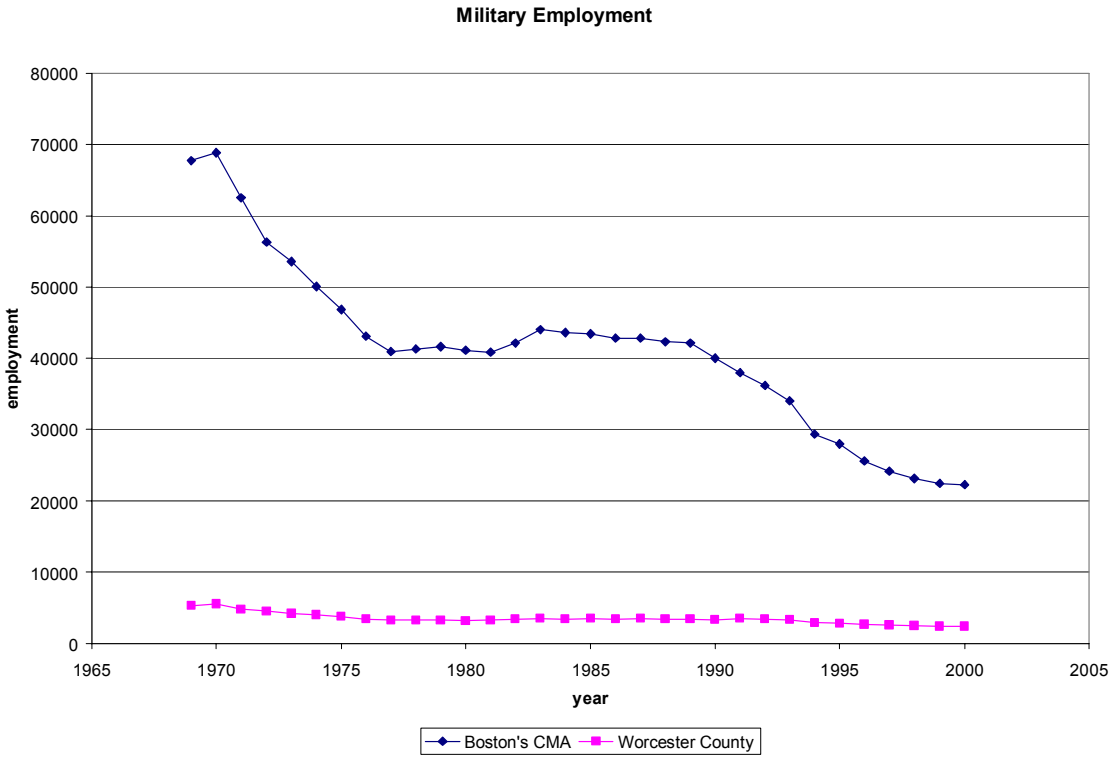
**Services Employment**

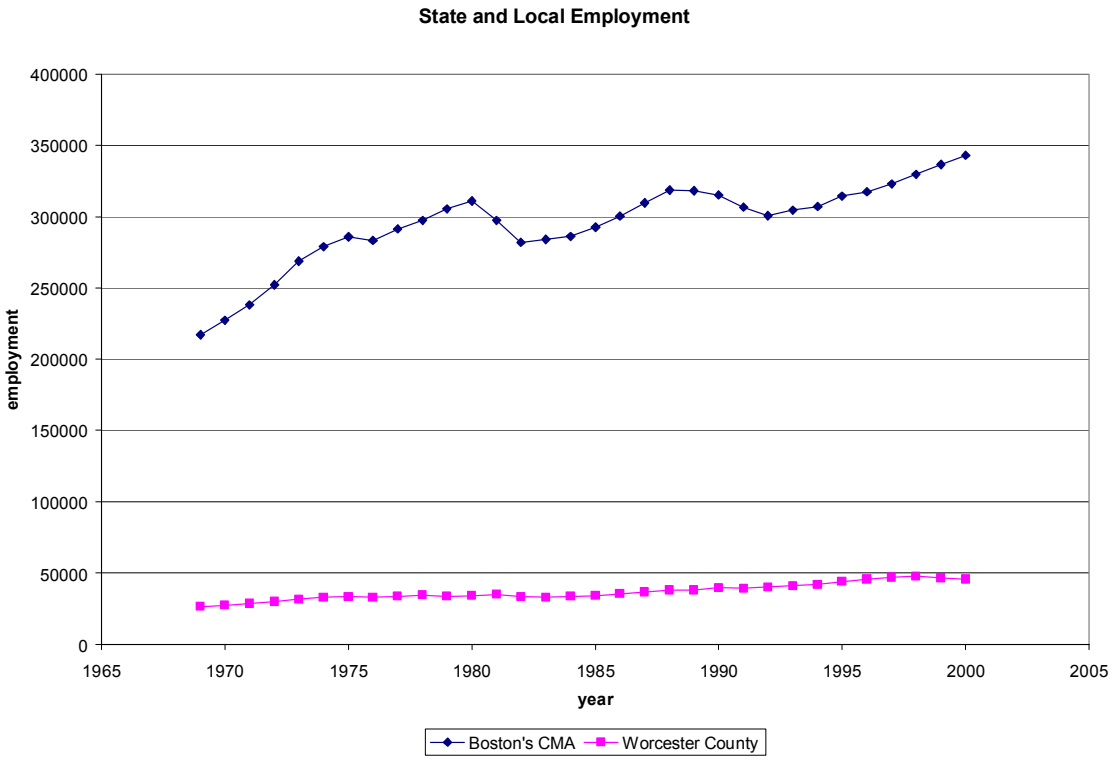



**Government and Government Enterprises Employment**

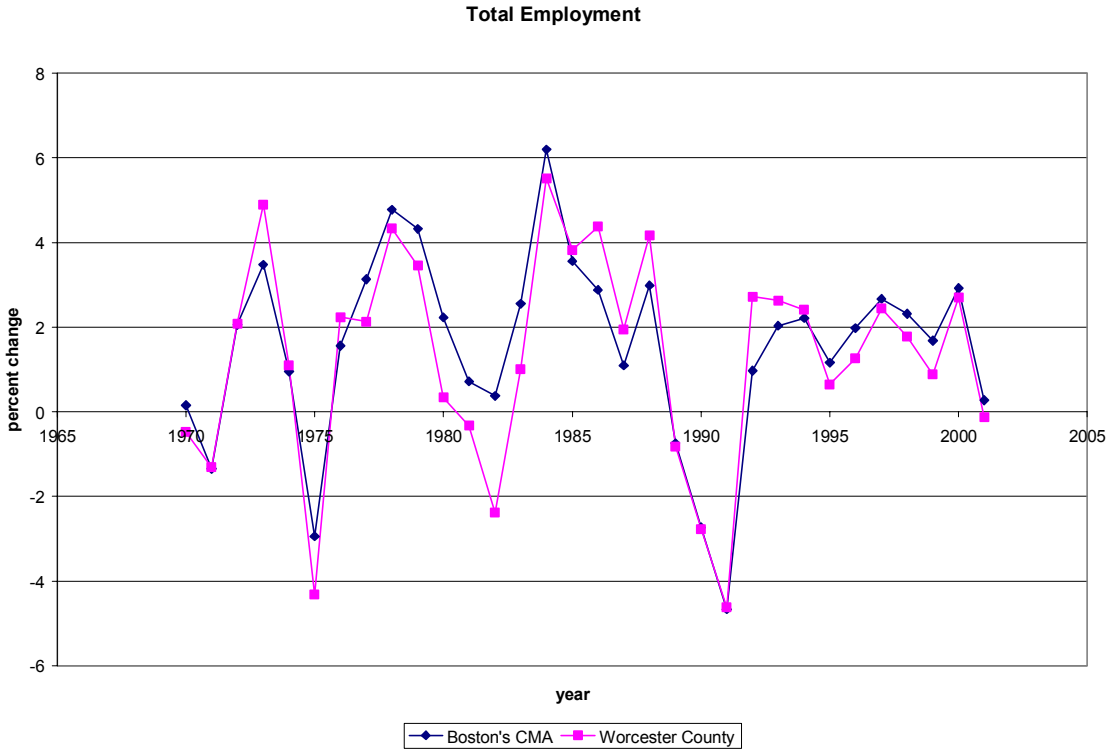


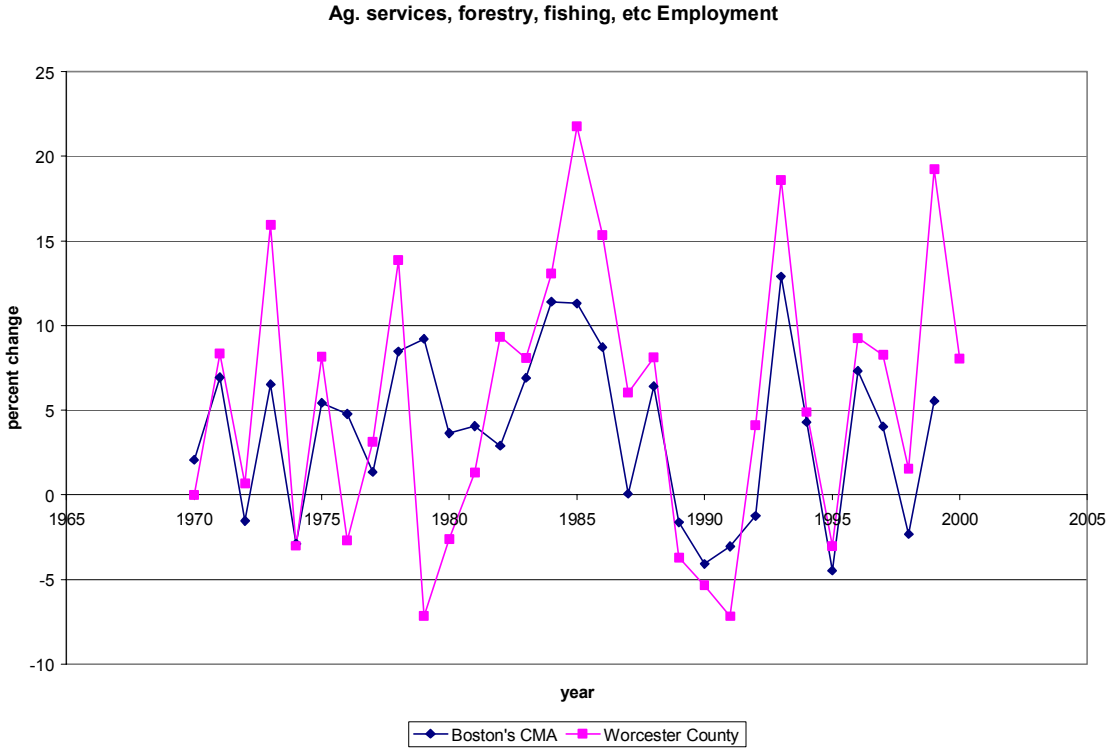

Federal, civilian Employment
70000
60000
50000
40000
30000
20000
10000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

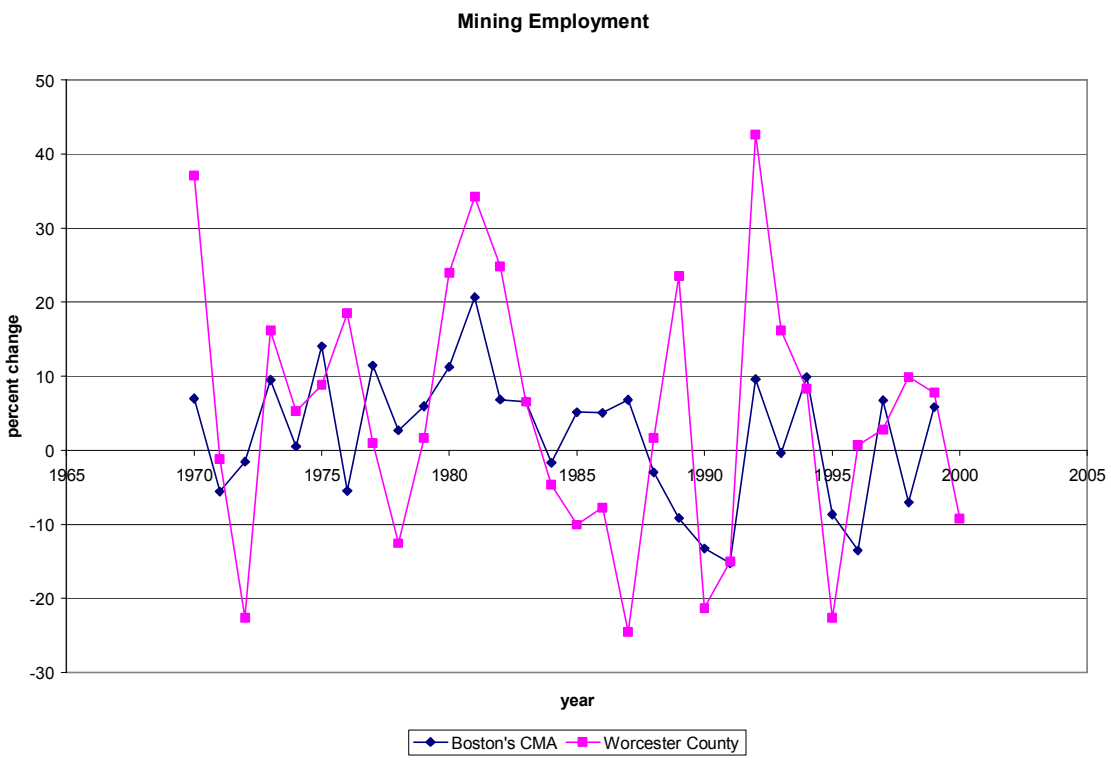

Military Employment
80000
70000
60000
50000
40000
30000
20000
10000
0
employment
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

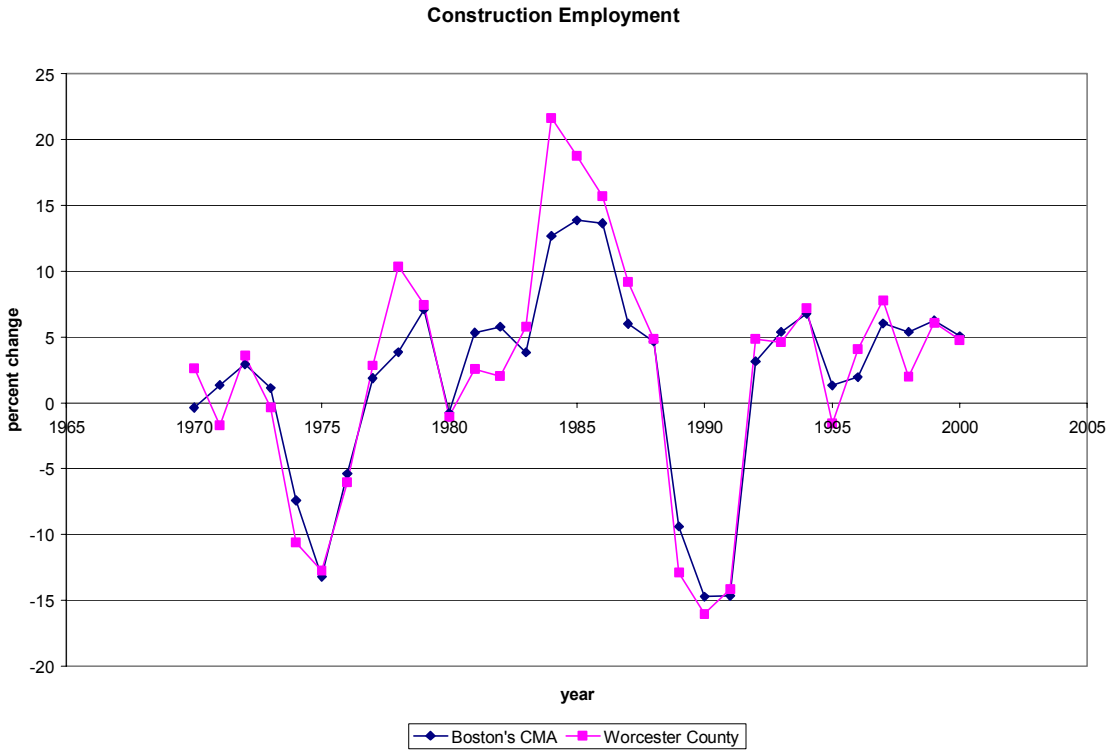


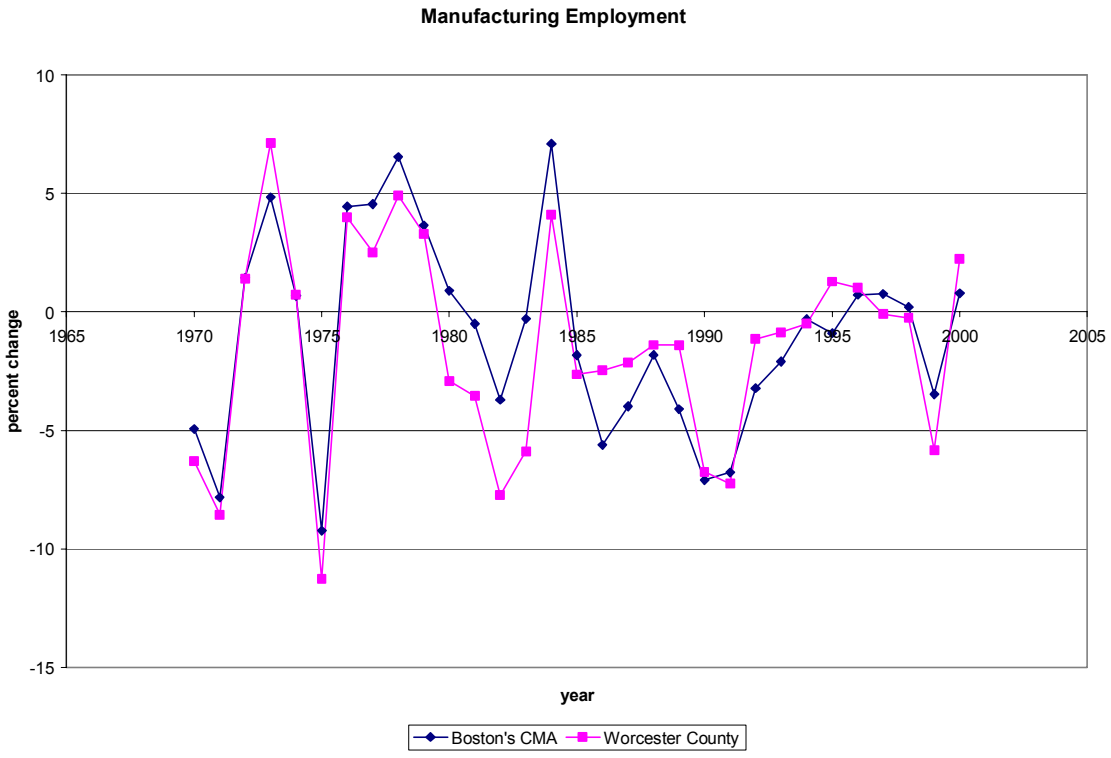

# Percent Change:

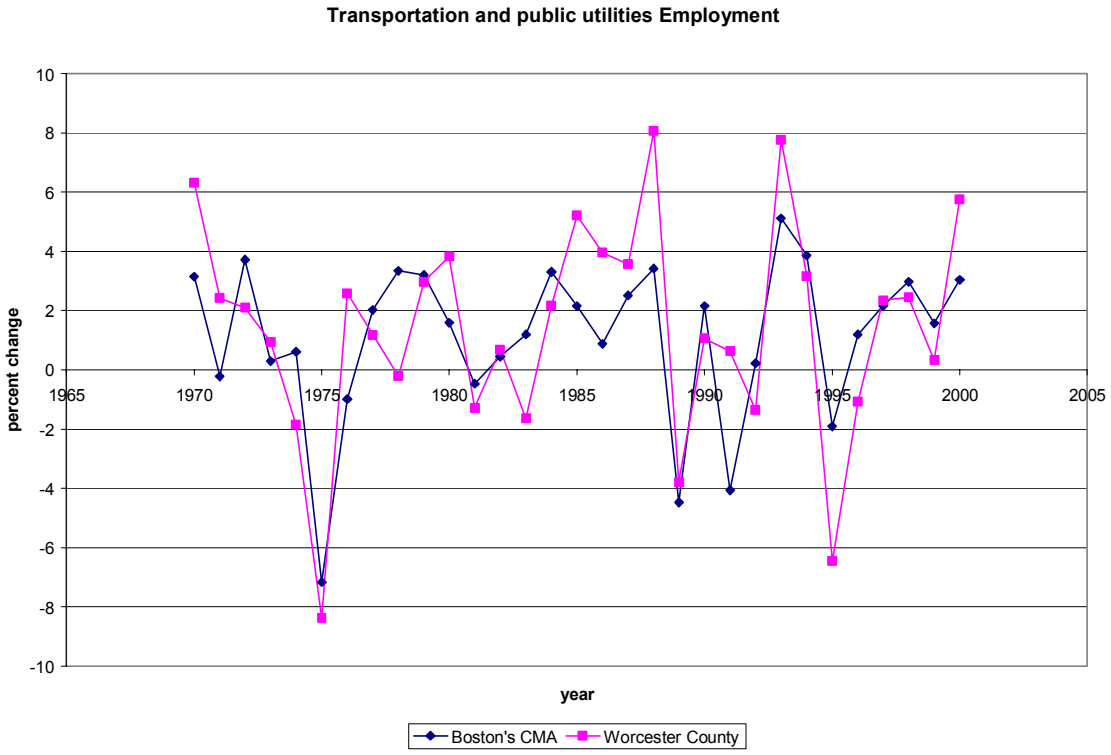


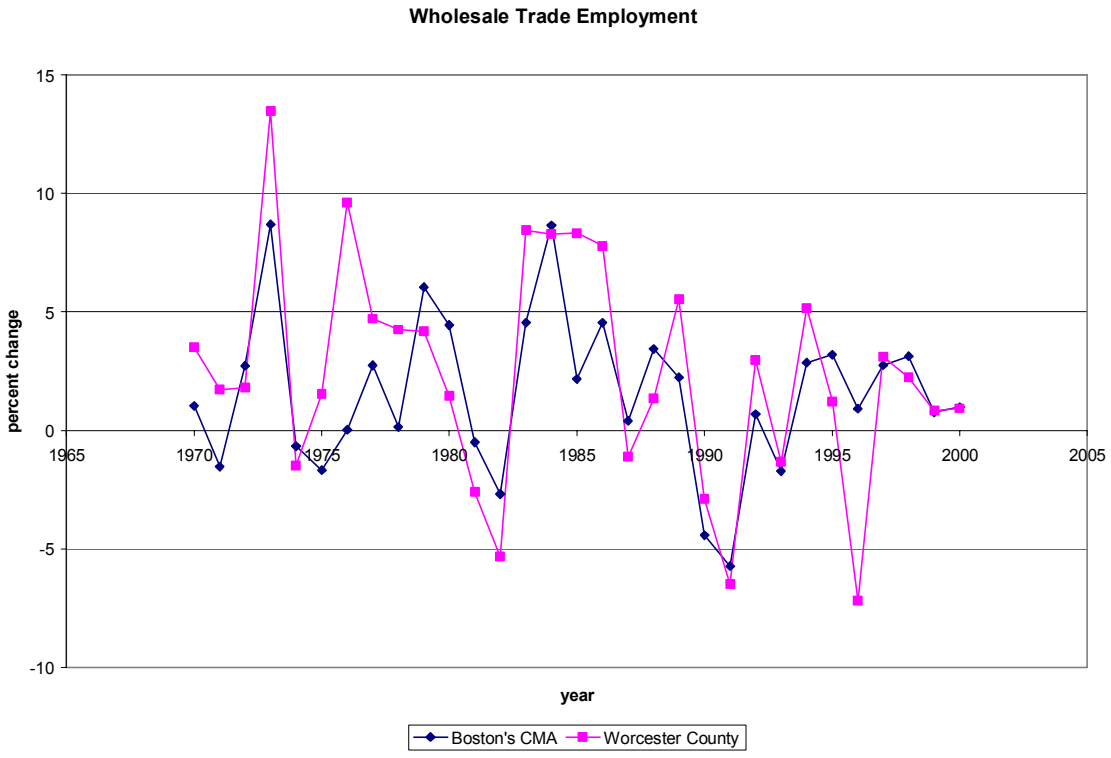

Ag. services, forestry, fishing, etc Employment
25
20
15
10
5
0
-5
-10
percent change
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County


Mining Employment
50
40
30
20
10
0
-10
-20
-30
percent change
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

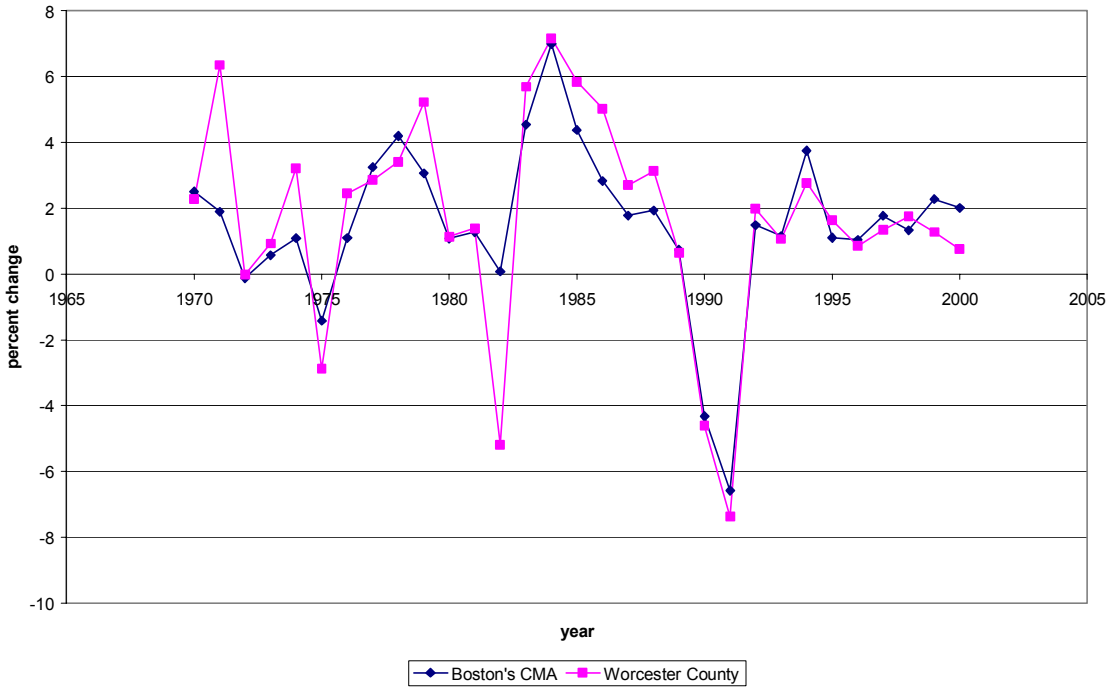

Construction Employment
25
20
15
10
5
0
-5
-10
-15
-20
percent change
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County


Manufacturing Employment
10
5
0
-5
-10
-15
percent change
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

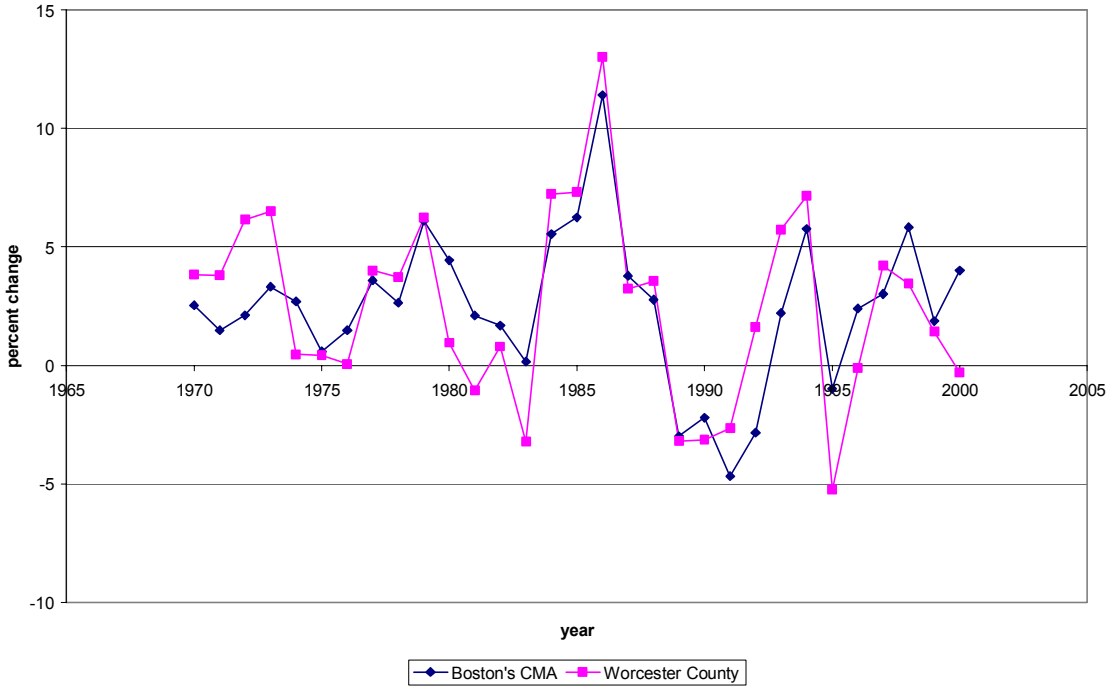

Transportation and public utilities Employment
10
8
6
4
2
0
-2
-4
-6
-8
-10
1965
1970
1975
1980
1985
1990
1995
2000
2005
percent change
year
Boston's CMA
Worcester County


Wholesale Trade Employment
15
10
5
0
-5
-10
1965
1970
1975
1980
1985
1990
1995
2000
2005
percent change
year
Boston's CMA
Worcester County

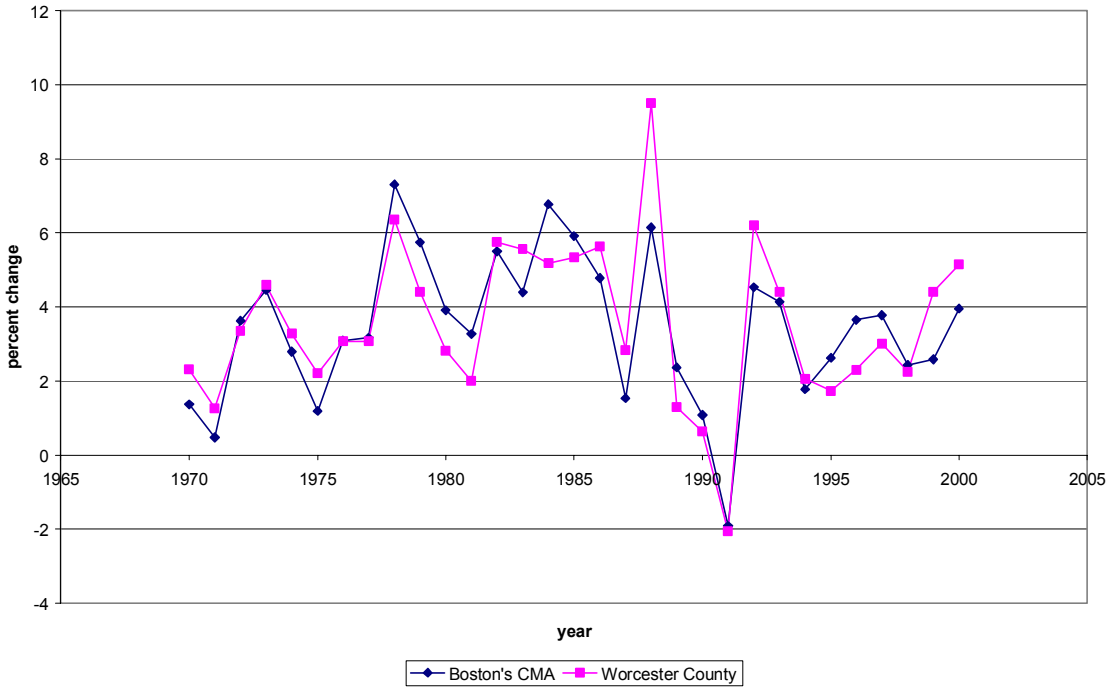
**Retail Trade Employment**



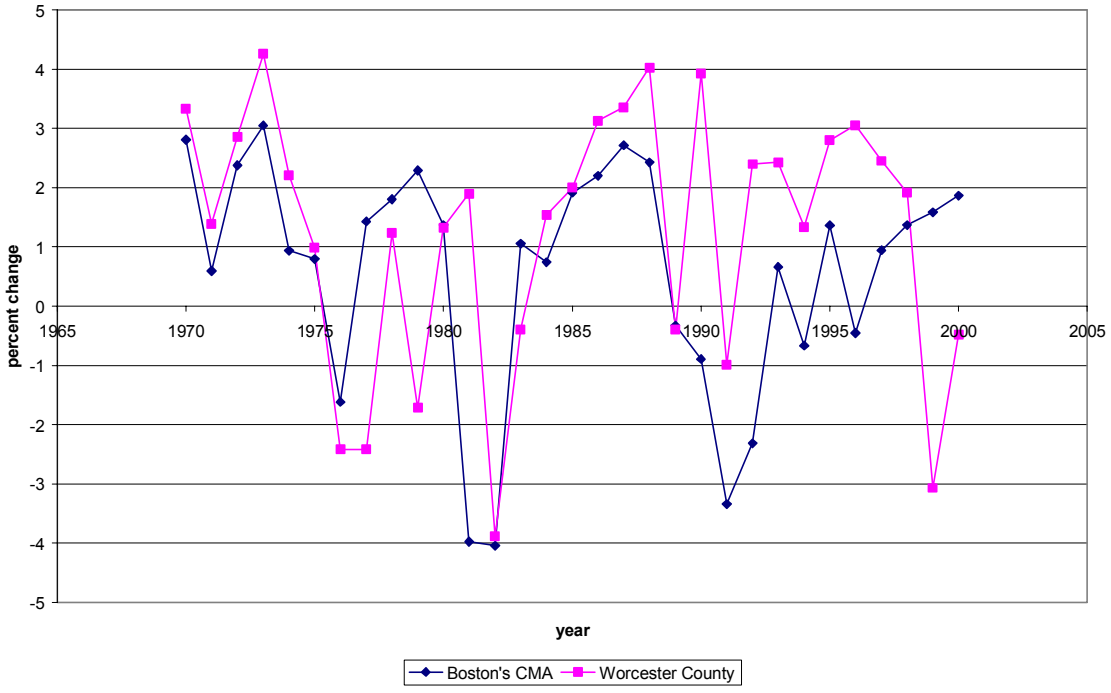

**Finance, insurance, real estate Employment**



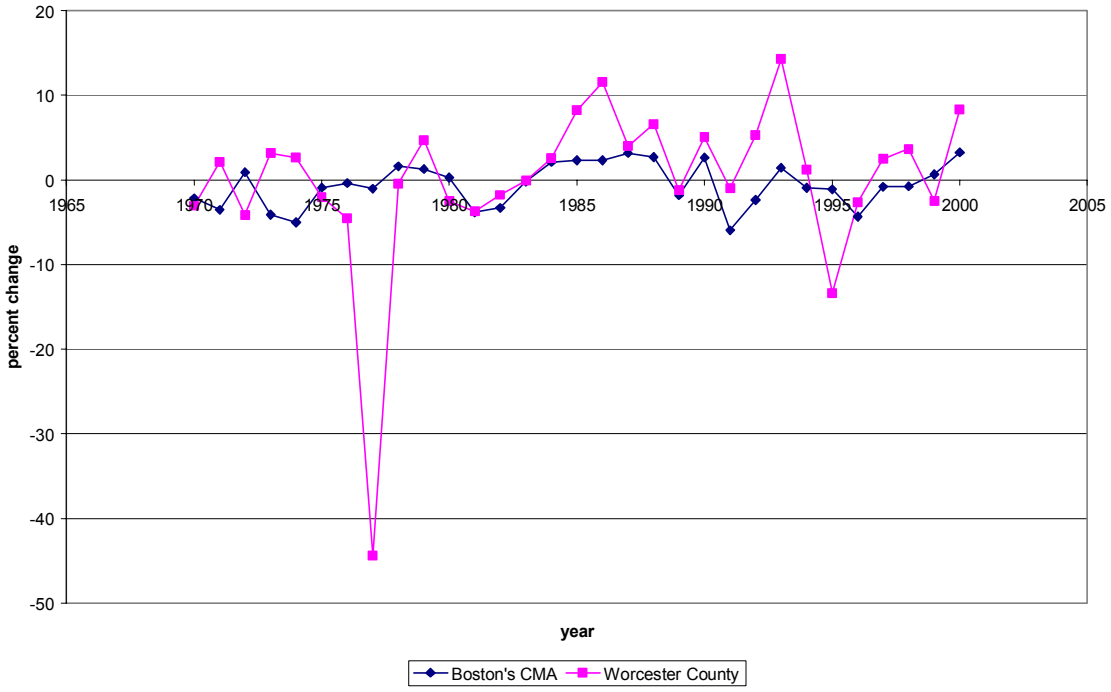
**Services Employment**



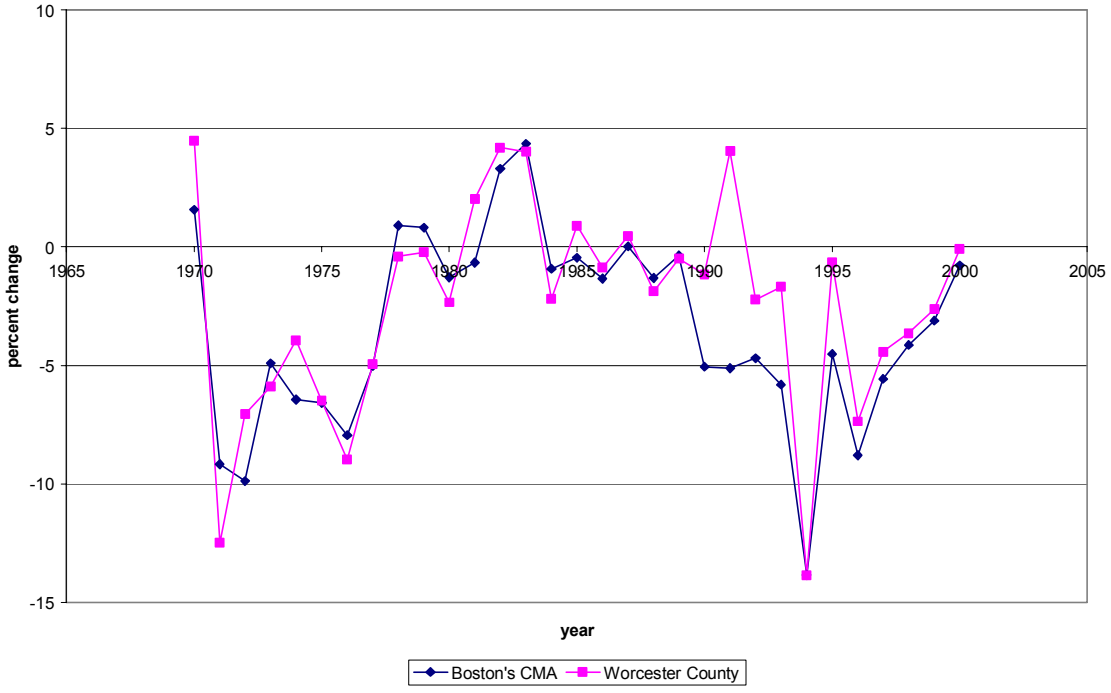

**Government and Government Enterprises Employment**

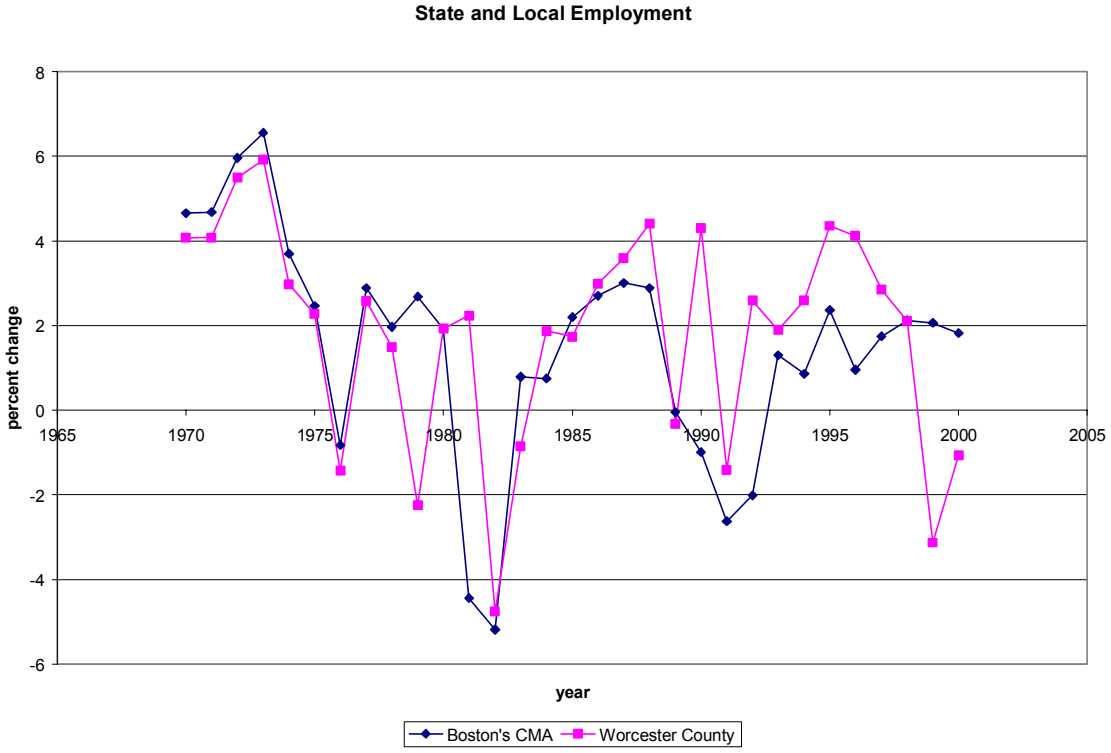


**Federal, civilian Employment**




**Military Employment**




State and Local Employment
8
6
4
2
0
-2
-4
-6
percent change
1965
1970
1975
1980
1985
1990
1995
2000
2005
year
Boston's CMA
Worcester County

## Appendix L: Complementary Industry

Upon request from the city manager, we developed a list of complementary industries. Instead of bringing in weaker industries of the city indiscriminately, we were told that introducing those weaker industries that were complementary to the strong industries was a better strategy. Unfortunately, finding complementary industries according to any sort of NAICS or SIC industry code is rather difficult. First, we examined the most recent edition (2003) of *United States Trade and Outlook*. The book is arranged by industry, although industries were not broken down by any sort of code. The book contained 54 chapters, each devoted to an industry. At the end of each chapter was a list of related chapters. These lists were used to derive the table of complementary industries we used.

The next step was to create an excel sheet of complementary industries according to the book's definition of industries. For example, chapter 1 of the book was metals and industrial mining. Chapter 1 was related to chapters 2 (coal mining), 6 (construction), 8 (building products and materials), 13 (steel mill products), 14 (nonferrous metals), 36 (motor vehicles), and 37 (automotive parts). From there, we carefully read each industry description, which is located in the beginning of each chapter, and assigned each chapter of the book to a 2-digit NAICS code. In going back over the excel list, we grouped all chapters with the same 2-digit NAICS codes and examined how many different 2-digit NAICS codes were represented in their complementary chapters. This tedious process resulted in the chart following this section. Some 2-digit NAICS industries were not represented at all in the book. The chart is arranged so that the bolded 2-digit industry is listed above its complementary non-bolded counterparts.

| NAICS code | Industry Description |
|---|---|
| **21** | **Mining** |
| 22 | Utilities |
| 23 | Construction |
| 32 | Manufacturing – Nonmetallic & Chemical |
| 33 | Manufacturing – Metallic, Electronic, Misc |
| 48-49 | Transportation & warehousing |
| 91 | Public Administration |
| | |
| **22** | **Utilities** |
| 21 | Mining |
| 33 | Manufacturing – Metallic, Electronic, Misc |
| | |
| **23** | **Construction** |
| 22 | Utilities |
| 32 | Manufacturing |
| 61 | Educational services |
| | |
| **31** | **Manufacturing – Textile & Food** |
| 33 | Manufacturing – Metallic, Electronic, Misc |
| 44-45 | Retail trade |
| | |
| **32** | **Manufacturing – Nonmetallic & Chemical** |
| 21 | Mining |
| 23 | Construction |
| 33 | Manufacturing – Metallic, Electronic, Misc |
| | |
| **33** | **Manufacturing – Metallic, Electronic, Misc** |
| 21 | Mining |
| 23 | Construction |
| 31 | Manufacturing – Textile & Food |
| 32 | Manufacturing – Nonmetallic & Chemical |
| 44-45 | Retail trade |
| 48-49 | Transportation & warehousing |
| 51 | Information |
| 62 | Health care & social assistance |
| 91 | Public Administration |
| | |
| **42** | **Wholesale trade** |
| 23 | Construction |
| 32 | Manufacturing – Nonmetallic & Chemical |
| 33 | Manufacturing – Metallic, Electronic, Misc |
| 44-45 | Retail trade |
| 51 | Information |
| | |
| **44-45** | **Retail trade** |
| 23 | Construction |
| 31 | Manufacturing – Textile & Food |

32 Manufacturing – Nonmetallic & Chemical
33 Manufacturing – Metallic, Electronic, Misc

**48-49 Transportation & warehousing**
32 Manufacturing – Nonmetallic & Chemical
33 Manufacturing – Metallic, Electronic, Misc
42 Wholesale trade
44-45 Retail trade
51 Information
91 Public Administration

**51 Information**
32 Manufacturing – Nonmetallic & Chemical
33 Manufacturing – Metallic, Electronic, Misc
54 Professional, scientific, & technical services
91 Public Administration

**52 Finance & insurance**
54 Professional, scientific, & technical services
62 Health care & social assistance

**53 Real estate & rental & leasing**

**54 Professional, scientific, & technical services**
51 Information

**56 Administrative & support & waste management & remediation serv**

**61 Educational services**
23 Construction
33 Manufacturing – Metallic, Electronic, Misc
51 Information

**62 Health care & social assistance**
32 Manufacturing – Nonmetallic & Chemical
33 Manufacturing – Metallic, Electronic, Misc

**71 Arts, entertainment, & recreation**

**72 Accommodation & foodservices**

**81 Other services (except public administration)**

**91 Public Administration**
21 Mining
22 Utilities
23 Construction

32 Manufacturing – Nonmetallic & Chemical
33 Manufacturing – Metallic, Electronic, Misc

(*U.S. Industry & Trade Outlook*, 1999)