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# Employment and Wage Trends in Manufacturing

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## **ACKNOWLEDGMENTS**

Special thanks to Chandrayee Chatterjee and Lakshmi Pandey for their technical assistance and to Laura Wheeler for her review of an earlier draft of this report.

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Publication note: The original version of this report was updated on August 3, 2016, to correct an error on page 6—millions was corrected to thousands in the 2035 job projections.

# 1. Introduction

To many people, economic activity is synonymous with manufacturing, and in particular with producing a tangible durable product, such as an automobile or washing machine. Attracting and growing manufacturing jobs is a significant focus of state economic development policies. And, manufacturing is front and center in the national debate regarding U.S. international competitiveness. However, the relative importance of manufacturing in the U.S. economy, as measured by employment, has been declining for a long time. In 2014, manufacturing accounted for 7.0 percent of U.S. employment, down from 19.0 percent in 1979, and 29.8 percent in 1948.<sup>1</sup> This trend is due to changes in production technology (e.g., replacing humans with robots) and the movement of manufacturing jobs offshore in search of low wage workers.

While manufacturing employment has become relatively less important in the United States, manufacturing is still a source of higher wage jobs. In 1948, the annual wage per full-time equivalent worker in manufacturing was 7.7 percent higher than the average wage rate for all employees in the private sector. This wage premium increased to 14.6 percent in 1980 and to 16.2 percent in 2014.<sup>2</sup> The causes of this trend are the same as for the trend in manufacturing employment. Lower wage manufacturing jobs have moved to low-wage countries, and for many of the remaining manufacturing jobs the changes in manufacturing technology now require higher skilled workers, who command higher wages.

In this report, we explore trends in employment and wages in manufacturing, focusing on the period since 1996.<sup>3</sup> We highlight changes in Georgia, comparing the trends in Georgia to those in other states and the United States. We focus on the post-1996 period as that is the beginning of the decline in manufacturing employment in Georgia. 1996 is also the year that per capita income in Georgia begin to fall relative to income per capita in the United States. Between 1950 and 1996, the per capita income in Georgia increased from 71.1 percent of the U.S. per capita income to 94.5 percent. But since 1996 the percentage has decreased nearly continuously, and now per capita income in Georgia is 85.1 percent of U.S. per capita income.

The report proceeds as follows. In Section 2, we explore the trends in manufacturing employment in the United States and Georgia for the past 35 years. Next, we consider the changes since 1997 in the level of employment (Section 3) and earnings per worker (Section 4) in the various manufacturing sectors in Georgia and the United States. Section 5 compares changes in manufacturing in Georgia to that in other states, while Section 6 discusses how the change in manufacturing employment differs across Georgia counties. Section 7 offers some thoughts and suggestions for state economic development policy.

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<sup>1</sup> Source: U.S. Bureau of Economic Analysis, Table SA25.

<sup>2</sup> Source: U.S. Bureau of Economic Analysis, Table 6.6.

<sup>3</sup> This report compliments a 2014 report on employment in Georgia written by Peter Bluestone, *Jobs in Georgia's Urban and Rural Regions, Changes in Distribution, Type, and Quality of Jobs in Georgia Counties from 2000-2012*, Center for State and Local Finance, [cslf.gsu.edu/download/jobs-georgias-urban-rural-regions-changes-distribution-type-quality-jobs-georgia-counties-2000-2012/?wpdmdl=5011](http://cslf.gsu.edu/download/jobs-georgias-urban-rural-regions-changes-distribution-type-quality-jobs-georgia-counties-2000-2012/?wpdmdl=5011).

The data we rely on in this report come from two sources: the U.S. Bureau of Economic Analysis (BEA) and the Annual Survey of Manufacturing (ASM) produced by the U.S. Census Bureau. The BEA data is available for a longer time period, so we use it for Section 2. The BEA data reports total full-time and part-time employment, while the ASM uses full-time equivalent workers. Thus, there are differences between the two sources in the number of jobs reported in any given year. For example, BEA reports Georgia manufacturing employment in 2014 was 389,819, while ASM reports manufacturing employment of 333,167. Another data issue concerns how firms are classified by industry. In the late 1990s, the U.S. government changed its industrial classification system, that is, how it classifies business establishments, switching from the Standard Industrial Classification (SIC) system to the North American Industrial Classification (NAICS) system. As a result, we do not have an employment series that consistently classifies businesses for the entire period. For a few years the government classified establishments using both systems, so we can see how the change in classification affected the measurement of manufacturing employment.

## 2. Trends in Manufacturing Employment, 1979 to 2014

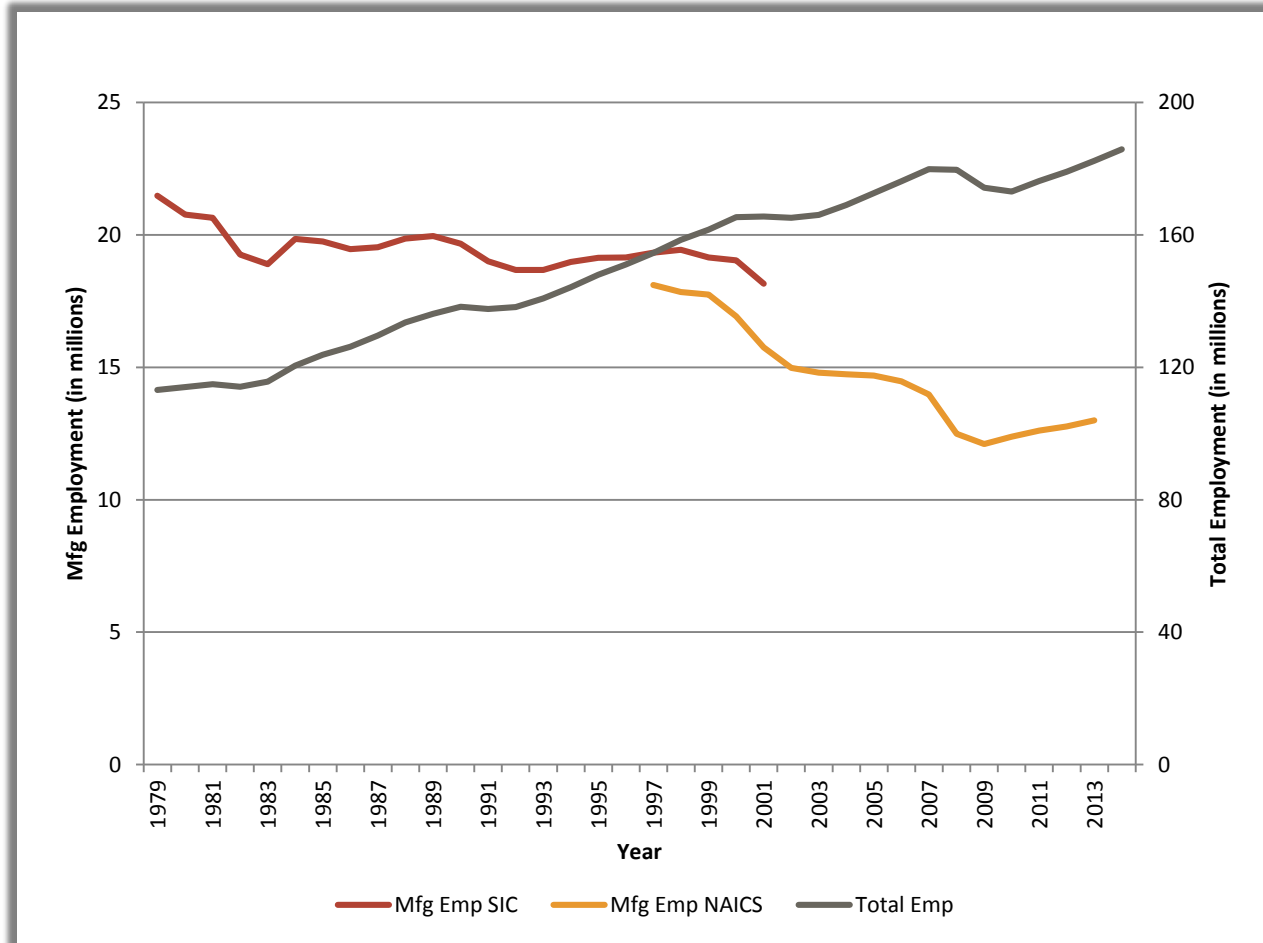
Between 1948 and 1979, employment in U.S. manufacturing grew but at a slower rate than total employment. However, since 1979, manufacturing employment in the United States has been declining (Figure 1). Because of the switch from the SIC to NAICS classification system, Figure 1 plots manufacturing employment using both the SIC and NAICS series (left-hand scale). Figure 1 also shows the change in total employment (right-hand scale), which increased by 64.2 percent, or at annual rate of 1.43 percent.

Between 1979 and 2014, the number of full-time and part-time workers in manufacturing in the United States fell from 21.48 million to 12.99 million, a decrease of 39.5 percent.<sup>4</sup> This amounts to an annual average rate of decline of 1.43 percent. Most of this decrease has occurred since 2000. The decrease in manufacturing employment between 1979 and 2000 (using the SIC series) was 2.44 million jobs, a decrease of 11.4 percent. This amounted to an average decrease of 116,200 jobs per year, an average annual decrease of 0.57 percent. Between 2000 and 2014, the job loss (using the NAICS series) was 4.76 million jobs, a decrease of 26.8 percent. On an annual basis, the United States lost 317,147 jobs per year since 2000, an average annual decrease of 2.06 percent. There has been a small increase in U.S. manufacturing employment since 2010, that is, since the end of the Great Recession; between 2010 and 2014, manufacturing jobs increased by 222,000 or 7.4 percent.

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<sup>4</sup> Part of this decrease is due to a change in how establishments are classified.

**Figure 1. U.S. Employment, Manufacturing and Total**

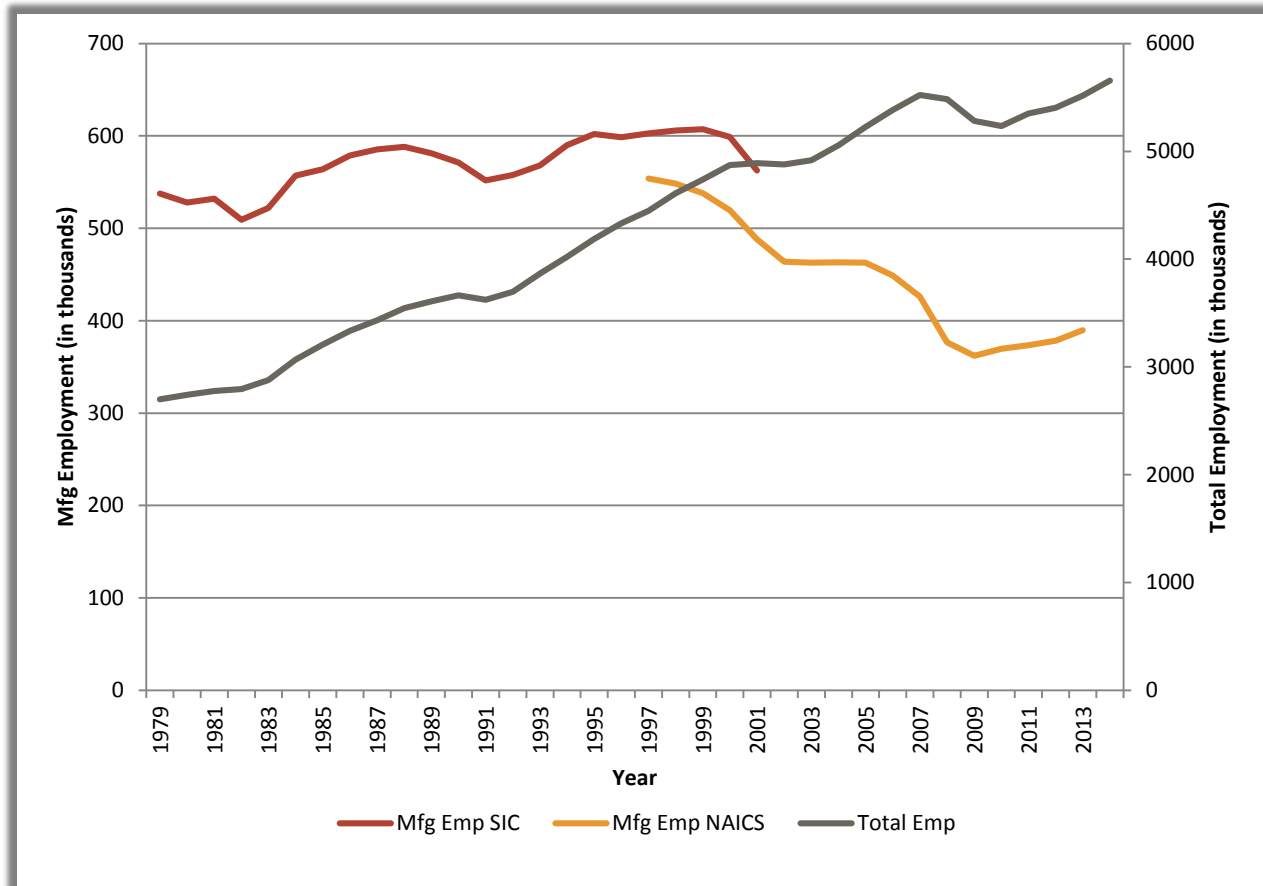


Source: U.S. Bureau of Economic Analysis

The picture for manufacturing employment in Georgia for the period 1979 to 2000 differs from that of the United States. Unlike the United States, manufacturing employment in Georgia trended upward between 1979 and the late 1990s (Figure 2, left-hand scale). Between 1979 and 2000, the number of manufacturing jobs in Georgia (using the SIC series) increased from 537,660 to 598,855, an addition of 61,195 manufacturing jobs or an increase of 11.4 percent. But since 2000, employment in Georgia has declined, other than a small increase in the post-Great Recession period. Between 2000 and 2014, manufacturing employment in Georgia (using the NAICS series) decreased from 537,935 to 389,819, or by 27.5 percent, slightly larger than the percentage decreases for the United States. On an annual basis, manufacturing employment in Georgia between 2000 and 2014 fell by 9,874 jobs per year, an annual rate of decline of 2.12 percent. In the post-Great Recession period (i.e., between 2010 and 2014), manufacturing employment in Georgia increased by 27,829 jobs, or by 7.7 percent, which is a slightly larger percentage than for the United States. Manufacturing employment currently (2014) accounts for 6.9 percent of Georgia's total employment, essentially the same as for the United States.

Figure 2 (right-hand scale) also shows the growth in total employment in Georgia. For the period 1979 to 2014, total employment in Georgia increased 109.5 percent, an annual percentage growth of 2.14 percent.

**Figure 2. Georgia Employment, Manufacturing and Total**



Source: U.S. Bureau of Economic Analysis

## GEORGIA'S MANUFACTURING EMPLOYMENT IN 2035

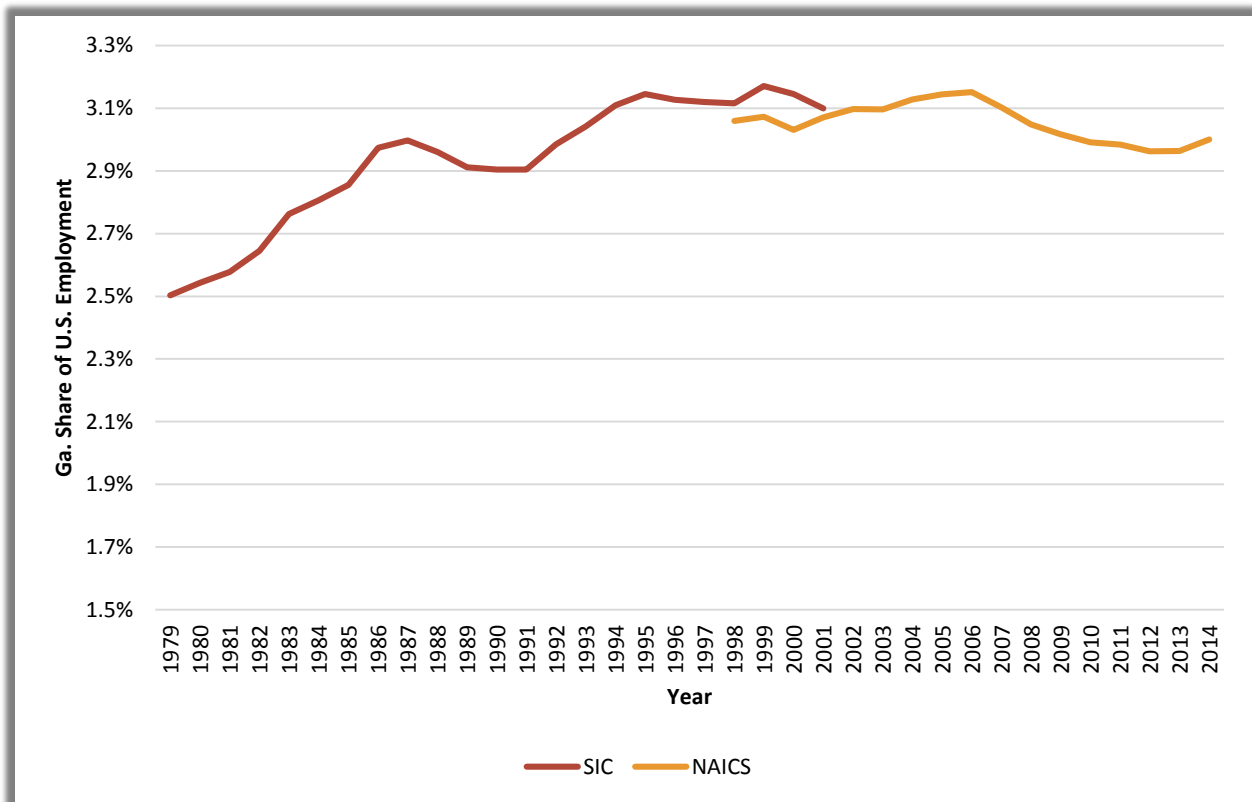
If the post-2000 employment trend continues, what might we expect manufacturing employment to be in 2035? There are several alternative assumptions we could make on which to base such a prediction. First, we assume that manufacturing employment in Georgia will decrease at the same percentage rate as it did between 2000 and 2014. Under this assumption, we would project that in 2035, manufacturing employment in Georgia would be 248.6 thousand jobs, which would be a 36 percent decrease over 2014. Second, we assume that employment will follow the linear trend line over the period 2000 through 2014. This assumption suggests that by 2035 manufacturing employment in Georgia will have fallen to 127.6 thousand jobs, a 67 percent decrease. Third, we assume that manufacturing employment will decrease at the same annual average rate of decrease in manufacturing employment between 2001 and 2014. This implies a decrease of 182.5 thousand jobs, a 53 percent decrease.

These calculations assume that manufacturing employment will fall beginning in 2014. Alternatively, we could assume that manufacturing employment will return to its pre-Great Recession level and then continue its longer term decline. Thus, we assume that manufacturing employment will increase by the same number of jobs per year as between 2010 and 2014 until manufacturing employment reaches the employment level in 2007. Once employment reaches that level, we assume that manufacturing employment will decrease by the same number of jobs per year as between 2000 and 2007. The result of this calculation is that in 2035, Georgia would have 300,012 manufacturing jobs, a decrease of 23.0 percent over 2014 employment. Regardless of the assumption we make, the expectation is that Georgia will experience a substantial decrease in manufacturing employment by 2035.



Figure 3 shows the trend in Georgia's share of U.S. manufacturing employment, using the same data as was used for figures 1 and 2. Georgia's share increased from 2.50 percent in 1979 to 3.17 percent in 1999 (SIC series) and to 3.15 percent in 2006 (NAICS series). By 2013, Georgia's share fell each year between 2006 and 2013, reaching 2.96 percent in 2013 (NAICS series). Georgia's share did increase to 3.00 percent in 2014.

**Figure 3. Georgia's Share of U.S. Manufacturing Employment**



Source: Author's calculations based on U.S. Bureau of Economic Analysis data

### 3. Analysis of Employment by Manufacturing Industry Sectors, 1997 to 2014

The manufacturing sector is comprised of many subsectors; we consider 21 subsectors. The NAICS specifies industries by code numbers that range from two digits to five digits. Major industrial divisions are denoted by two digits, e.g., 31, 32, and 33 refer to three major manufacturing sectors. As a sector is subdivided into finer categories, additional digits are added. We use data for three-digit industries, referring to the three-digit codes that classify them. Table 1 lists the three-digit codes and the names of each of the 21 manufacturing subsectors (see Appendix A for a description of each subsector).<sup>5</sup> These

<sup>5</sup> These three-digit industries are broken out in even more detail in the data, but 21 manufacturing sub-industries provides sufficient detail for our purposes.

sub-industries allow us to delve more deeply into the nature of the change in manufacturing employment and wages. We consider two years, 1997 and 2014. We start with employment in 1997 because it is the year that manufacturing employment began its decline in Georgia, and conveniently is the first year that employment by NAICS sector is available. The most recent data available are for 2014. The data are from the Annual Census of Manufacturing.

**Table 1. NAICS Codes and Industry Names of Manufacturing Industries**

NAICS CODE	INDUSTRY	NAICS CODE	INDUSTRY
311	Food manufacturing	326	Plastics and rubber products manufacturing
312	Beverage and tobacco product manufacturing	327	Nonmetallic mineral product manufacturing
313	Textile mills	331	Primary metal manufacturing
314	Textile product mills	332	Fabricated metal product manufacturing
315	Apparel manufacturing	333	Machinery manufacturing
316	Leather and allied product manufacturing	334	Computer and electronic product manufacturing
321	Wood product manufacturing	335	Electrical equipment, appliance, and component manufacturing
322	Paper manufacturing	336	Transportation equipment manufacturing
323	Printing and related support activities	337	Furniture and related product manufacturing
324	Petroleum and coal products manufacturing	339	Miscellaneous manufacturing
325	Chemical manufacturing		

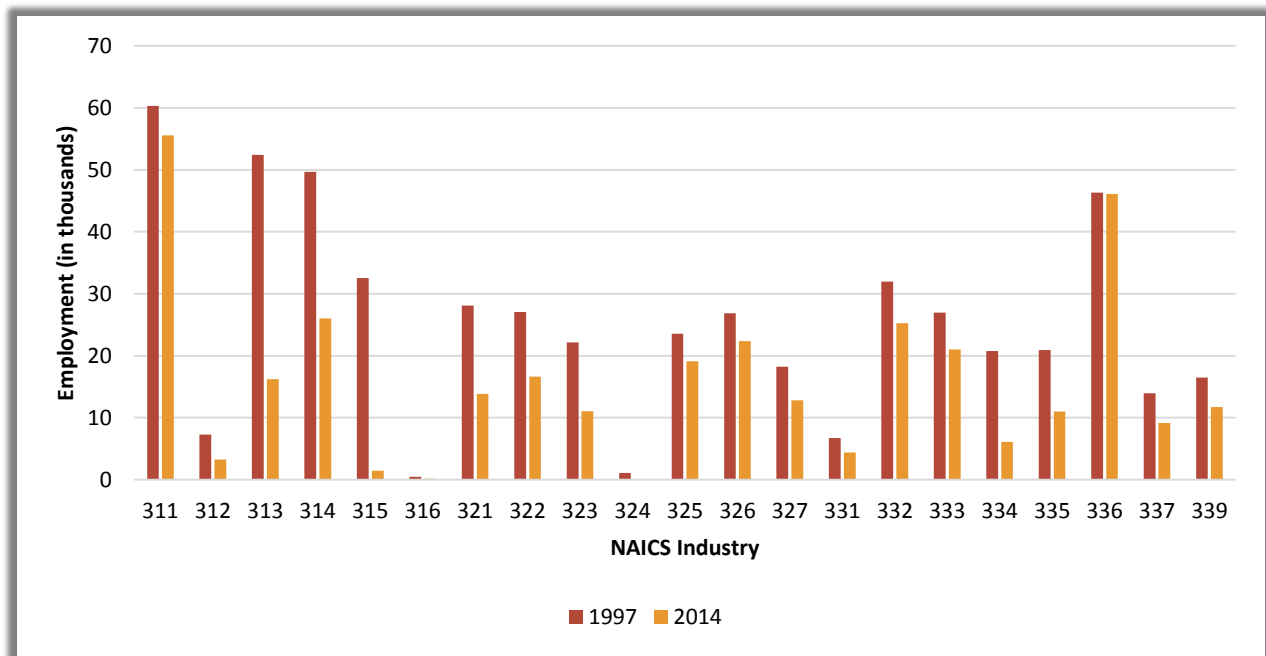
See Appendix A for a description of each subsector.

Figure 4 shows employment levels for Georgia for the 21 manufacturing industries for 1997 and 2014, while Figure 5 shows the percentage change in employment. As can be seen, employment decreased in all 21 manufacturing industries, but by differing percentages. In 1997, the four largest manufacturing industries were food manufacturing (NAICS 311), textile mills (NAICS 313), textile product mills (NAICS 314), and transportation equipment manufacturing (NAICS 336). In 1997, these four manufacturing industries accounted for 39.1 percent of total manufacturing employment in Georgia. Over the 17-year period, employment in food manufacturing and transportation equipment manufacturing decreased by relatively small percentages, 7.9 percent and 0.5 percent, respectively. However, employment in textile mills and textile product mills fell by 69.1 percent and 47.6 percent, respectively.

The subsector with the largest decrease in the number of employees was textile mills, while apparel manufacturing had the largest percentage decrease. The three industries, textile mills, textile product mills, and apparel manufacturing, accounted for 25.2 percent of manufacturing in Georgia in 1997, but only 13.1 percent in 2014. The decrease in employment in these three subsectors accounted for 45.4

percent of the decrease in manufacturing employment in Georgia between 1997 and 2014. Employment in these three subsectors was declining long before 1997.<sup>6</sup> Now, apparel manufacturing has largely disappeared in Georgia. In 1997, there were 368 apparel manufacturing establishments in Georgia, while in 2014 there were only 90 establishments.<sup>7</sup> The decrease in employment between 1997 and 2014 in the 18 subsectors outside of textile mills, textile product mills, and apparel manufacturing was 27.5 percent.

**Figure 4. Georgia Manufacturing Employment by Sector**

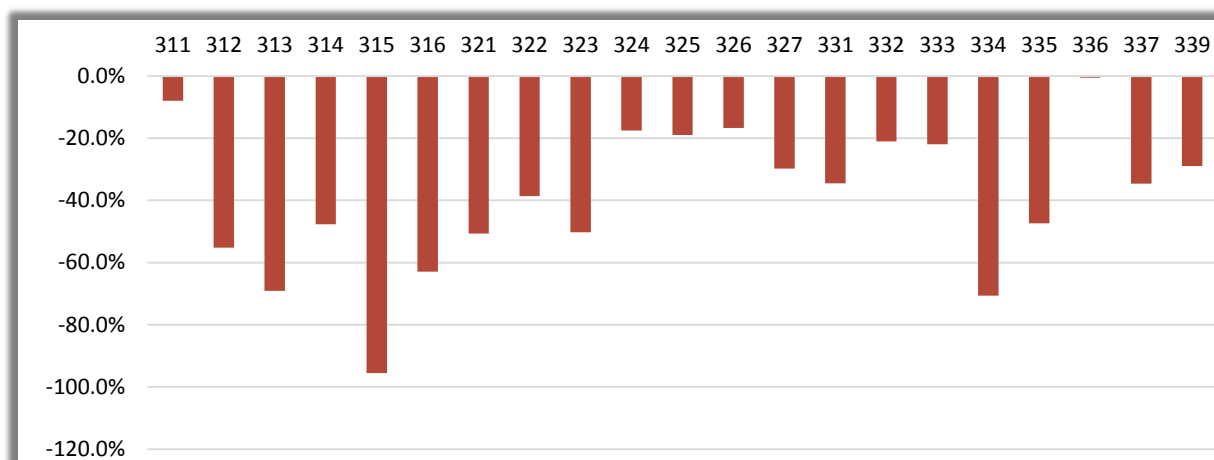


Source: Annual Survey of Manufacturing, 1997 and 2014

<sup>6</sup> Between 1979, the year that textile and apparel manufacturing reached its peak, and 1996, employment in those two industries fell by 24.2 percent. We used Bureau of Economic Analysis data on full-time and part-time employment in the two industries as classified by the SIC.

<sup>7</sup> County Business Patterns, U.S. Census Bureau, [www.census.gov/programs-surveys/cbp.html](http://www.census.gov/programs-surveys/cbp.html).

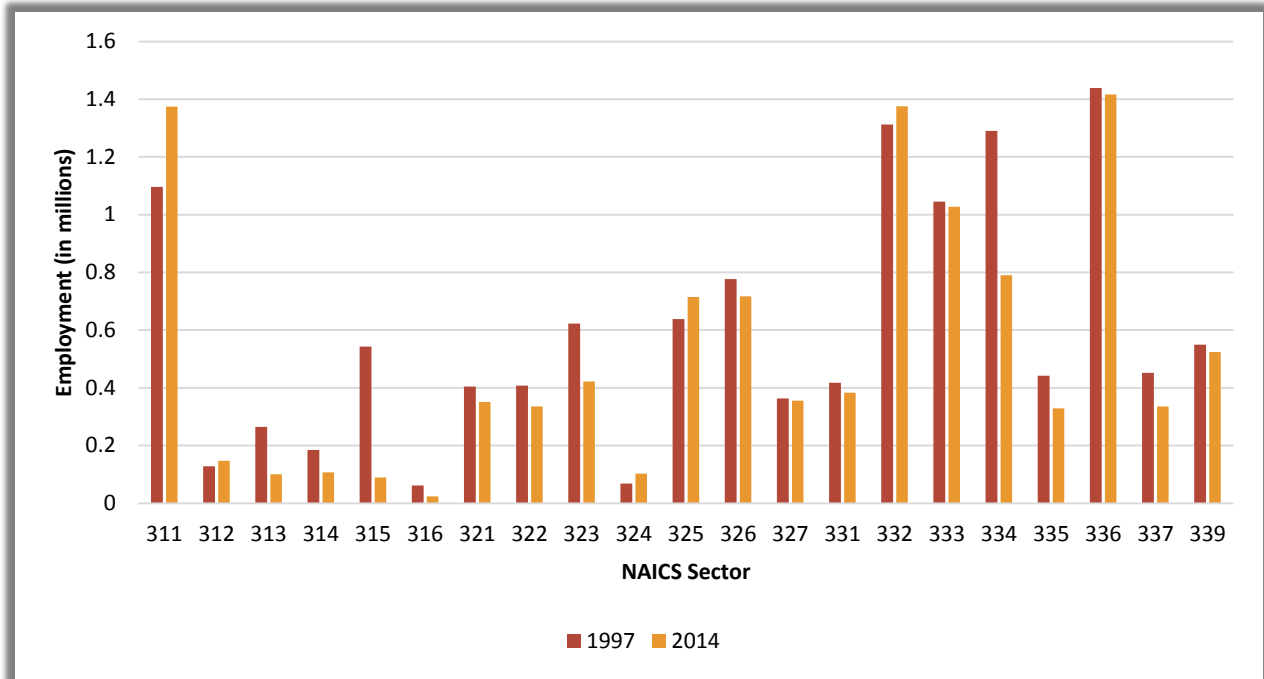
**Figure 5. Percentage Change in Georgia Employment by NAICS Sector**



Source: Author's calculations based on Annual Survey of Manufacturing data

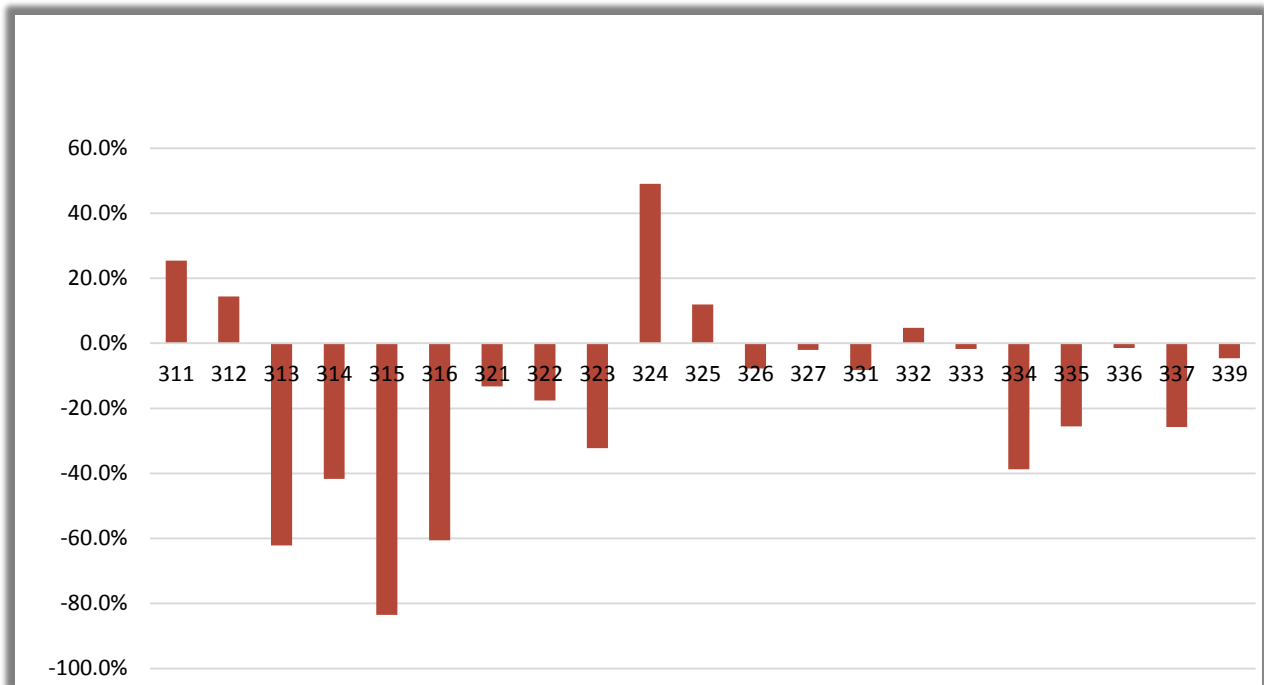
Figures 6 and 7 report the equivalent information as figures 4 and 5 for the United States. Food manufacturing (NAICS 311), fabricated metal product manufacturing (NAICS 332), computer and electronic product manufacturing (NAICS 334), and transportation equipment manufacturing (NAICS 336) were the four largest industries in the United States in 1997. These four subsectors accounted for 32.3 percent of manufacturing employment in 1997. Of these subsectors, three were also three of the largest four industries in 2014; computer and electronic product manufacturing (NAICS 334) was replaced by machinery manufacturing (NAICS 333) among the four largest manufacturing industries. While apparel manufacturing (NAICS 315) had the largest percentage decrease in employment, 83.5 percent, computer and electronic product manufacturing (NAICS 334) had the largest decrease in the number of employees. Generally, the percentage decreases in employment by sector were smaller for the United States than for Georgia, and in fact, for the United States six manufacturing industries experienced employment growth, although the growth was small.

Figure 6. U.S. Manufacturing Employment by Sector



Source: Annual Survey of Manufacturing, 1997 and 2014

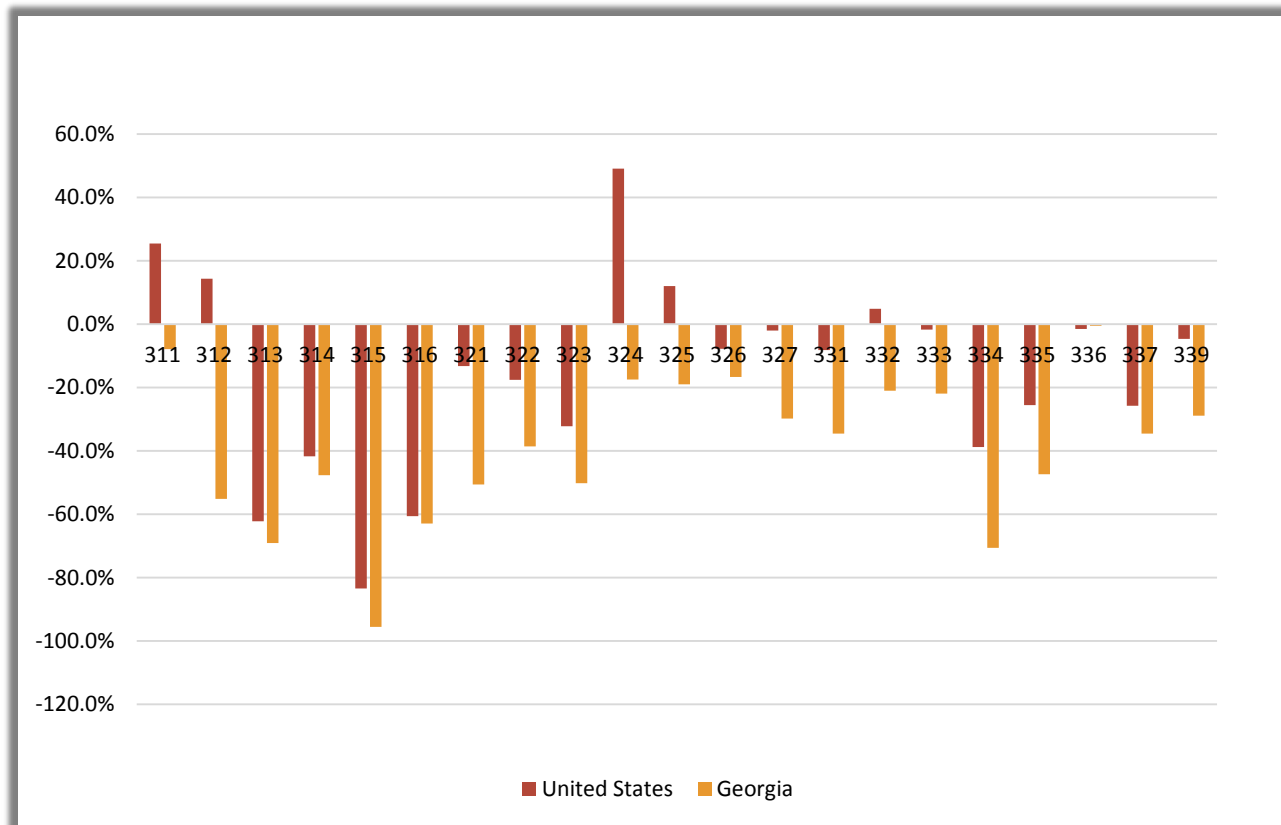
Figure 7. Percentage Change in U.S. Employment by NAICS Sector



Source: Author's calculations based on Annual Survey of Manufacturing data

Figure 8 compares the percentage change in employment by sector for the United States and Georgia. The figure makes clear that the percentage decreases in employment were greater in Georgia than in the United States, with the exception of transportation equipment manufacturing (NAICS 336).

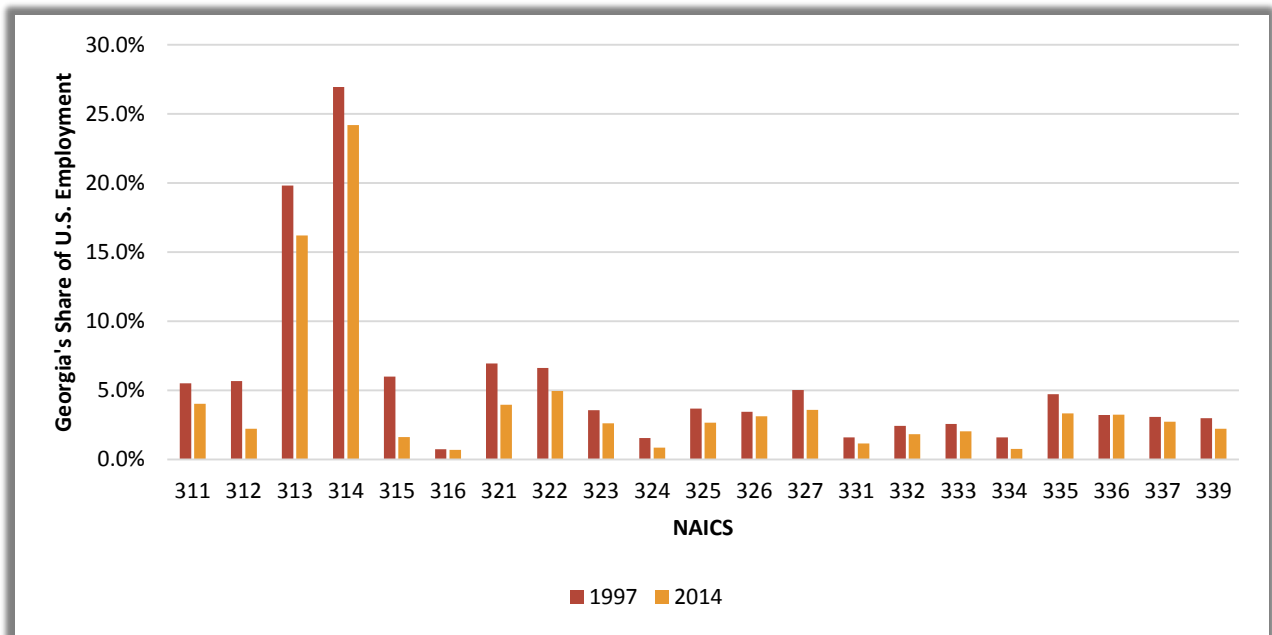
**Figure 8. Percentage Change in Employment by NAICS Sector:  
Georgia versus United States**



Source: Author's calculations based on Annual Survey of Manufacturing data

Figure 9 shows Georgia's share of U.S. employment for each subsector for 1997 and 2014. Georgia's share of employment fell in all but one of the 21 subsectors, the only exception being transportation equipment manufacturing (NAICS 336). Despite the large declines in employment in textile mills (NAICS 313) and textile product mills (NAICS 314), they are the only two subsectors that currently (2014) command more than 5 percent of U.S. employment. The decrease in apparel manufacturing (NAICS 315) suffered the largest percentage decrease in its share of U.S. employment, going from 6.0 percent to 1.6 percent.

**Figure 9. Georgia's Share of U.S. Employment, 1997 and 2014**

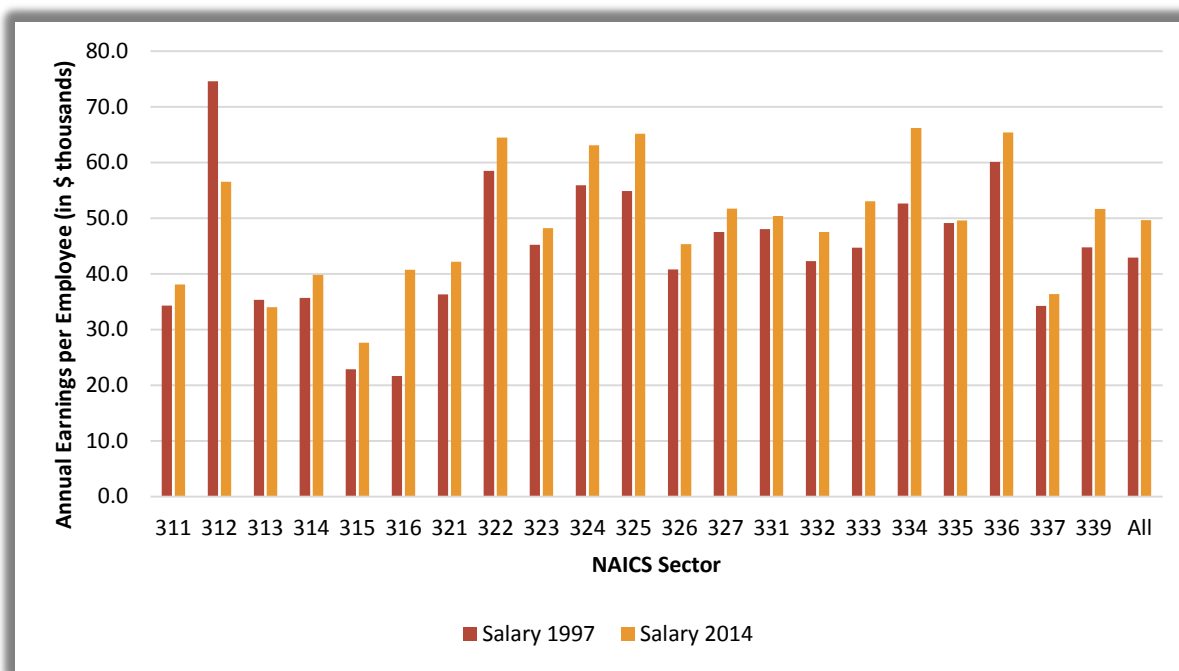


Source: Author's calculations based on Annual Survey of Manufacturing data

## 4. Analysis of Wages and Salary by Manufacturing Sector, 1997 to 2014

We turn now to an analysis of annual wages and salary in manufacturing. These data are from the Annual Survey of Manufacturing; 1997 values have been adjusted for inflation. We consider Georgia first. Figure 10 shows the annual wage and salary for each of the 21 manufacturing industries (subsectors) and the average of all 21 sectors (shown as “All” on the right-hand side of the x-axis). There are significant differences in average earnings across the 21 manufacturing industries. The sector with the lowest earnings per worker in 2014, \$27,604, is in the apparel manufacturing (NAICS 315), while the highest earnings per worker in 2014, \$66,181, is in computer and electronic product manufacturing (NAICS 334). The ratio of the highest to lowest annual average earnings in 2014 is 2.40.

**Figure 10. Annual Wage and Salary per Employee – Georgia**

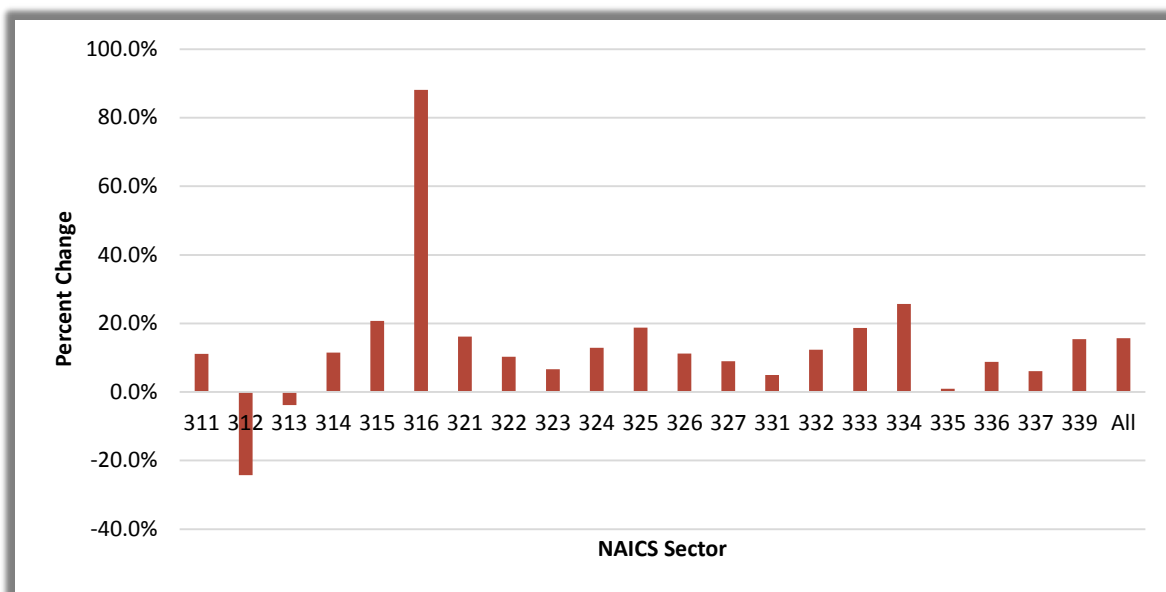


Source: Author’s calculations based on Annual Survey of Manufacturing data

Figure 11 shows the percentage change in annual earnings per employee for Georgia. With the exception of the beverage and tobacco product manufacturing sector (NAICS 312) and textile mills (NAICS 313), all industries experienced an increase in annual real earnings per employee. Leather and allied product manufacturing (NAICS 316) saw an increase in average earnings of 88.1 percent, but that industry is very small, accounting for only 0.05 percent of total employment in manufacturing in Georgia, and thus we should not make much of that change in earnings. On average, real earnings per employee in Georgia increased by 15.7 percent.



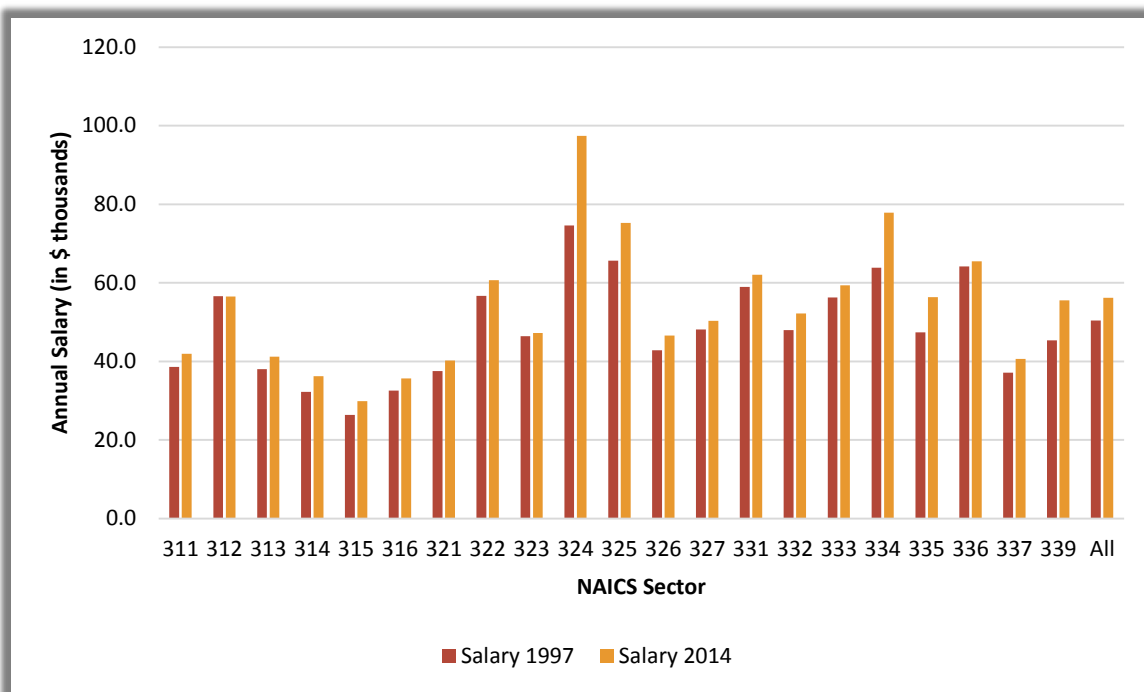
**Figure 11. Percent Change in Annual Employee Earnings, 1997-2014 – Georgia**



Source: Author's calculations based on Annual Survey of Manufacturing data

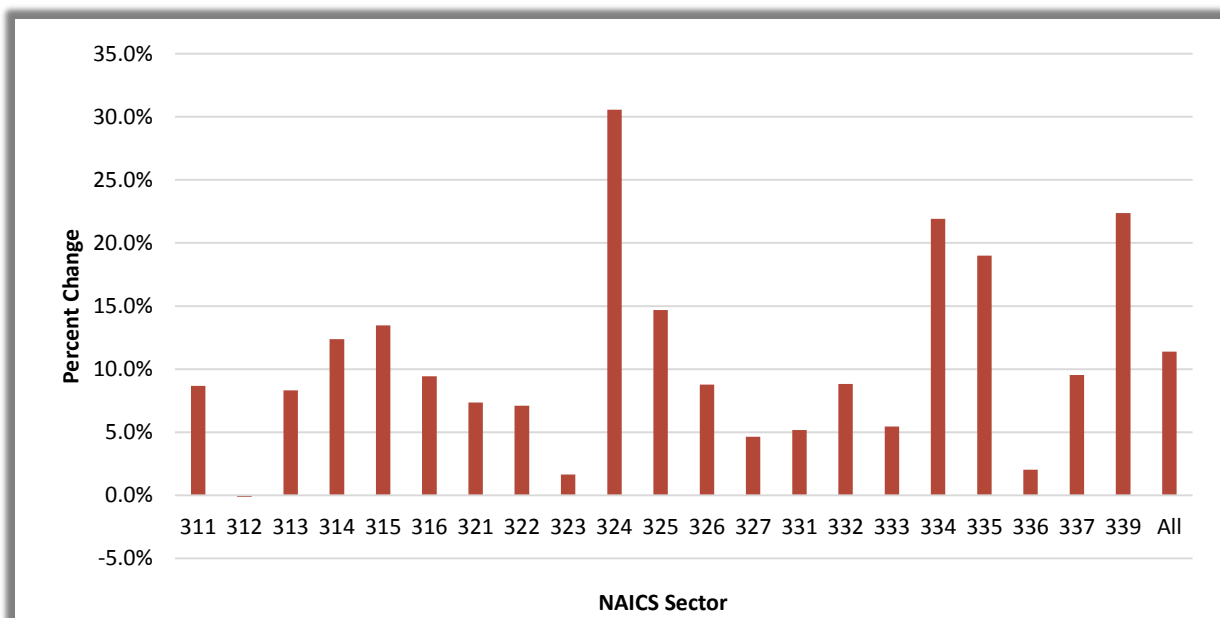
Figures 12 and 13 show the distribution and change in annual earnings per employee for the United States. For the United States only the beverage and tobacco product manufacturing sector (NAICS 312) experienced a decrease in real earnings per employee, and that decrease was only 0.1 percent. The increase in average manufacturing earnings per employee was 11.4 percent, a bit lower than the increase for Georgia.

**Figure 12. Annual Wage and Salary per Employee – United States**



Source: Author’s calculations based on Annual Survey of Manufacturing data

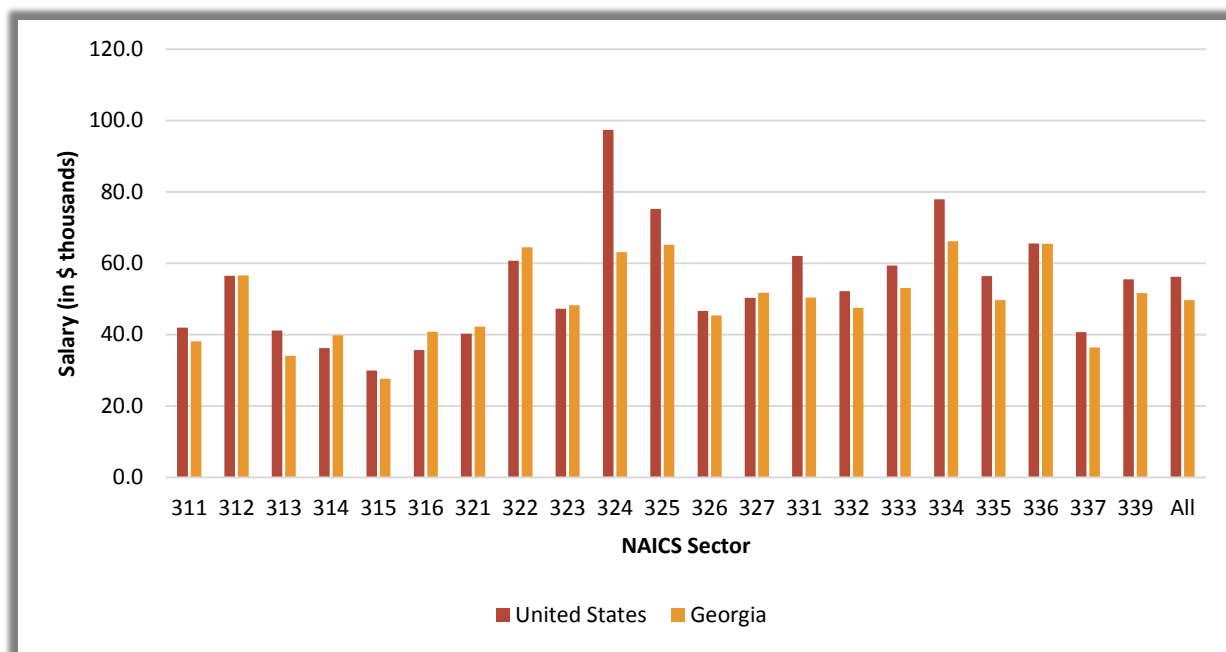
**Figure 13. Percent Change in Annual Employee Earnings, 1997-2014 – United States**



Source: Author’s calculations based on Annual Survey of Manufacturing data

Figure 14 compares earnings per employee in 2014 in Georgia to that for the United States. As can be seen, earnings per employee are higher in the United States than in Georgia for 13 of the manufacturing industries, although other than petroleum and coal products manufacturing (NAICS 324) the earnings per employee are similar for the United States and Georgia.

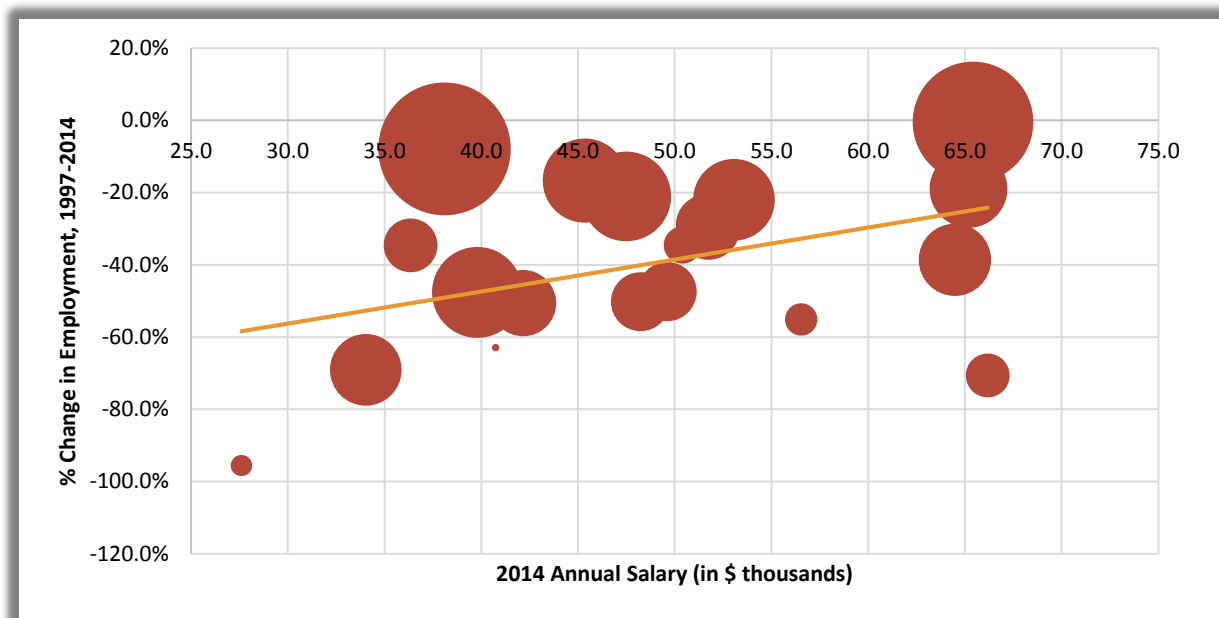
**Figure 14. Salary Comparison, 2014**



Source: Author's calculations based on Annual Survey of Manufacturing data

Figure 15 plots the percentage change in employment between 1997 and 2014 against the 2014 earnings per employee for Georgia for the 21 manufacturing sectors. The size of the circles reflects the size of the sector. We have plotted the line estimated by regressing the percentage change in employment between 1997 and 2014 against average earnings in 2014. The positive slope implies that on average, manufacturing industries that paid higher wages in 2014 were those that experienced smaller employment losses. However, there is a large industry, food manufacturing (NAICS 311), that had a small decrease in employment but has below average earnings per worker. On the other hand, transportation equipment manufacturing (NAICS 336), the second largest manufacturing industry, had the smallest decrease in employment and pays wages well above average for manufacturing.

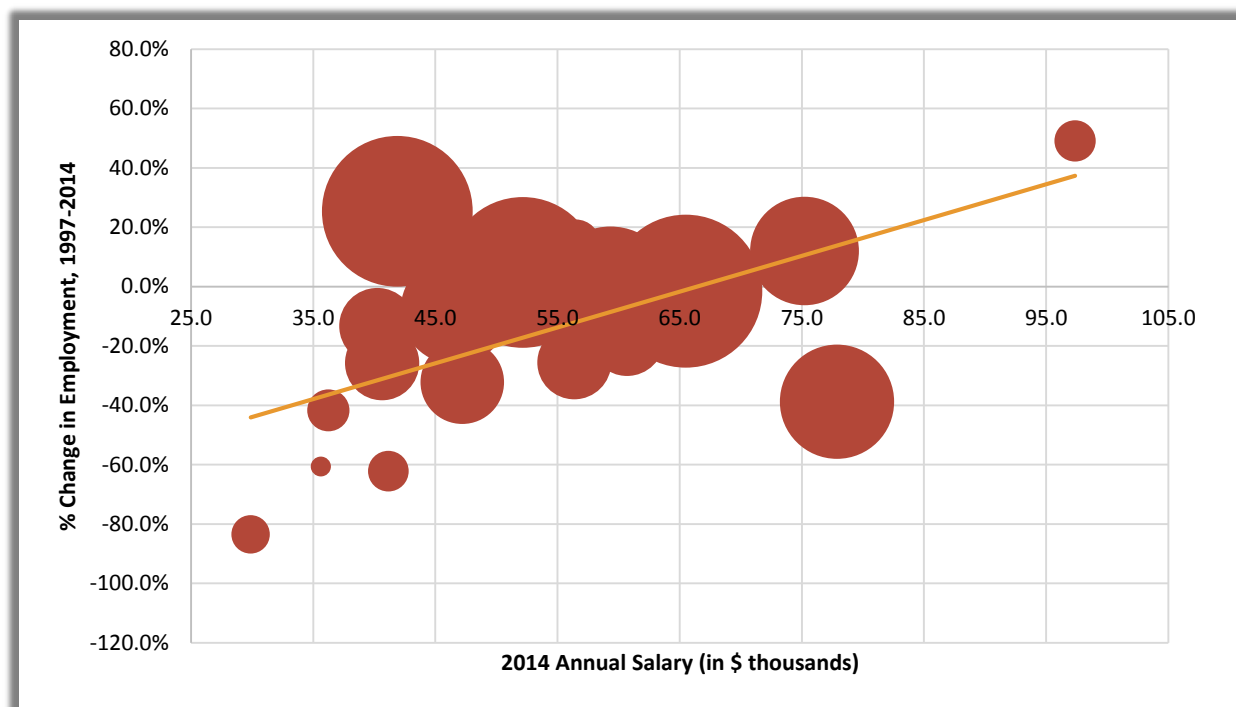
**Figure 15. Percent Change in Employment and 2014 Salary – Georgia**



Source: Author's calculations based on Annual Survey of Manufacturing data

Figure 16 is the equivalent figure for the United States. The patterns in Figures 15 and 16 are similar, that is, on average industries that grew more (or declined less) have higher 2014 salaries. Because more of the subsector experienced positive growth in the United States than in Georgia, the regression line crosses the x-axis in Figure 16. Appendix Table B-1 presents the data used construct Figures 15 and 16.

**Figure 16. Percent Change in Employment and 2014 Salary – United States**



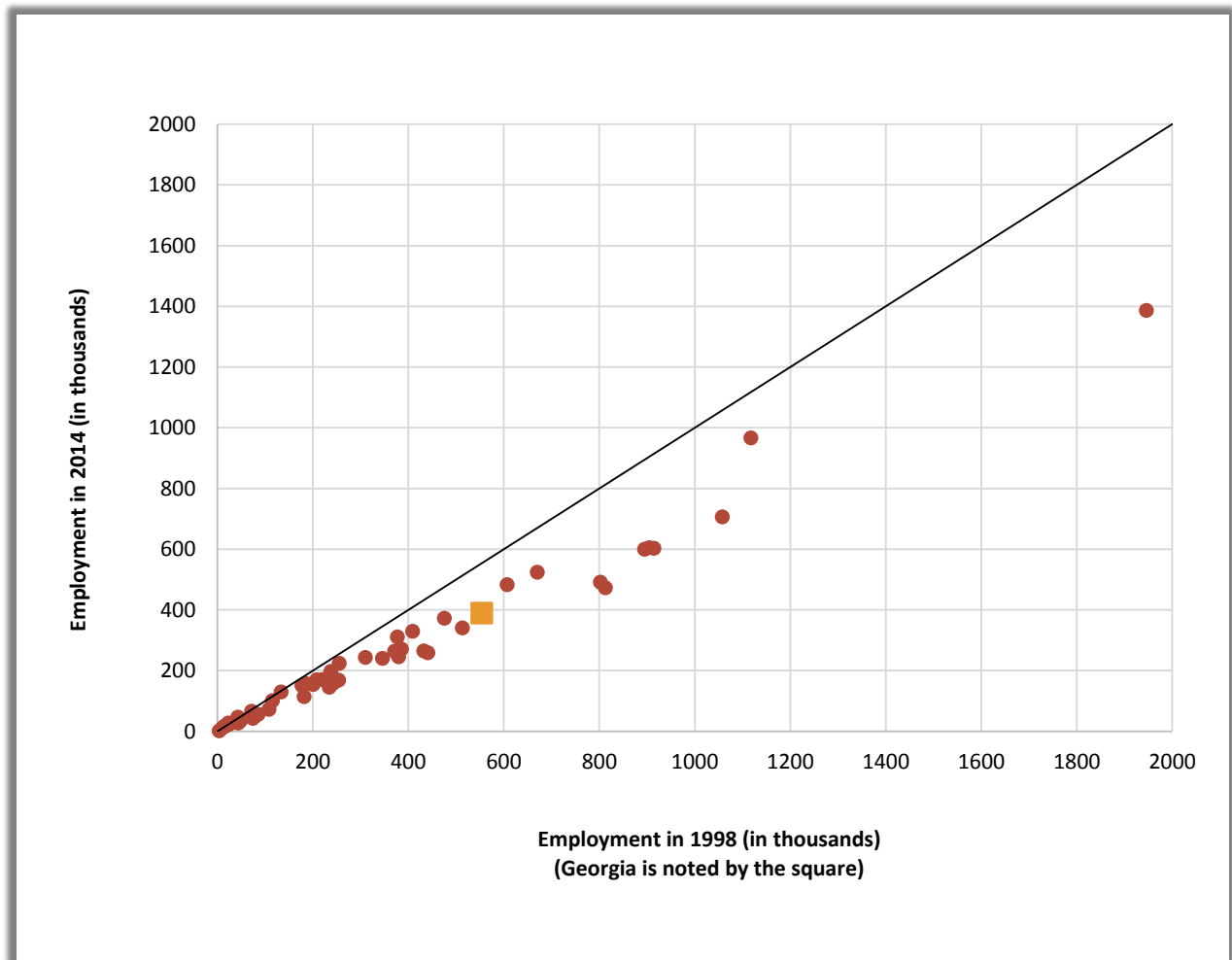
Source: Author's calculations based on Annual Survey of Manufacturing data

## 5. Georgia Compared to Other States

Figure 17 is a plot of total manufacturing employment in 1998 and 2014 for each state, using data from the Bureau of Economic Analysis (BEA).<sup>8</sup> (As noted above, BEA employment includes both full-time and part-time employment.) Each point in Figure 17 is a state and shows how its employment in 2014 compares to its employment in 1998. A point on the line in Figure 17 represents equal employment in the two years. As can be seen, nearly all of the states are below the line, implying that employment in 2014 is lower than in 1998. Only a few states with small manufacturing employment are above the line, and then just barely. This can also be seen in Figure 18, which shows the percentage change in employment between 1998 and 2014. Only six states experienced employment growth in manufacturing, and these tended to be states with small manufacturing employment. Among all states, Georgia had the 23rd largest percentage decrease in manufacturing employment, slightly larger than for the United States as a whole. Three of Georgia's five border states had larger percentage decreases, while Alabama's decrease was only slightly smaller than Georgia's. Among the border states only Florida had a significantly smaller decrease in manufacturing employment. Appendix Table B-2 contains the data used to construct Figures 17 and 18.

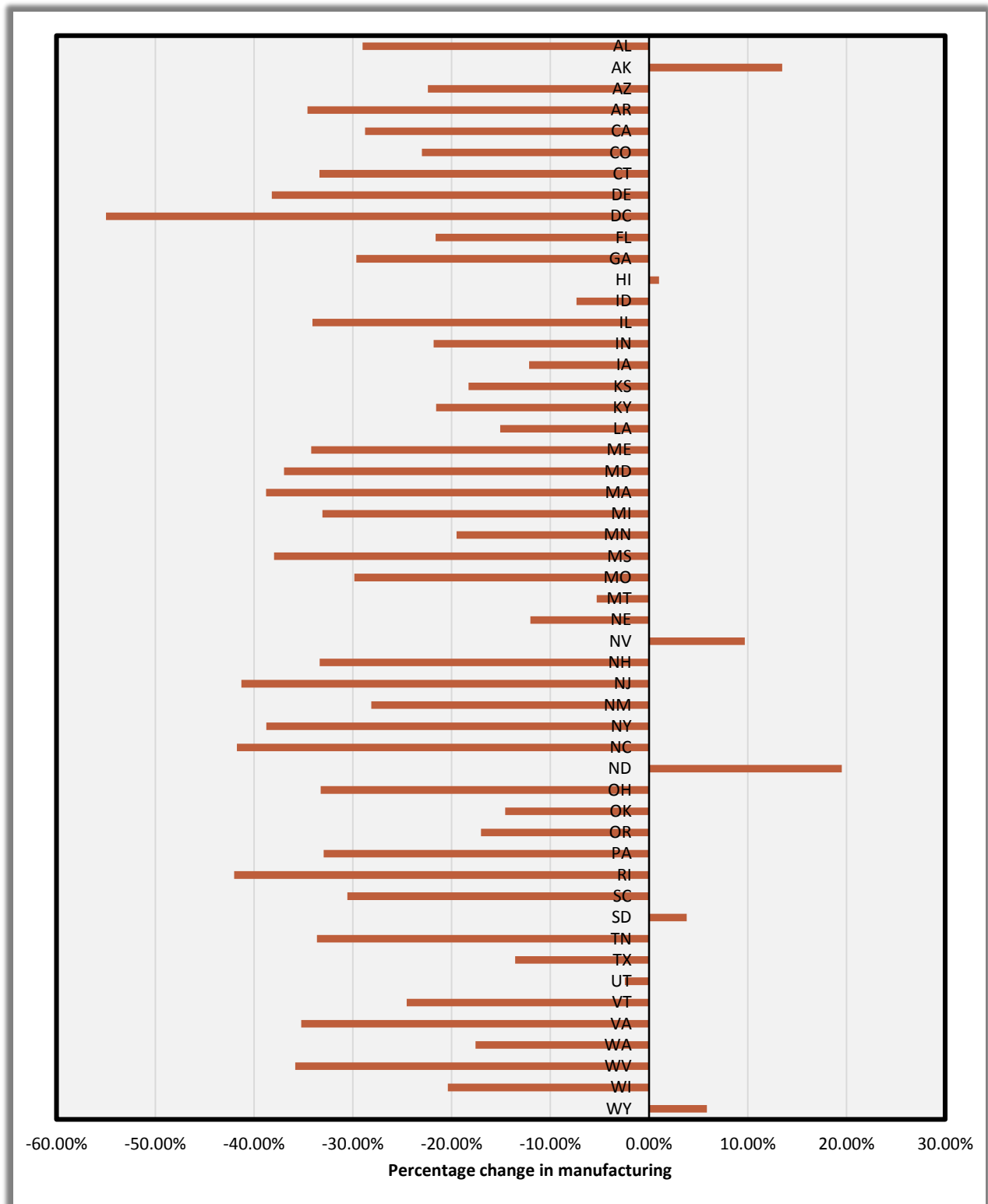
<sup>8</sup> NAICS manufacturing employment by state is not available from BEA before 1998.

Figure 17. Plot by State for Employment in 1998 and 2014



Source: Author's calculations based data from Bureau of Economic Analysis, Table SA25N

Figure 18. Percentage Change in Manufacturing, 1998-2014



Source: Author's calculations based data from Bureau of Economic Analysis, Table SA25N

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## 6. Manufacturing Employment by Georgia County

Figure 19 shows the change in manufacturing employment by county for the period 2001-14.<sup>9</sup> Appendix Table B-3 contains the data for each county. There are 20 counties for which manufacturing employment is zero or not reported because of data confidentiality issues. These 20 counties accounted for only 1.5 percent of the state's manufacturing employment in 2014, and in the aggregate suffered a decrease in employment of 1.4 percent for the period 2001-14.

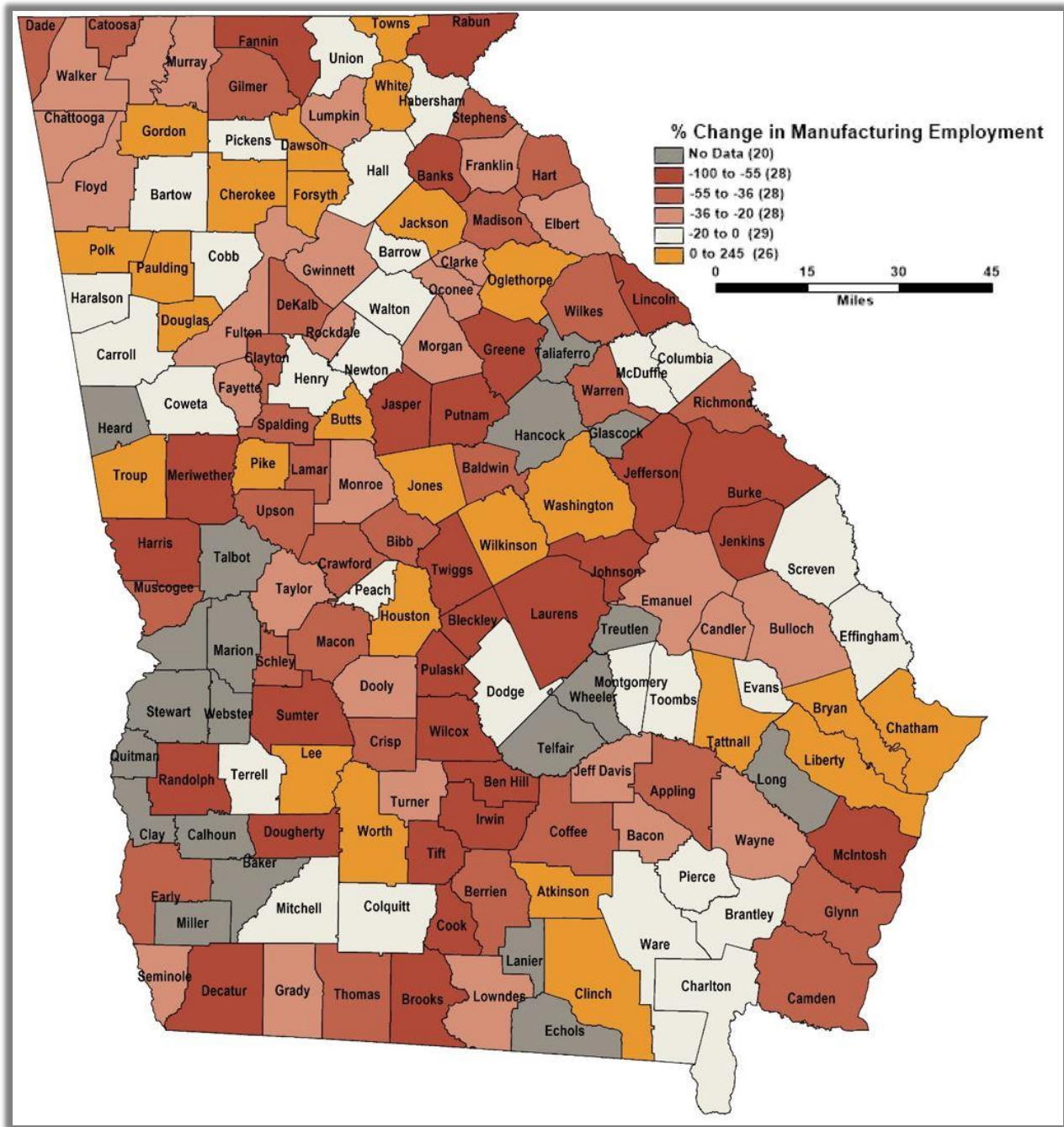
There is a wide range of percentage changes in manufacturing employment. Most counties (113 of the 139 counties for which data were available) experienced a decrease in manufacturing employment. Two counties, Jenkins and Bleckley, experienced almost a 100 percent reduction in employment. Counties with very large percentage increases (for example, Lee with a 245 percent increase) were counties with small manufacturing employment in 2001. Figure 19 maps the percentage change in manufacturing employment by county. It is apparent from Figure 19 that there is no significant concentration of counties with large percentage increases or decreases in employment; these counties are scattered throughout Georgia.

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<sup>9</sup> These data are from the U.S. Bureau of Economic Analysis. The earliest year for which county manufacturing employment using the NAICS classification is available is 2001.



Figure 19. Percent Change in Manufacturing Employment, 2001-14



Source: U.S. Bureau of Economic Analysis, Table CA25N

## 7. Conclusions

Manufacturing employment has been declining in the United States since 1979 and in Georgia since 2000, and now accounts for less than 7 percent of total employment in the United States and Georgia.

Manufacturing jobs may increase in the short run as the United States continues to recover from the Great Recession. However, there is no expectation that manufacturing jobs will continue to grow once the United States has fully recovered from the Great Recession. On average, manufacturing jobs pay higher wages than the average for all jobs, and that premium has increased over time. Given that manufacturing jobs are becoming more technologically intensive, and thus will require increasing numbers of skilled workers, it is expected that relative wages in manufacturing will continue to increase.

The trends in manufacturing employment have implications for state economic development policy. The following are some things Georgia should consider:

- 1 The economic forces driving the change in manufacturing employment are very substantial, and neither the United States nor Georgia is likely to be able to reverse them. But, Georgia might be able to modify the magnitude of the effect of these forces on manufacturing in Georgia.
- 2 Given the declining number of manufacturing jobs in the United States, trying to attract manufacturing jobs from other states is not likely to be a very cost effective policy. But that doesn't imply that Georgia should not be open to manufacturing plants that are considering relocating from other states or countries.
- 3 Rather than seeking existing manufacturing plants, Georgia should consider adopting programs and policies that encourage the development and growth of new manufacturing facilities within Georgia.
- 4 Georgia should consider developing programs and policies that would reduce the likelihood that plants would seek to relocate, particularly offshore.
- 5 Given the changes in manufacturing technology, Georgia should consider developing programs and policies that assist existing plants to adopt new technologies in existing facilities.
- 6 Changes in manufacturing technology requires a more skilled work force. Rather than waiting for plants to close before offering training to unemployed workers, a more proactive approach might be considered. Georgia could consider developing programs and policies that prepare existing manufacturing workers for expected changes in required skill levels for redesigned or new jobs, either with their existing employer or a new employer.

7

Georgia should study the effectiveness of existing development tax credits. Might there be alternative uses of those funds that would be more effective in creating or retaining jobs that pay higher than average wages?

8

Given the trends in manufacturing employment, Georgia should consider how much emphasis to place on manufacturing jobs. Would Georgia be better off focusing on other industrial sectors that pay higher than average wages?

# Appendices

## APPENDIX A. DEFINITIONS OF MANUFACTURING INDUSTRIES

### ***311 Food Manufacturing***

Industries in the Food Manufacturing subsector transform livestock and agricultural products into products for intermediate or final consumption. The industry groups are distinguished by the raw materials (generally of animal or vegetable origin) processed into food products.

The food products manufactured in these establishments are typically sold to wholesalers or retailers for distribution to consumers, but establishments primarily engaged in retailing bakery and candy products made on the premises not for immediate consumption are included.

Establishments primarily engaged in manufacturing beverages are classified in Subsector 312, Beverage and Tobacco Product Manufacturing.

### ***312 Beverage and Tobacco Product Manufacturing***

Industries in the Beverage and Tobacco Product Manufacturing subsector manufacture beverages and tobacco products. The industry group, Beverage Manufacturing, includes three types of establishments: (1) those that manufacture nonalcoholic beverages; (2) those that manufacture alcoholic beverages through the fermentation process; and (3) those that produce distilled alcoholic beverages. Ice manufacturing, while not a beverage, is included with nonalcoholic beverage manufacturing because it uses the same production process as water purification.

In the case of activities related to the manufacture of beverages, the structure follows the defined production processes. Brandy, a distilled beverage, was not placed under distillery product manufacturing, but rather under the NAICS class for winery product manufacturing since the production process used in the manufacturing of alcoholic grape-based beverages produces both wines (fermented beverage) and brandies (distilled beverage).

The industry group, Tobacco Manufacturing, includes two types of establishments: (1) those engaged in redrying and stemming tobacco and, (2) those that manufacture tobacco products, such as cigarettes and cigars.

### ***313 Textile Mills***

Industries in the Textile Mills subsector group establishments that transform a basic fiber (natural or synthetic) into a product, such as yarn or fabric that is further manufactured into usable items, such as apparel, sheets, towels, and textile bags for individual or industrial consumption. The further manufacturing may be performed in the same establishment and classified in this subsector, or it may be performed at a separate establishment and be classified elsewhere in manufacturing.

The main processes in this subsector include preparation and spinning of fiber, knitting or weaving of fabric, and the finishing of the textile. The NAICS structure follows and captures this process flow. Major industries in this flow, such as preparation of fibers, weaving of fabric, knitting of fabric, and fiber and

fabric finishing, are uniquely identified. Texturizing, throwing, twisting, and winding of yarn contains aspects of both fiber preparation and fiber finishing and is classified with preparation of fibers rather than with finishing of fiber.

NAICS separates the manufacturing of primary textiles and the manufacturing of textile products (except apparel) when the textile product is produced from purchased primary textiles, such as fabric. The manufacturing of textile products (except apparel) from purchased fabric is classified in Subsector 314, Textile Product Mills, and apparel from purchased fabric is classified in Subsector 315, Apparel Manufacturing.

Excluded from this subsector are establishments that weave or knit fabric and make garments. These establishments are included in Subsector 315, Apparel Manufacturing.

### ***314 Textile Product Mills***

Industries in the Textile Product Mills subsector group establishments that make textile products (except apparel). With a few exceptions, processes used in these industries are generally cut and sew (i.e., purchasing fabric and cutting and sewing to make nonapparel textile products, such as sheets and towels).

### ***315 Apparel Manufacturing***

Industries in the Apparel Manufacturing subsector group establishments with two distinct manufacturing processes: (1) cut and sew (i.e., purchasing fabric and cutting and sewing to make a garment), and (2) the manufacture of garments in establishments that first knit fabric and then cut and sew the fabric into a garment. The Apparel Manufacturing subsector includes a diverse range of establishments manufacturing full lines of ready-to-wear apparel and custom apparel: apparel contractors, performing cutting or sewing operations on materials owned by others; jobbers performing entrepreneurial functions involved in apparel manufacture; and tailors, manufacturing custom garments for individual clients are all included. Knitting, when done alone, is classified in the Textile Mills subsector, but when knitting is combined with the production of complete garments, the activity is classified in Apparel Manufacturing.

### ***316 Leather and Allied Product Manufacturing***

Establishments in the Leather and Allied Product Manufacturing subsector transform hides into leather by tanning or curing and fabricating the leather into products for final consumption. It also includes the manufacture of similar products from other materials, including products (except apparel) made from "leather substitutes," such as rubber, plastics, or textiles. Rubber footwear, textile luggage, and plastics purses or wallets are examples of "leather substitute" products included in this group. The products made from leather substitutes are included in this subsector because they are made in similar ways leather products are made (e.g., luggage). They are made in the same establishments, so it is not practical to separate them.

The inclusion of leather making in this subsector is partly because leather tanning is a relatively small industry that has few close neighbors as a production process, partly because leather is an input to some of the other products classified in this subsector and partly for historical reasons.

### **321 Wood Product Manufacturing**

Industries in the Wood Product Manufacturing subsector manufacture wood products, such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, manufactured homes (i.e., mobile homes), and prefabricated wood buildings. The production processes of the Wood Product Manufacturing subsector include sawing, planing, shaping, laminating, and assembling of wood products starting from logs that are cut into bolts, or lumber that then may be further cut, or shaped by lathes or other shaping tools. The lumber or other transformed wood shapes may also be subsequently planed or smoothed, and assembled into finished products, such as wood containers. The Wood Product Manufacturing subsector includes establishments that make wood products from logs and bolts that are sawed and shaped, and establishments that purchase sawed lumber and make wood products. With the exception of sawmills and wood preservation establishments, the establishments are grouped into industries mainly based on the specific products manufactured.

### **322 Paper Manufacturing**

Industries in the Paper Manufacturing subsector make pulp, paper, or converted paper products. The manufacturing of these products is grouped together because they constitute a series of vertically connected processes. More than one is often carried out in a single establishment. There are essentially three activities. The manufacturing of pulp involves separating the cellulose fibers from other impurities in wood or used paper. The manufacturing of paper involves matting these fibers into a sheet. Converted paper products are made from paper and other materials by various cutting and shaping techniques and includes coating and laminating activities.

The Paper Manufacturing subsector is subdivided into two industry groups, the first for the manufacturing of pulp and paper and the second for the manufacturing of converted paper products. Paper making is treated as the core activity of the subsector. Therefore, any establishment that makes paper (including paperboard), either alone or in combination with pulp manufacturing or paper converting, is classified as a paper or paperboard mill. Establishments that make pulp without making paper are classified as pulp mills. Pulp mills, paper mills and paperboard mills comprise the first industry group.

Establishments that make products from purchased paper and other materials make up the second industry group, Converted Paper Product Manufacturing. This general activity is then subdivided based, for the most part, on process distinctions. Paperboard container manufacturing uses corrugating, cutting, and shaping machinery to form paperboard into containers. Paper bag and coated and treated paper manufacturing establishments cut and coat paper and foil. Stationery product manufacturing establishments make a variety of paper products used for writing, filing, and similar applications. Other

converted paper product manufacturing includes, in particular, the conversion of sanitary paper stock into such things as tissue paper and disposable diapers.

An important process used in the Paper Bag and Coated and Treated Paper Manufacturing industry is lamination, often combined with coating. Lamination and coating makes a composite material with improved properties of strength, impermeability, and so on. The laminated materials may be paper, metal foil, or plastics film. While paper is often one of the components, it is not always. Lamination of plastics film to plastics film is classified in the NAICS Subsector 326, Plastics and Rubber Products Manufacturing, because establishments that do this often first make the film. The same situation holds with respect to bags. The manufacturing of bags from plastics only, whether or not laminated, is classified in Subsector 326, Plastics and Rubber Products Manufacturing, but all other bag manufacturing is classified in this subsector.

Excluded from this subsector are photosensitive papers. These papers are chemically treated and are classified in Industry 32599, All Other Chemical Product and Preparation Manufacturing.

### ***323 Printing and Related Support Activities***

Industries in the Printing and Related Support Activities subsector print products, such as newspapers, books, labels, business cards, stationery, business forms, and other materials, and perform support activities, such as data imaging, platemaking services, and bookbinding. The support activities included here are an integral part of the printing industry, and a product (a printing plate, a bound book, or a computer disk or file) that is an integral part of the printing industry is almost always provided by these operations.

Processes used in printing include a variety of methods used to transfer an image from a plate, screen, film, or computer file to some medium, such as paper, plastics, metal, textile articles, or wood. The printing processes employed include, but are not limited to, lithographic, gravure, screen, flexographic, digital, and letterpress.

In contrast to many other classification systems that locate publishing of printed materials in manufacturing, NAICS classifies the publishing of printed products in Subsector 511, Publishing Industries (except Internet). Though printing and publishing are often carried out by the same enterprise (a newspaper, for example), it is less and less the case that these distinct activities are carried out in the same establishment. When publishing and printing are done in the same establishment, the establishment is classified in Sector 51, Information, in the appropriate NAICS industry even if the receipts for printing exceed those for publishing.

This subsector includes printing on clothing because the production process for that activity is printing, not clothing manufacturing. For instance, the printing of T-shirts is included in this subsector. In contrast, printing on fabric (or grey goods) is not included. This activity is part of the process of finishing the fabric and is included in the NAICS Textile Mills subsector in Industry 31331, Textile and Fabric Finishing Mills.



### ***324 Petroleum and Coal Products Manufacturing***

The Petroleum and Coal Products Manufacturing subsector is based on the transformation of crude petroleum and coal into usable products. The dominant process is petroleum refining that involves the separation of crude petroleum into component products through such techniques as cracking and distillation.

In addition, this subsector includes establishments that primarily further process refined petroleum and coal products and produce products, such as asphalt coatings and petroleum lubricating oils. However, establishments that manufacture petrochemicals from refined petroleum are classified in Industry 32511, Petrochemical Manufacturing.

### ***325 Chemical Manufacturing***

The Chemical Manufacturing subsector is based on the transformation of organic and inorganic raw materials by a chemical process and the formulation of products. This subsector distinguishes the production of basic chemicals that comprise the first industry group from the production of intermediate and end products produced by further processing of basic chemicals that make up the remaining industry groups.

This subsector does not include all industries transforming raw materials by a chemical process. It is common for some chemical processing to occur during mining operations. These beneficiating operations, such as copper concentrating, are classified in Sector 21, Mining, Quarrying, and Oil and Gas Extraction. Furthermore, the refining of crude petroleum is included in Subsector 324, Petroleum and Coal Products Manufacturing. In addition, the manufacturing of aluminum oxide is included in Subsector 331, Primary Metal Manufacturing; and beverage distilleries are classified in Subsector 312, Beverage and Tobacco Product Manufacturing. As is the case of these two activities, the grouping of industries into subsectors may take into account the association of the activities performed with other activities in the subsector.

### ***326 Plastics and Rubber Products Manufacturing***

Industries in the Plastics and Rubber Products Manufacturing subsector make goods by processing plastics materials and raw rubber. The core technology employed by establishments in this subsector is that of plastics or rubber product production. Plastics and rubber are combined in the same subsector because plastics are increasingly being used as a substitute for rubber; however the subsector is generally restricted to the production of products made of just one material, either solely plastics or rubber.

Many manufacturing activities use plastics or rubber, for example the manufacture of footwear, or furniture. Typically, the production process of these products involves more than one material. In these cases, technologies that allow disparate materials to be formed and combined are of central importance in describing the manufacturing activity. In NAICS, such activities (the footwear and furniture manufacturing) are not classified in the Plastics and Rubber Products Manufacturing subsector because the core technologies for these activities are diverse and involve multiple materials.



Within the Plastics and Rubber Products Manufacturing subsector, a distinction is made between plastics and rubber products at the industry group level, although it is not a rigid distinction, as can be seen from the definition of Industry 32622, Rubber and Plastics Hoses and Belting Manufacturing. As materials technology progresses, plastics are increasingly being used as a substitute for rubber; and eventually, the distinction may disappear as a basis for establishment classification.

In keeping with the core technology focus of plastics, lamination of plastics film to plastics film as well as the production of bags from plastics only is classified in this subsector. Lamination and bag production involving plastics and materials other than plastics are classified in the NAICS Subsector 322, Paper Manufacturing.

### ***327 Nonmetallic Mineral Product Manufacturing***

The Nonmetallic Mineral Product Manufacturing subsector transforms mined or quarried nonmetallic minerals, such as sand, gravel, stone, clay, and refractory materials, into products for intermediate or final consumption. Processes used include grinding, mixing, cutting, shaping, and honing. Heat often is used in the process and chemicals are frequently mixed to change the composition, purity, and chemical properties for the intended product. For example, glass is produced by heating silica sand to the melting point (sometimes combined with cullet or recycled glass) and then drawn, floated, or blow molded to the desired shape or thickness. Refractory materials are heated and then formed into bricks or other shapes for use in industrial applications.

The Nonmetallic Mineral Product Manufacturing subsector includes establishments that manufacture products, such as bricks, refractories, ceramic products, and glass and glass products, such as plate glass and containers. Also included are cement and concrete products, lime, gypsum and other nonmetallic mineral products including abrasive products, ceramic plumbing fixtures, statuary, cut stone products, and mineral wool. The products are used in a wide range of activities from construction and heavy and light manufacturing to articles for personal use.

Mining, beneficiating, and manufacturing activities often occur in a single location. Separate receipts will be collected for these activities whenever possible. When receipts cannot be broken out between mining and manufacturing, establishments that mine or quarry nonmetallic minerals, beneficiate the nonmetallic minerals and further process the nonmetallic minerals into a more finished manufactured product are classified based on the primary activity of the establishment. A mine that manufactures a small amount of finished products will be classified in Sector 21, Mining, Quarrying, and Oil and Gas Extraction. An establishment that mines whose primary output is a more finished manufactured product will be classified in the Manufacturing Sector.

Excluded from the Nonmetallic Mineral Product Manufacturing subsector are establishments that primarily beneficiate mined nonmetallic minerals. Beneficiation is the process whereby the extracted material is reduced to particles that can be separated into mineral and waste, the former suitable for further processing or direct use. Beneficiation establishments are included in Sector 21, Mining, Quarrying, and Oil and Gas Extraction.

### ***331 Primary Metal Manufacturing***

Industries in the Primary Metal Manufacturing subsector smelt and/or refine ferrous and nonferrous metals from ore, pig or scrap, using electrometallurgical and other process metallurgical techniques. Establishments in this subsector also manufacture metal alloys and superalloys by introducing other chemical elements to pure metals. The output of smelting and refining, usually in ingot form, is used in rolling, drawing, and extruding operations to make sheet, strip, bar, rod, or wire, and in molten form to make castings and other basic metal products.

Primary manufacturing of ferrous and nonferrous metals begins with ore or concentrate as the primary input. Establishments manufacturing primary metals from ore and/or concentrate remain classified in the primary smelting, primary refining, or iron and steel mill industries regardless of the form of their output. Establishments primarily engaged in secondary smelting and/or secondary refining recover ferrous and nonferrous metals from scrap and/or dross. The output of the secondary smelting and/or secondary refining industries is limited to shapes such as ingot or billet that will be further processed. Recovery of metals from scrap often occurs in establishments that are primarily engaged in activities, such as rolling, drawing, extruding, or similar processes.

Excluded from the Primary Metal Manufacturing subsector are establishments primarily engaged in manufacturing ferrous and nonferrous forgings (except ferrous forgings made in steel mills) and stampings. Although forging, stamping, and casting are all methods used to make metal shapes, forging and stamping do not use molten metals and are included in Subsector 332, Fabricated Metal Product Manufacturing. Establishments primarily engaged in operating coke ovens are classified in Industry 32419, Other Petroleum and Coal Products Manufacturing.

### ***332 Fabricated Metal Product Manufacturing***

Industries in the Fabricated Metal Product Manufacturing subsector transform metal into intermediate or end products, other than machinery, computers and electronics, and metal furniture, or treat metals and metal formed products fabricated elsewhere. Important fabricated metal processes are forging, stamping, bending, forming, and machining, used to shape individual pieces of metal; and other processes, such as welding and assembling, used to join separate parts together. Establishments in this subsector may use one of these processes or a combination of these processes.

The NAICS structure for this subsector distinguishes the forging and stamping processes in a single industry. The remaining industries in the subsector group establishments based on similar combinations of processes used to make products.

The manufacturing performed in the Fabricated Metal Product Manufacturing subsector begins with manufactured metal shapes. The establishments in this subsector further fabricate the purchased metal shapes into a product. For instance, the Spring and Wire Product Manufacturing industry starts with wire and fabricates such items.

Within manufacturing there are other establishments that make the same products made by this subsector; only these establishments begin production further back in the production process. These establishments have a more integrated operation. For instance, one establishment may manufacture steel, draw it into wire, and make wire products in the same establishment. Such operations are classified in the Primary Metal Manufacturing subsector.

### ***333 Machinery Manufacturing***

Industries in the Machinery Manufacturing subsector create end products that apply mechanical force, for example, the application of gears and levers, to perform work. Some important processes for the manufacture of machinery are forging, stamping, bending, forming, and machining that are used to shape individual pieces of metal. Processes, such as welding and assembling are used to join separate parts together. Although these processes are similar to those used in metal fabricating establishments, machinery manufacturing is different because it typically employs multiple metal forming processes in manufacturing the various parts of the machine. Moreover, complex assembly operations are an inherent part of the production process.

In general, design considerations are very important in machinery production. Establishments specialize in making machinery designed for particular applications. Thus, design is considered to be part of the production process for the purpose of implementing NAICS. The NAICS structure reflects this by defining industries and industry groups that make machinery for different applications. A broad distinction exists between machinery that is generally used in a variety of industrial applications (i.e., general purpose machinery) and machinery that is designed to be used in a particular industry (i.e., special purpose machinery). Three industry groups consist of special purpose machinery--Agricultural, Construction, and Mining Machinery Manufacturing; Industrial Machinery Manufacturing; and Commercial and Service Industry Machinery Manufacturing. The other industry groups make general-purpose machinery: Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing; Metalworking Machinery Manufacturing; Engine, Turbine, and Power Transmission Equipment Manufacturing; and Other General Purpose Machinery Manufacturing.

### ***334 Computer and Electronic Product Manufacturing***

Industries in the Computer and Electronic Product Manufacturing subsector group establishments that manufacture computers, computer peripherals, communications equipment, and similar electronic products, and establishments that manufacture components for such products. The Computer and Electronic Product Manufacturing industries have been combined in the hierarchy of NAICS because of the economic significance they have attained. Their rapid growth suggests that they will become even more important to the economies of all three North American countries in the future, and in addition their manufacturing processes are fundamentally different from the manufacturing processes of other machinery and equipment. The design and use of integrated circuits and the application of highly specialized miniaturization technologies are common elements in the production technologies of the computer and electronic subsector. Convergence of technology motivates this NAICS subsector.

Digitalization of sound recording, for example, causes both the medium (the compact disc) and the equipment to resemble the technologies for recording, storing, transmitting, and manipulating data. Communications technology and equipment have been converging with computer technology. When technologically-related components are in the same sector, it makes it easier to adjust the classification for future changes, without needing to redefine its basic structure. The creation of the Computer and Electronic Product Manufacturing subsector assists in delineating new and emerging industries because the activities that will serve as the probable sources of new industries, such as computer manufacturing and communications equipment manufacturing, or computers and audio equipment, are brought together. As new activities emerge, they are less likely therefore, to cross the subsector boundaries of the classification.

### ***335 Electrical Equipment, Appliance, and Component Manufacturing***

Industries in the Electrical Equipment, Appliance, and Component Manufacturing subsector manufacture products that generate, distribute and use electrical power. Electric Lighting Equipment Manufacturing establishments produce electric lamp bulbs, lighting fixtures, and parts. Household Appliance Manufacturing establishments make both small and major electrical appliances and parts. Electrical Equipment Manufacturing establishments make goods, such as electric motors, generators, transformers, and switchgear apparatus. Other Electrical Equipment and Component Manufacturing establishments make devices for storing electrical power (e.g., batteries), for transmitting electricity (e.g., insulated wire), and wiring devices (e.g., electrical outlets, fuse boxes, and light switches).

### ***336 Transportation Equipment Manufacturing***

Industries in the Transportation Equipment Manufacturing subsector produce equipment for transporting people and goods. Transportation equipment is a type of machinery. An entire subsector is devoted to this activity because of the significance of its economic size in all three North American countries.

Establishments in this subsector utilize production processes similar to those of other machinery manufacturing establishments - bending, forming, welding, machining, and assembling metal or plastic parts into components and finished products. However, the assembly of components and subassemblies and their further assembly into finished vehicles tends to be a more common production process in this subsector than in the Machinery Manufacturing subsector.

NAICS has industry groups for the manufacture of equipment for each mode of transport - road, rail, air and water. Parts for motor vehicles warrant a separate industry group because of their importance and because parts manufacture requires less assembly, and the establishments that manufacture only parts are not as vertically integrated as those that make complete vehicles.

Land use motor vehicle equipment not designed for highway operation (e.g., agricultural equipment, construction equipment, and materials handling equipment) is classified in the appropriate NAICS subsector based on the type and use of the equipment.

### ***337 Furniture and Related Product Manufacturing***

Industries in the Furniture and Related Product Manufacturing subsector make furniture and related articles, such as mattresses, window blinds, cabinets, and fixtures. The processes used in the manufacture of furniture include the cutting, bending, molding, laminating, and assembly of such materials as wood, metal, glass, plastics, and rattan. However, the production process for furniture is not solely bending metal, cutting and shaping wood, or extruding and molding plastics. Design and fashion trends play an important part in the production of furniture. The integrated design of the article for both esthetic and functional qualities is also a major part of the process of manufacturing furniture. Design services may be performed by the furniture establishment's work force or may be purchased from industrial designers.

Furniture may be made of any material, but the most common ones used in North America are metal and wood. Furniture manufacturing establishments may specialize in making articles primarily from one material. Some of the equipment required to make a wooden table, for example, is different from that used to make a metal one. However, furniture is usually made from several materials. A wooden table might have metal brackets, and a wooden chair a fabric or plastics seat. Therefore, in NAICS, furniture initially is classified based on the type of furniture (application for which it is designed) rather than the material used. For example, an upholstered sofa is treated as household furniture, although it may also be used in hotels or offices.

When classifying furniture according to the component material from which it is made, furniture made from more than one material is classified based on the material used in the frame, or if there is no frame, the predominant component material. Upholstered household furniture (excluding kitchen and dining room chairs with upholstered seats) is classified without regard to the frame material. Kitchen or dining room chairs with upholstered seats are classified according to the frame material.

Furniture may be made on a stock or custom basis and may be shipped assembled or unassembled (i.e., knockdown). The manufacture of furniture parts and frames is included in this subsector.

Some of the processes used in furniture manufacturing are similar to processes that are used in other segments of manufacturing. For example, cutting and assembly occurs in the production of wood trusses that are classified in Subsector 321, Wood Product Manufacturing. However, the multiple processes that distinguish wood furniture manufacturing from wood product manufacturing warrant inclusion of wooden furniture manufacturing in the Furniture and Related Product Manufacturing subsector. Metal furniture manufacturing uses techniques that are also employed in the manufacturing of roll-formed products classified in Subsector 332, Fabricated Metal Product Manufacturing. The molding process for plastics furniture is similar to the molding of other plastics products. However, plastics furniture producing establishments tend to specialize in furniture.

NAICS attempts to keep furniture manufacturing together, but there are two notable exceptions: seating for transportation equipment and specialized hospital furniture (e.g., hospital beds and operating tables). These exceptions are related to the fact that some of the aspects of the production process for these

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products, primarily the design, are highly integrated with the other manufactured goods, namely motor vehicles and health equipment.

### ***339 Miscellaneous Manufacturing***

Industries in the Miscellaneous Manufacturing subsector make a wide range of products that cannot readily be classified in specific NAICS subsectors in manufacturing. Processes used by these establishments vary significantly, both among and within industries. For example, a variety of manufacturing processes are used in manufacturing sporting and athletic goods that include products such as tennis racquets and golf balls. The processes for these products differ from each other, and the processes differ significantly from the fabrication processes used in making dolls or toys, the melting and shaping of precious metals to make jewelry, and the bending, forming, and assembly used in making medical products.

The industries in this subsector are defined by what is made rather than how it is made. Although individual establishments might be appropriately classified elsewhere in the NAICS structure, for historical continuity, these product-based industries were maintained. In most cases, no one process or material predominates for an industry.

Establishments in this subsector manufacture products as diverse as medical equipment and supplies, jewelry, sporting goods, toys, and office supplies.

## APPENDIX B. EMPLOYMENT DATA

Table B-1. Employment by Manufacturing Sector

NAICS CODE	GEORGIA			UNITED STATES		
	2014 ANNUAL EARNINGS	PERCENTAGE CHANGE IN EMPLOYMENT	2014 EMPLOYMENT	2014 ANNUAL EARNINGS	PERCENTAGE CHANGE IN EMPLOYMENT	2014 EMPLOYMENT
311	38,098	-7.9%	55,555	41,890	25.4%	1,374,345
312	56,533	-55.1%	3,277	56,496	14.3%	146,928
313	34,024	-69.1%	16,213	41,154	-62.2%	99,955
314	39,797	-47.6%	26,018	36,234	-41.7%	107,512
315	27,604	-95.6%	1,445	29,875	-83.5%	89,588
316	40,737	-62.9%	171	35,619	-60.6%	24,221
321	42,166	-50.6%	13,866	40,235	-13.3%	350,836
322	64,483	-38.6%	16,610	60,690	-17.6%	335,853
323	48,225	-50.2%	11,036	47,197	-32.2%	422,035
324	63,096	-17.5%	885	97,366	49.1%	102,408
325	65,194	-19.0%	19,090	75,225	12.0%	714,567
326	45,355	-16.7%	22,379	46,600	-7.8%	716,591
327	51,742	-29.8%	12,788	50,310	-2.0%	355,275
331	50,401	-34.5%	4,398	62,041	-8.2%	382,788
332	47,500	-21.1%	25,250	52,159	4.8%	1,375,346
333	53,064	-22.0%	21,039	59,322	-1.7%	1,027,684
334	66,181	-70.7%	6,086	77,869	-38.8%	789,735
335	49,616	-47.4%	11,009	56,373	-25.6%	329,081
336	65,419	-0.5%	46,097	65,503	-1.5%	1,416,901
337	36,347	-34.6%	9,140	40,640	-25.8%	335,487
339	51,636	-28.9%	11,700	55,499	-4.6%	524,341

Source: Annual Survey of Manufacturers

**Table B-2. Manufacturing Employment by State, 1996 and 2004**

STATE	EMPLOYMENT		PERCENT CHANGE
	1996	2014	
United States	18,108,900	12,993,400	-28.25%
Alabama	371,337	263,640	-29.00%
Alaska	15,106	17,145	13.50%
Arizona	220,161	170,847	-22.40%
Arkansas	243,368	159,176	-34.59%
California	1,946,179	1,386,726	-28.75%
Colorado	200,544	154,401	-23.01%
Connecticut	254,028	169,244	-33.38%
Delaware	43,850	27,100	-38.20%
District of Columbia	3,998	1,799	-55.00%
Florida	475,487	372,681	-21.62%
<b>Georgia</b>	<b>553,974</b>	<b>389,819</b>	<b>-29.63%</b>
Hawaii	18,745	18,934	1.01%
Idaho	71,884	66,611	-7.34%
Illinois	914,475	602,716	-34.09%
Indiana	670,161	523,920	-21.82%
Iowa	255,371	224,382	-12.13%
Kansas	207,787	169,818	-18.27%
Kentucky	309,938	243,107	-21.56%
Louisiana	185,533	157,568	-15.07%
Maine	85,291	56,105	-34.22%
Maryland	181,489	114,400	-36.97%
Massachusetts	432,273	264,637	-38.78%
Michigan	904,327	605,155	-33.08%
Minnesota	408,796	329,080	-19.50%
Mississippi	234,475	145,465	-37.96%
Missouri	385,733	270,670	-29.83%
Montana	24,736	23,429	-5.28%
Nebraska	115,072	101,247	-12.01%
Nevada	42,892	47,057	9.71%
New Hampshire	108,011	71,986	-33.35%
New Jersey	441,068	258,994	-41.28%
New Mexico	48,379	34,774	-28.12%
New York	802,472	491,514	-38.75%
North Carolina	812,498	473,437	-41.73%
North Dakota	23,067	27,573	19.53%
Ohio	1,057,861	706,083	-33.25%
Oklahoma	177,195	151,398	-14.56%
Oregon	237,777	197,303	-17.02%



STATE	EMPLOYMENT		
	1996	2014	PERCENT CHANGE
Pennsylvania	894,758	599,987	-32.94%
Rhode Island	74,279	43,074	-42.01%
South Carolina	345,652	240,023	-30.56%
South Dakota	43,135	44,784	3.82%
Tennessee	513,440	340,754	-33.63%
Texas	1,117,551	966,218	-13.54%
Utah	133,350	130,106	-2.43%
Vermont	47,224	35,634	-24.54%
Virginia	379,376	245,772	-35.22%
Washington	377,249	310,931	-17.58%
West Virginia	79,184	50,812	-35.83%
Wisconsin	607,022	483,356	-20.37%
Wyoming	11,342	12,008	5.87%

Source: U.S. Bureau of Economic Analysis

**Table B-3. Manufacturing Employment and Percent Change by County, 2001 and 2014**

COUNTY	2001	2014	PERCENT CHANGE	COUNTY	2001	2014	PERCENT CHANGE
Georgia	519,690	389,819	-24.99%	Crisp	1,499	850	-43.30%
Appling	1,079	688	-36.24%	Dade	1,050	641	-38.95%
Atkinson	809	860	6.30%	Dawson	572	572	0.00%
Bacon	1,046	820	-21.61%	Decatur	2,448	706	-71.16%
Baker	NA	NA	NA	DeKalb	24,708	15,443	-37.50%
Baldwin	3,061	1,741	-43.12%	Dodge	556	504	-9.35%
Banks	1,143	387	-66.14%	Dooly	1,291	1,033	-19.98%
Barrow	2,368	2,240	-5.41%	Dougherty	7,953	3,380	-57.50%
Bartow	9,299	8,920	-4.08%	Douglas	3,590	4,029	12.23%
Ben Hill	3,611	1,267	-64.91%	Early	1,394	867	-37.80%
Berrien	1,658	862	-48.01%	Echols	NA	21	NA
Bibb	11,251	5,426	-51.77%	Effingham	1,819	1,732	-4.78%
Bleckley	1,427	59	-95.87%	Elbert	2,946	2,130	-27.70%
Brantley	214	195	-8.88%	Emanuel	2,061	1,589	-22.90%
Brooks	710	214	-69.86%	Evans	2,075	1,996	-3.81%
Bryan	242	396	63.64%	Fannin	803	338	-57.91%
Bulloch	2,479	1,831	-26.14%	Fayette	4,797	3,550	-26.00%
Burke	1,495	670	-55.18%	Floyd	9,156	5,870	-35.89%
Butts	970	1,034	6.60%	Forsyth	6,644	8,993	35.36%
Calhoun	NA	NA	NA	Franklin	1,909	1,376	-27.92%
Camden	1,534	733	-52.22%	Fulton	41,853	28,194	-32.64%
Candler	261	176	-32.57%	Gilmer	3,190	1,538	-51.79%
Carroll	7,883	6,626	-15.95%	Glascok	NA	59	NA
Catoosa	2,575	1,425	-44.66%	Glynn	3,502	2,065	-41.03%
Charlton	402	358	-10.95%	Gordon	8,324	8,592	3.22%
Chatham	14,057	14,505	3.19%	Grady	866	639	-26.21%
Chattahoochee	NA	NA	NA	Greene	1,315	402	-69.43%
Chattooga	4,066	2,763	-32.05%	Gwinnett	34,748	26,531	-23.65%
Cherokee	4,142	4,452	7.48%	Habersham	4,339	4,318	-0.48%
Clarke	9,545	6,252	-34.50%	Hall	19,190	18,525	-3.47%
Clay	-	-	NA	Hancock	NA	NA	NA
Clayton	7,458	4,739	-36.46%	Haralson	1,800	1,631	-9.39%
Clinch	746	842	12.87%	Harris	254	NA	NA
Cobb	22,985	19,602	-14.72%	Hart	2,786	1,595	-42.75%
Coffee	5,347	2,667	-50.12%	Heard	NA	575	NA
Colquitt	3,300	2,758	-16.42%	Henry	3,846	3,176	-17.42%
Columbia	3,091	2,891	-6.47%	Houston	4,327	4,987	15.25%
Cook	1,194	476	-60.13%	Irwin	572	227	-60.31%
Coweta	5,253	4,848	-7.71%	Jackson	4,619	5,490	18.86%
Crawford	207	97	-53.14%	Jasper	963	385	-60.02%

COUNTY	2001	2014	PERCENT CHANGE	COUNTY	2001	2014	PERCENT CHANGE
Jeff Davis	1,865	1,455	-21.98%	Richmond	12,209	7,519	-38.41%
Jefferson	1,747	775	-55.64%	Rockdale	6,440	5,162	-19.84%
Jenkins	1,189	37	-96.89%	Schley	670	367	-45.22%
Johnson	458	186	-59.39%	Screven	951	949	-0.21%
Jones	85	85	0.00%	Seminole	264	192	-27.27%
Lamar	1,237	644	-47.94%	Spalding	4,998	2,704	-45.90%
Lanier	NA	132	NA	Stephens	3,544	2,129	-39.93%
Laurens	4,819	2,012	-58.25%	Stewart	NA	NA	NA
Lee	92	317	244.57%	Sumter	2,995	1,168	-61.00%
Liberty	1,147	2,074	80.82%	Talbot	NA	21	NA
Lincoln	111	NA	NA	Taliaferro	NA	NA	NA
Long	NA	NA	NA	Tattnall	112	219	95.54%
Lowndes	5,373	3,971	-26.09%	Taylor	153	118	-22.88%
Lumpkin	1,218	833	-31.61%	Telfair	NA	NA	NA
McDuffie	1,865	1,597	-14.37%	Terrell	610	513	-15.90%
McIntosh	74	NA	NA	Thomas	4,085	2,495	-38.92%
Macon	1,125	528	-53.07%	Tift	3,614	1,203	-66.71%
Madison	505	292	-42.18%	Toombs	1,766	1,466	-16.99%
Marion	NA	571	NA	Towns	97	133	37.11%
Meriwether	1,494	652	-56.36%	Treutlen	NA	NA	NA
Miller	NA	76	NA	Troup	10,545	11,019	4.50%
Mitchell	2,968	2,502	-15.70%	Turner	380	296	-22.11%
Monroe	354	231	-34.75%	Twiggs	25	NA	NA
Montgomery	199	179	-10.05%	Union	401	359	-10.47%
Morgan	1,437	1,119	-22.13%	Upson	2,792	1,265	-54.69%
Murray	7,039	4,685	-33.44%	Walker	5,907	4,394	-25.61%
Muscogee	13,072	6,838	-47.69%	Walton	2,438	2,328	-4.51%
Newton	4,631	4,493	-2.98%	Ware	1,696	1,574	-7.19%
Oconee	729	481	-34.02%	Warren	695	392	-43.60%
Oglethorpe	138	142	2.90%	Washington	510	529	3.73%
Paulding	1,089	1,171	7.53%	Wayne	1,951	1,358	-30.39%
Peach	2,593	2,294	-11.53%	Webster	NA	NA	NA
Pickens	867	848	-2.19%	Wheeler	NA	-	NA
Pierce	435	428	-1.61%	White	962	971	0.94%
Pike	213	413	93.90%	Whitfield	24,577	18,468	-24.86%
Polk	2,967	3,519	18.60%	Wilcox	99	NA	NA
Pulaski	322	NA	NA	Wilkes	1,103	552	-49.95%
Putnam	1,731	515	-70.25%	Wilkinson	229	404	76.42%
Quitman	NA	NA	NA	Worth	375	376	0.27%
Rabun	1,686	416	-75.33%				
Randolph	423	NA	NA				

Notes: NA means not available due to data confidentiality.

Source: U.S. Bureau of Economic Analysis, Table CA25N

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## About the Author

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David Sjoquist is a faculty member in the Andrew Young School of Policy Studies at Georgia State University. A specialist in the field of public finance, Sjoquist has an extensive interest in urban economics, especially local economic development, central city poverty, and education policy. He has published extensively on topics, such as analysis of public policies, tax allocation districts, teenage employment, local government fiscal conditions, and the urban underclass. His current research interests include property taxation, school financing, local sales taxes and income taxes. His work has been published in such journals as *American Economic Review*, *Journal of Public Economics*, *National Tax Journal*, and *Review of Economics and Statistics*. He holds a doctorate from the University of Minnesota.

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