Economic and Demographic Profile

| Macon, Georgia |

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Introduction

Macon, Georgia is the 4th largest city in the state, with a population of over 150,000 people. The city was first settled in the early 1800s as the most inland navigable point of the Ocmulgee River. This strategic location allowed commerce in the city to thrive, contributing to its growth. The city continued to grow during the Civil War, due to its use as an arsenal of the confederacy. In the post war era, Macon and surrounding cities served as transportation hubs, further contributing to regional population growth.

Today, a network of nearby cities including Warner Robins, Perry, Fort Valley, Forsyth, and Gray, among others, are closely located to each other with low transportation barriers. This network of cities has inter-twining economies that form the Middle Georgia regional economy. Using federal government classification systems, this Middle Georgia Region is best approximated by the Macon-Warner Robins-Fort Valley combined statistical area (CSA). Hence, the economic region we profile in this report is the Macon-Warner Robins-Fort Valley CSA (referred to as the Macon CSA in this report). Specifically, the Macon CSA includes Bibb County, Crawford County, Houston County, Jones County, Monroe County, Peach County, Pulaski County, and Twiggs County.

The purpose of this document is to profile the demographic, economic, and labor structure of the Macon-Warner Robbins CSA to better prepare for a more robust, prosperous, and vigorous future ahead.

Demographics

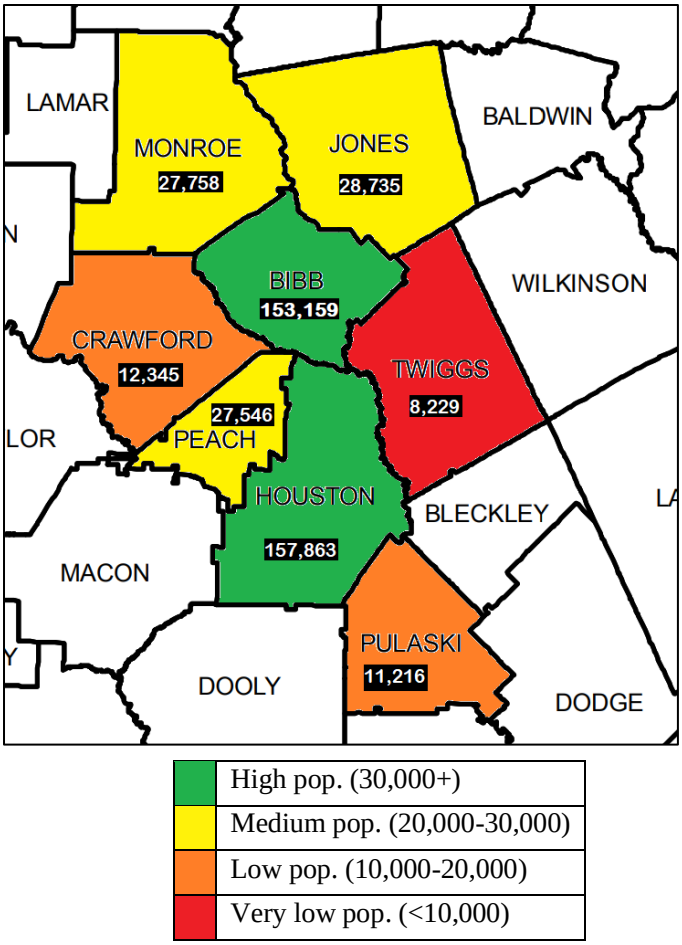
In total, the Macon CSA is home to 426,831 people, making it the 97th largest CSA in the United States. Over two thirds of this population live in Houston or Bibb County, home to the cities of Warner Robins and Macon, respectively. The remaining counties in the Macon CSA are much more sparsely populated relative to Houston and Bibb County. Figure 1 shows a map of the county populations of each county within the Macon CSA. The Macon CSA population has grown 6.38% between 2010 and 2020.

In the Macon CSA, there are 331,720 people (77.7%) that are age 18 or older. Of this population, 15% do not have a high school diploma, 63.6% have a high school diploma (or equivalent), but do not have a bachelor's degree, 12.3% have a bachelor's degree, and 9.1% have a postgraduate degree. These statistics are summarized in Table 1.

Table 1
Macon CSA Educational Attainment, 2021[1]

Educational Attainment	Population (18+)	Population (18+) %
No High School Diploma	49,707	15.0%
High School Diploma and/or some college	211,121	63.6%
Bachelor's Degree	40,855	12.3%
Postgraduate degree	30,037	9.1%

Figure 1
Macon CSA: Population by County - 2020[2]

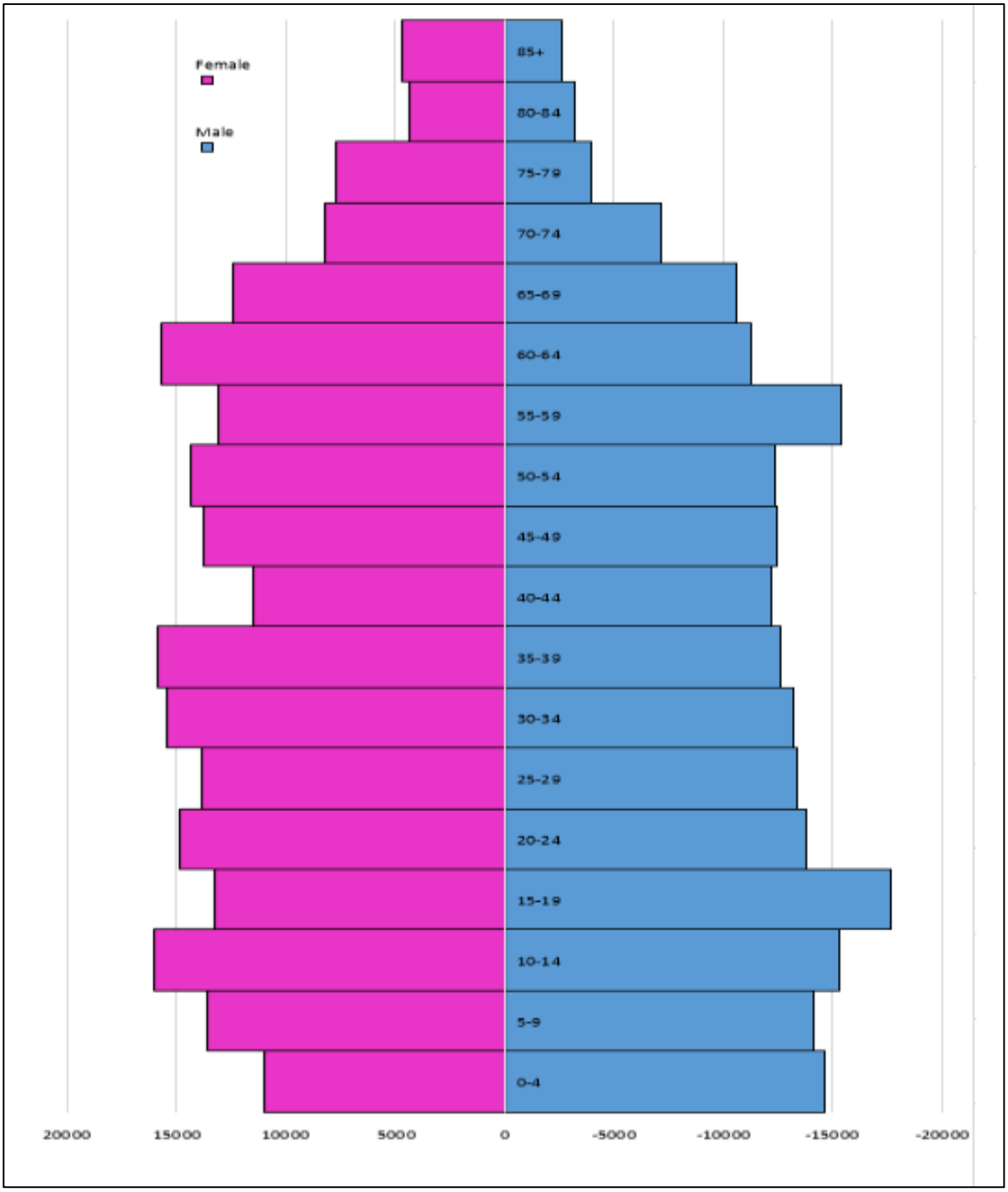


	High pop. (30,000+)
	Medium pop. (20,000-30,000)
	Low pop. (10,000-20,000)
	Very low pop. (<10,000)

[1] "Quickfacts: Macon-Bibb County Georgia," *US Census Bureau,* 2021.
[2] "Quickfacts: Macon-Bibb County Georgia," *US Census Bureau,* 2021.

Furthermore, the age distribution of people within the Macon CSA indicates that there are roughly the same number of young people as middle-aged people, with a noticeable decline in population beginning around age 70. This tells us that birth rates within the region are likely just high enough to sustain its current population, and that any trends in population growth / decline are likely to be driven by net migration, rather than birth rates. The male to female ratio is relatively balanced between ages 0 and 70. However, after age 70, the male population begins to decline much quicker than the female population. This is likely because males have a shorter expected lifespan than females. To illustrate this population trend, the Macon CSA population pyramid is shown in Figure 2.

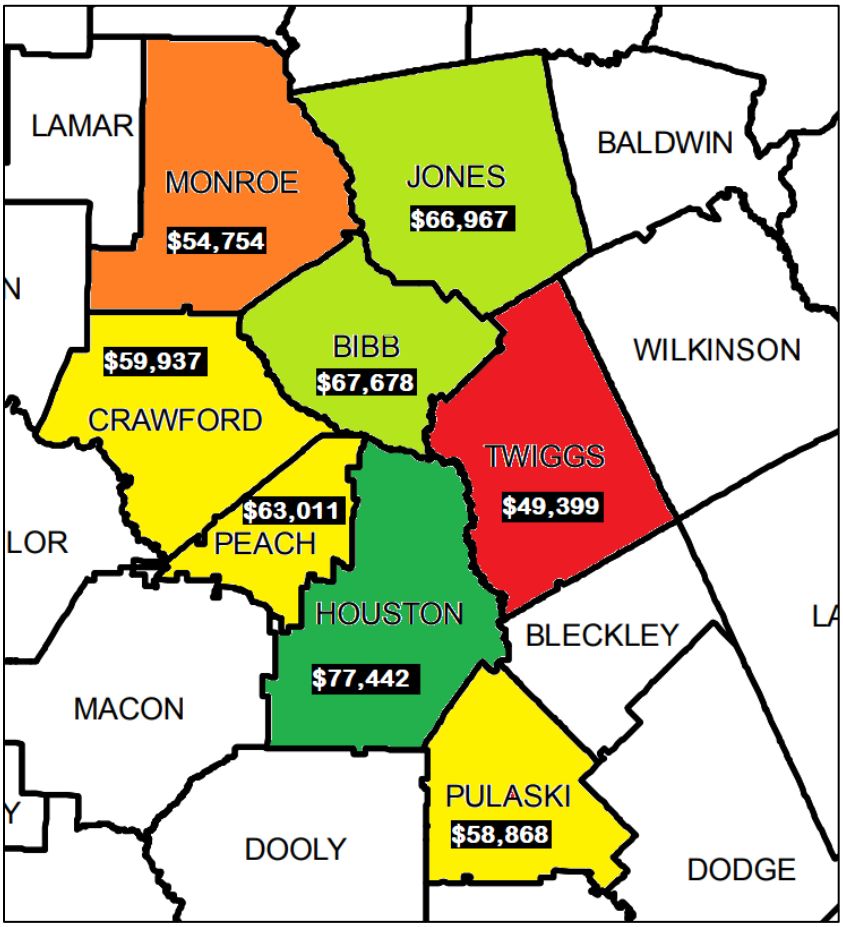
Figure 2
Macon CSA Population Pyramid-2020[3]



[3] "Quickfacts: Macon-Bibb County Georgia," *US Census Bureau,* 2021.

The mean household income for the Macon CSA is $69,292.23, which is 1.0% higher than the national average of $67,521. However, only two of the seven counties within the Macon CSA have a mean household income higher than the national average: Houston and Bibb Counties. These counties are the largest population centers within the Macon CSA, indicating that there may be a sharp dichotomy between urban and rural economic prosperity within the CSA. This observation is further supported by the fact that Twiggs County, the least populated county in the CSA, has the lowest mean household income in the CSA. Figure 3 shows the mean household income of each county within the Macon CSA.

Figure 3
Mean Household Income by County, 2020[4]



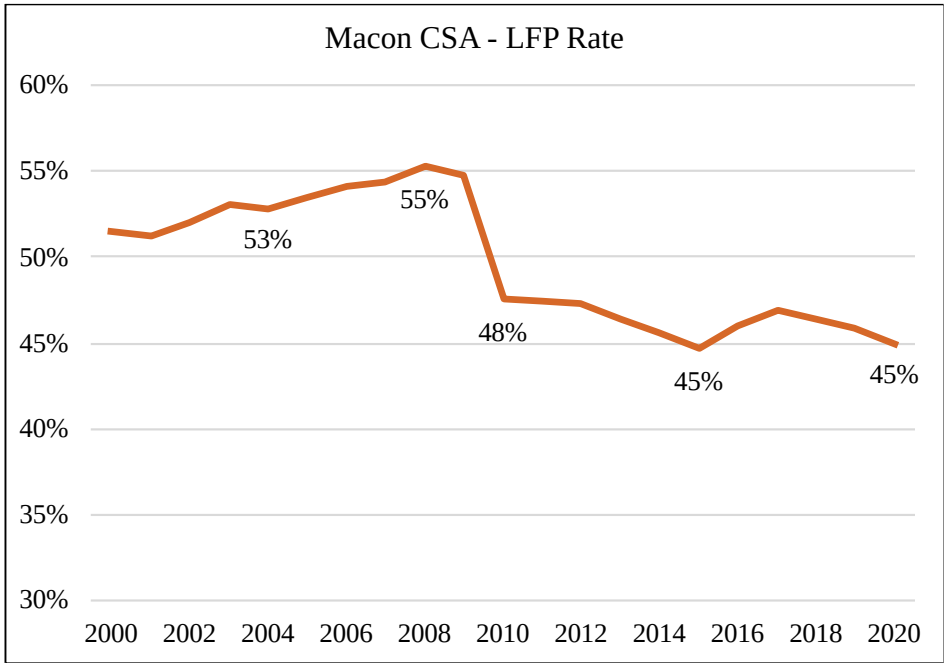
	Very high income. ($70,000+)
	High income ($65,000-$70,000)
	Medium income ($55,000-$65,000)
	Moderate income. ($50,000-55,000)
	Low income. (<$50,000)

[4] "Quickfacts: Macon-Bibb County Georgia," *US Census Bureau,* 2021.

Labor and Workforce

Demographically, the Warner Robins MSA, positioned as roughly the southwest half of the Macon CSA, has been increasing in population and wealth faster than the northern half of the CSA. This trend has only accelerated since 2014, as Figure 19 shows. This population trend extends to labor force composition and participation rates, as well; between 2010 and 2020, the labor force participation growth rate of the Warner Robins MSA was 1.3%, compared with -3.8% for the Macon MSA.

Figure 4[5]



Indeed, the overall labor force participation (LFP) rate for the Macon CSA declined (Figure 4) in the past decade. After a strong period of growth from 2000-2008, the area has never fully recovered from the 2008 recession, slipping to a low of 45% participation in 2015 and retesting those waters in 2020. Since 2008, there have been only two years with growth in labor force participation. Probing this disconnect is a key task for further economic development in the Macon area.

[5] "Resident Population in Macon-Bibb County, GA (MSA) and Warner Robins, GA (MSA)," *St. Louis FRED.*

Figure 5 – Macon CSA Job Creation[6]

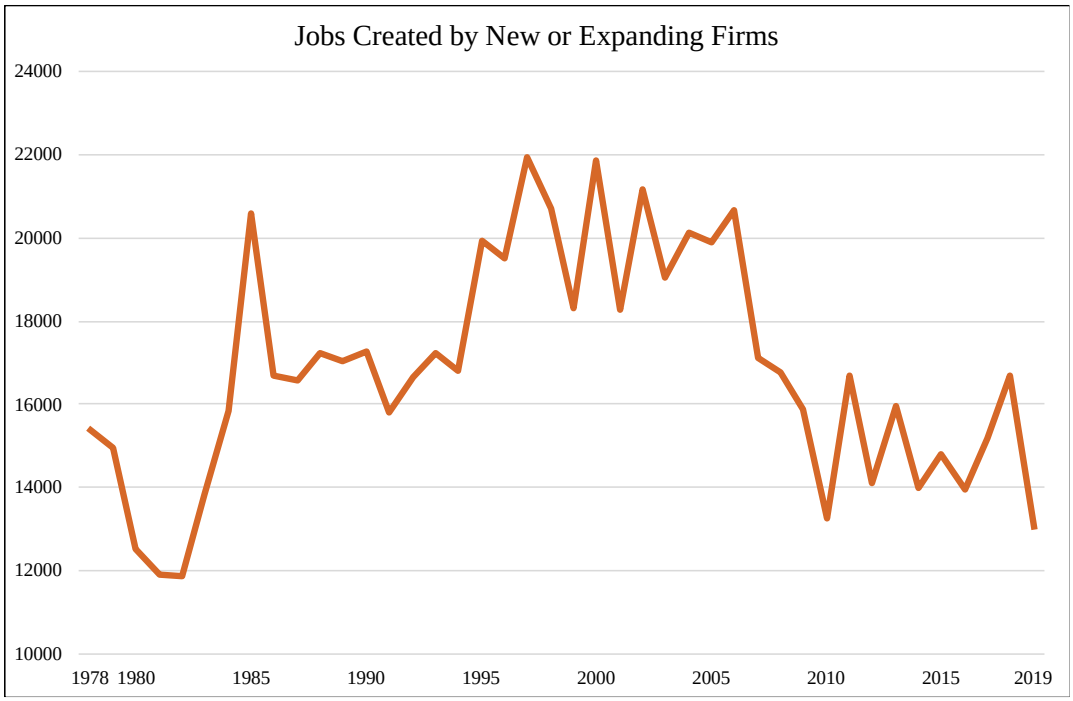
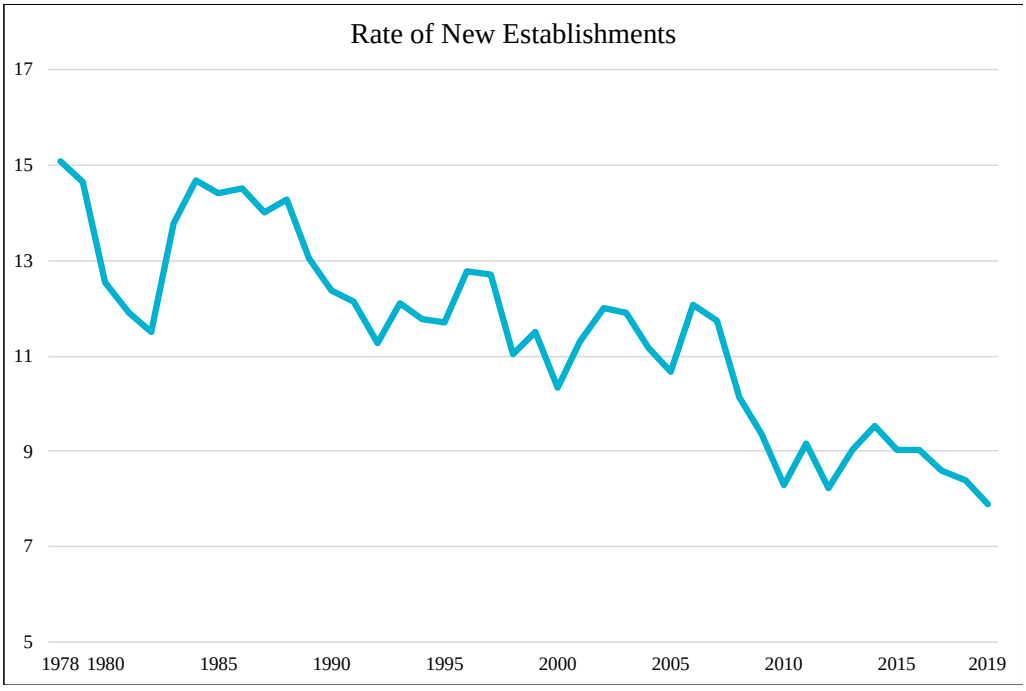
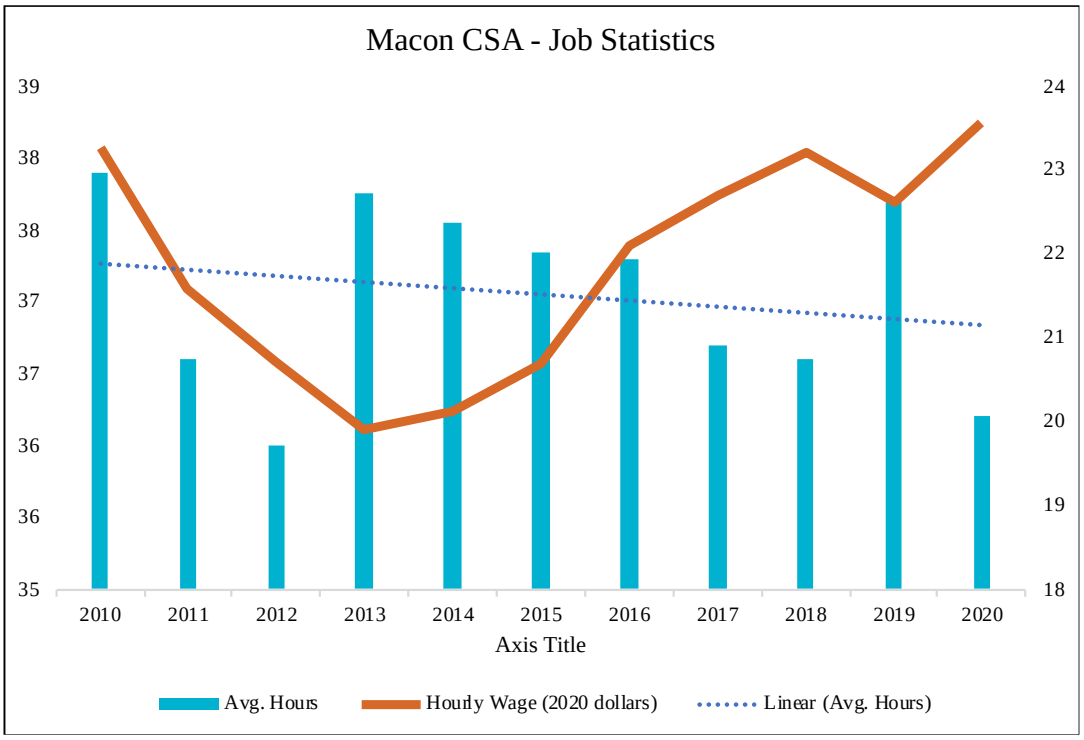


Figure 6[7]



[6] "Business Employment Dynamics," *U.S. Bureau of Labor Statistics*.
[7] "Business Employment Dynamics," *U.S. Bureau of Labor Statistics.*

Figure 7[8]

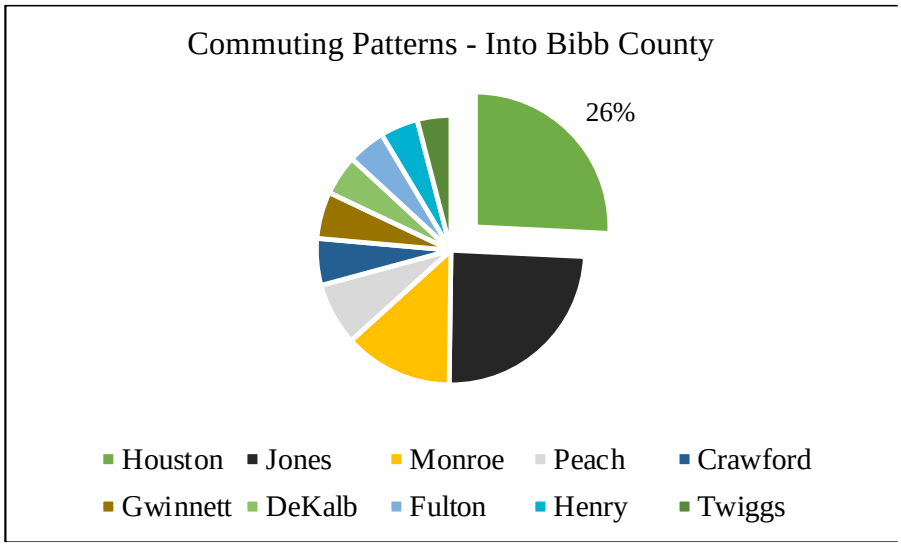


As Figure 7 indicates, worker wages in the Macon CSA have been on the upswing since 2013 after slipping heavily during 2010-2013 (recession). The chart demonstrates the hourly wages of all private sector employees (measured in the fourth quarter of each year except for 2020, where the third quarter is measured due to data availability) and the average private hours worked each week for private sector employees. For much of the decade, then, the average wages of workers hovered between $20 - $24, with particularly marked increases between 2015-2016 and 2019-2020. The continued downtrend of average hours is a statistic to keep an eye on for the future. The low average in 2020 can be discounted due to the immense labor fluctuations of the Covid-19 pandemic, but as the trendline above indicates, hours have been decreasing throughout the decade.

This could be due to a variety of reasons, including an aging workforce, the rise of the gig economy where multiple part-time jobs is financially advantageous, or an increasing share of workers owning independent businesses. On the other hand, it could be an indicator of an underemployed workforce, where workers are excluded from the full-time job market they want to seek.

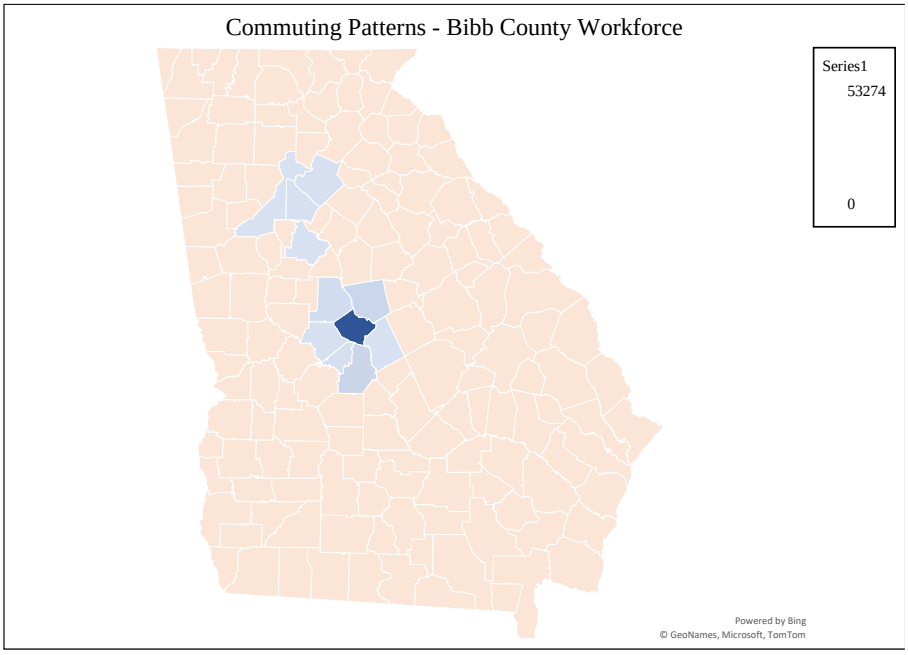
[8] "State and Metro Area Employment, Hours, & Earnings," *Bureau of Labor Statistics.*

Figure 8[9]



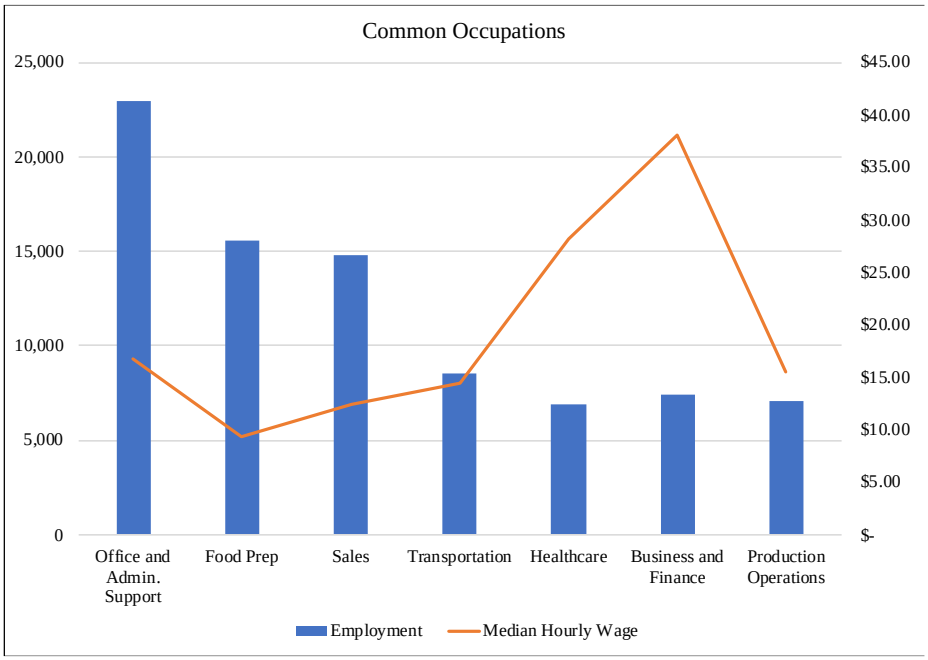
Nearly 73% of workers in Bibb County, the central county in the Macon MSA, reside in Bibb County itself. Of the rest, neighboring Houston County (Warner Robins) makes up the next largest percentage, at 26% of the remainder. As Figure 9 below indicates, there is a sizeable percentage (20% of commuters from outside of Bibb County) that travel from the Atlanta MSA counties of Gwinnett, Fulton, Henry, and DeKalb.

Figure 9[10]



[9] "Macon-Bibb County Industrial Authority Strategic Plan," *VisionFirst Advisors,* January 2021, 19.
[10] "Macon-Bibb County Industrial Authority Strategic Plan," *VisionFirst Advisors,* 19.

Figure 10[11]



On average, wages for the top ten occupations in the Warner Robins MSA are 10.65% higher than in the Macon MSA, corresponding with the general trend of higher prosperity in the south of the consolidated region (Macon CSA).

Table 4 details the top ten occupational categories in the Macon CSA. As might be expected, service-related jobs spearhead this group. Nationally, the services industry has risen dramatically since 1980, with the primary growth occurring in urban centers. Relatively isolated urban centers, such as the city of Macon, can be expected to have particularly high concentrations in service sectors, as outlying rural areas tend to rely on the regional hub for retail and business services. In fact, the goods-producing industries have remained relatively flat for the Macon CSA over the past ten years at approximately 11% of total employment, with an increase in only 0.6 percentage points during that time span.[12]

[11] "Occupational Employment and Wage Statistics: May 2020," *U.S. Bureau of Labor Statistics*,
[12] "State and Metro Area Employment, Hours, & Earnings." *Bureau of Labor Statistics.*

Table 2[13]

Occupation	Total Employment	Avg. Wage	Median Wage Differential
Fast Food	5480	$9.12	-2%
Retail Sales	5300	$11.19	1%
Customer Service	4310	$17.33	13%
Cashiers	3760	$9.90	-10%
Project Management	3630	$36.23	-30%
Laborers in Freight and Stock	3390	$16.18	-29%
Registered Nurses	3140	$31.64	2%
Waiters	3080	$8.74	1%
Office Clerks	2740	$14.86	-1%
Stockers and Order Fillers	2730	$12.05	-6%
			Macon MSA compared to WR MSA

With that in mind, it is logical that the majority (roughly seven, although there is overlap) of these top ten occupational categories belong to the service sector and are relatively low paying. The business and finance sectors (Customer Service, Project Management, and Office Clerks) do have significantly higher pay than the other predominant jobs, with Warner Robins having a particularly high concentration of project managers. Nearly across the board, with the notable exception of the customer service sector, the Warner Robins MSA offers higher pay for the above positions.

Although it is easy to focus on a few targeted industries – those that export products, provide specialization and high pay for blue-collar workers, or are on the cutting edge of research or their industry – it is critical not to overlook the base of jobs in the region. Although serving local needs and paying a relatively humble salary, many of the above jobs are the entry point into the economy for citizens and contribute to economic opportunity and a thriving retail environment.

[13] "Occupational Employment and Wage Statistics: May 2020," U.S. Bureau of Labor Statistics,

Economic History and Sectoral structure

Macon has historically relied upon its textile and transportation hub industries as its main economic drivers. However, the days of a large textile industry in Macon have long passed. The Macon economy transitioned out of the textile industry phase but did not have another economic industry to fill the gap. Many economic systems and residents consequently faced difficulty. Currently, the Macon economy is recovering and is on the rise. The economy has not yet solidified around another industry, but the next large industries of the Macon economy are currently in the making. The Macon economy can be measured from many different perspectives.[14]

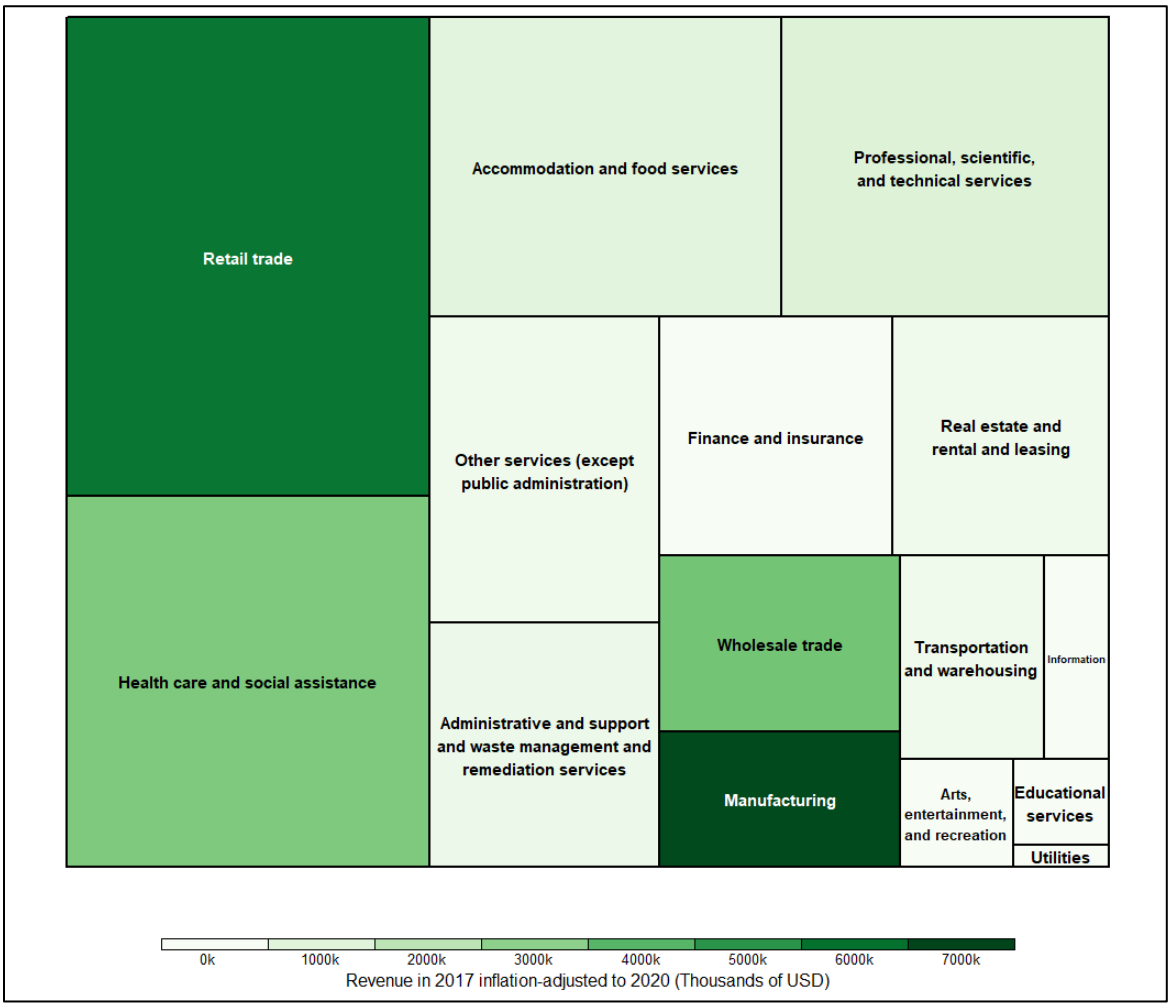
This section examines the economic sectors, quantity and of businesses, employee characteristics, and specific major companies in the area. Historical data comparison would add much context to see trends in where the Macon economy came from and where it is heading, but the relevant economic data provided at the Macon MSA level is not provided beyond two time data points by government sources, 2017 and 2012. Two data points do not show significant trends, it would require more. Therefore, historical economic data comparisons are not made, and this report will have to settle with a 2017 cross-sectional snapshot.

The Macon CSA is populated by a large quantity of business firms in retail trade, healthcare, and accommodation and food services. The highest revenue sectors of the Macon economy are manufacturing and retail trade. Manufacturing produces the greatest revenue by far at roughly 40% more revenue than the next highest revenue producer, retail trade. Figure 11 details the quantity of businesses involved and the revenue in the Macon CSA economy.

The figure shows a trend that the larger the number of firms in a sector the more revenue it produces. This trend is somewhat intuitive. However, manufacturing and wholesale trade sectors are outliers from this trend. While both the manufacturing and wholesale trade sectors have relatively medium sized firm quantity with respect to all the sectors in the Macon CSA economy, both have revenues that outpace their relative firm quantities. This means that the manufacturing and wholesale trade firms are highly efficient in providing valuable resources from the region. These efficiencies should be noted.

[14] "Macon-Bibb County Big Picture Comprehensive Plan Update 2041," Macon-Bibb County Planning & Zoning Commission, 2017.

Figure 11
Share of Firms and Revenue per Sector in Macon CSA in 2017[15]



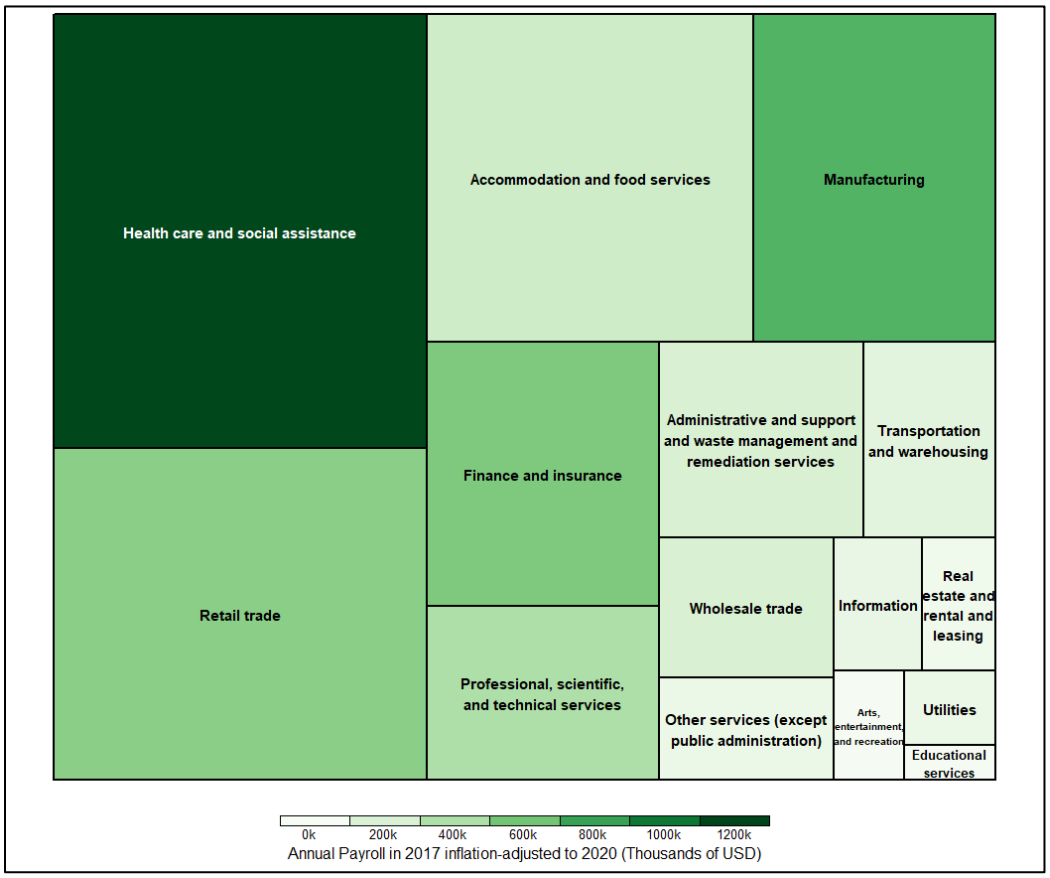
Notes: Nonemployer firms are not represented.

Once again, healthcare, retail trade, and accommodation and food services are at the top of the list, but this time by number of employees. These three sectors have the highest employee count and the largest number of firms. In Figure 12, it is expected that with a larger share of employees relative to the total amount of employees in the Macon CSA a larger payroll would be incurred by businesses. This expectation holds true for the most part. There are three noticeable deviations shown in Figure 12. First, the accommodation and food services sector employees many people, but has a low payroll. This may mean that jobs in that sector pay poorly in comparison to other sectors in the Macon CSA.

[15] "ECNSVY Business Patterns County Business Patterns: Macon MSA." *US Census Bureau.* 2019.

This sector is large in employees and firms residing in the Macon CSA area and may not bode financially well for this large population. Second, once again, the manufacturing industry stands out as high performing. The manufacturing sector pays more per employee than the Figure 12 trend suggests. Lastly, the healthcare sector payroll increases at a greater rate than the number of employees in that sector. This means that healthcare employees are paid very well on average compared to employees of other sectors.

Figure 12
Share of Employees and Payroll per Sector in Macon CSA in 2017[16]



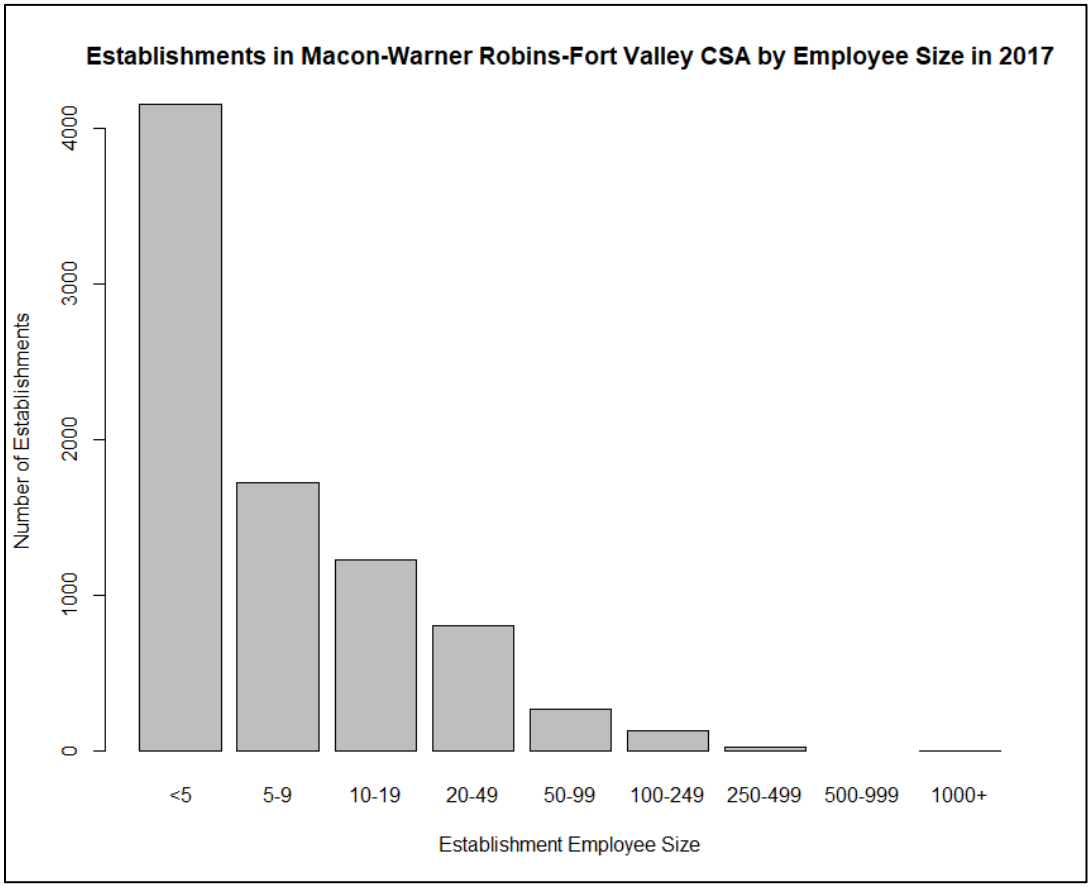
Notes: Nonemployer firms are not represented.

Having viewed the business economy by sector, we will now view the business economy by size. The Macon CSA is largely saturated by smaller establishments, as seen in Figure 13. It seems that there are only a handful of large establishments by employee size. Though, it is possible that the quantity of 500-999 category of companies in the Macon CSA area are large. The number of firms and establishments are practically identical numbers in the lower range of employee sizes, so the large number of small employee sizes are not due to establishments being employed efficiently at

[16] "ECNSVY Business Patterns County Business Patterns: Macon MSA." *US Census Bureau.* 2019.

a smaller number of people. Unless enterprise size is large in the Macon CSA, small businesses must comprise a large majority of businesses in the Macon CSA.

Figure 13
Establishments Count in Macon CSA by Employee Size, 2017



Notes: Nonemployer establishment count is excluded. The 500-999 establishment employee size count was not available and is, therefore, not displayed.

All of the previous analyses excluded nonemployer businesses because they are a different scale of business compared to the rest of the Macon CSA economy. The employee small-scale business majority from Figure 13 carries on into the nonemployer business world. In fact, 78.7% of businesses as classified as nonemployer in 2017. Despite such high instances of nonemployer businesses in the Macon CSA, nonemployer revenues only account for 8.6% of total business revenues in 2017, as seen in Figure 15. While many owners and customers might rely on nonemployer businesses for their profits and services respectively, nonemployer businesses may not contribute much export or local spending value for the region due to their relatively low revenues compared to other business sizes. With that said, the large quantity of nonemployer businesses represents a large opportunity. Should the Macon CSA region figure out how to help

most nonemployer businesses grow, nonemployer business contribution as a revenue producer may increase dramatically due to their sheer quantity of nonemployer businesses.

Figure 14
Nonemployer Share of Establishments 2017

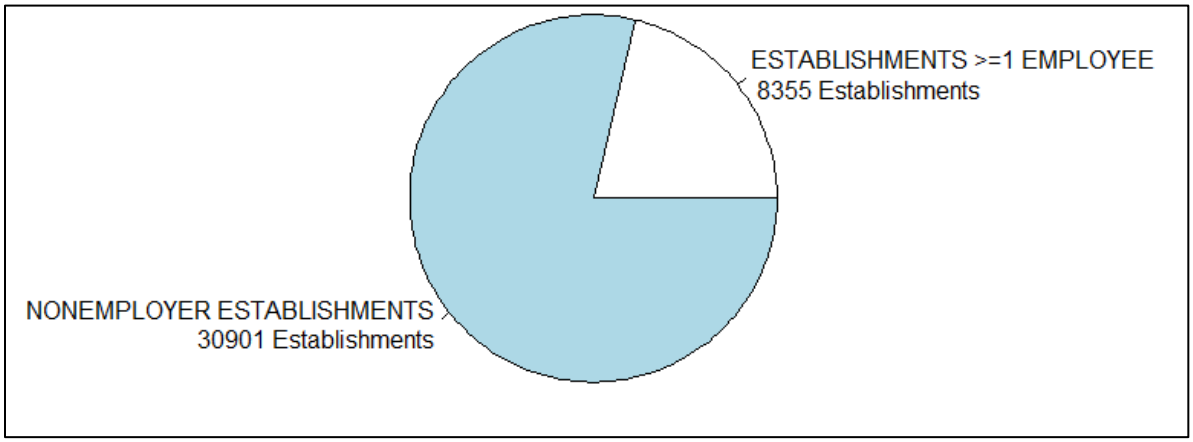
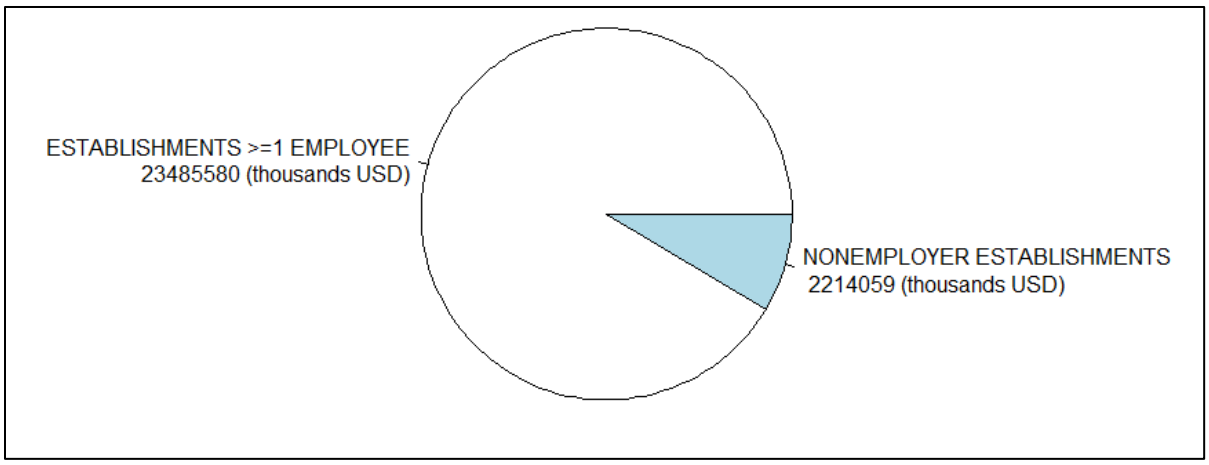


Figure 15
Nonemployer Revenue Share, 2017[17]



Notes: Inflation Adjusted

At the opposite end of the spectrum of nonemployer businesses are the largest companies affecting the Macon CSA region. By revenue in 2021, we see mostly private companies which makes sense as private companies operate to produce maximal profit, as seen in Table 2. These top sales volume private companies are wholesalers and manufacturers for the most part. This confirms our observations from before that the wholesalers and manufacturers are highly efficient for value

[17] "ECNSVY Nonemployer Statistics Macon MSA 2017," *US Census Bureau*, 2019.

production. Somewhat unexpected though are that three non-profits rank in the top 20. In some sense this also makes sense due to healthcare appearing in the higher end of the scales in Figures 11 and 12. In these top companies we see some large established enterprises which might allow for economic resilience in the Macon CSA region because its economy can rely on other national and international economies and not just local ones.

Table 3

Top Businesses by Sales Volume in Macon-Warner Robins-Fort Valley CSA in 2021[11]

Rank	Company Name	Sales Volume (USD)	Primary NAICS Description	Business Type
1	Medical Center-Radiology Svc*	$4,195,314,000	Diagnostic Imaging Centers	Not for Profit
2	Graphic Packaging Intl LLC*	$726,424,000	Paperboard Mills	Private
3	Walthall Oil Co	$597,782,000	Petroleum And Petroleum Products Merchant Wholesale	Private
4	Frito-Lay Inc*	$571,166,000	Other Snack Food Manufacturing	Private
5	U.S. Air Force*	$472,412,000	Software Publishers	Governmental
6	Houston Heart Institute*	$464,516,000	Freestanding Ambulatory Surgical And Emergency Cen	Not for Profit
7	Perdue Farms Inc*	$464,516,000	Poultry Processing	Private
8	Ricoh USA*	$326,141,000	Office Equipment Merchant Wholesalers	Private
9	First Quality Retail Group	$229,791,000	Women's, Children's, And Infants' Clothing And Accessories	Private
10	Georgia Power Co	$226,526,000	Electric Power Distribution	Private
11	Irving Tissue	$214,679,000	Paper (Except Newsprint) Mills	Private
12	Directorate Of Contracting*	$186,205,000	All Other Specialty Trade Contractors	Governmental
13	Kohl's Distribution Ctr	$178,468,000	Other Miscellaneous Durable Goods Merchant Wholesale	Private
14	Flint Energies	$147,662,000	Electric Power Distribution	Private
15	Macon Coca-Cola Bottling Co	$145,256,000	Soft Drink Manufacturing	Private
16	Meco Of Macon	$143,468,000	Motor Vehicle Supplies And New Parts Merchant Wholesale	Private
17	Mc Lane Foodservice	$123,508,000	Wholesale Trade Agents And Brokers	Private
18	WCR Inc	$112,257,000	Industrial Machinery And Equipment Merchant Wholesale	Private
19	Goodwill	$11,178,000	Used Merchandise Stores	Not for Profit
20	Ferrellgas	$10,760,100	Petroleum And Petroleum Products Merchant Wholesale	Private

*Notes: *also appears in the top 20 list of businesses by employment. Sales volume data for certain governmental and nonprofit entities was unavailable.*

In contrast to the sales volume businesses, the top businesses by employment show relatively more instances of not for profit and governmental entities, as seen in Table 3. Once again, medical institutions primarily in Macon-Bibb and Houston County are top employers for the region.

Two new types of businesses are prominent once employment is considered. First is the military interest in the region. Robins Air Force Base far outpaces the rest of the business establishments by a factor of 8 times more than the second closest business employee count. The US Air Force software development team and directorate of contracting are also located in the Robins Air Force Base. The second is that education and academic institutions support a large population of persons. The academic presence in the region may enable the region to capture new economic opportunities and quickly training their available workforce.

The businesses that appear in Table 2 and Table 3, along with the rest of the businesses accounted for in Figure 11 follow a location distribution as shown in Figure 16. The establishment locations follow the patterns of clustering around highway nodes with most businesses appearing in massive intersection where Macon is located. Warner Robins stands out a bit in this respect. Warner Robins seems to be a prime spot for firms, right behind Macon, but its business location patterns do not cluster around a highway. In fact, the businesses are somewhat uniformly distributed in between highways. This may indicate that Warner Robins has a more suburban region where businesses do not benefit from high business density compared to an urban core vs. non-core distribution of businesses in Macon. The gap between Macon and Warner Robins is where the Robins Air Force sits along with some undeveloped property.

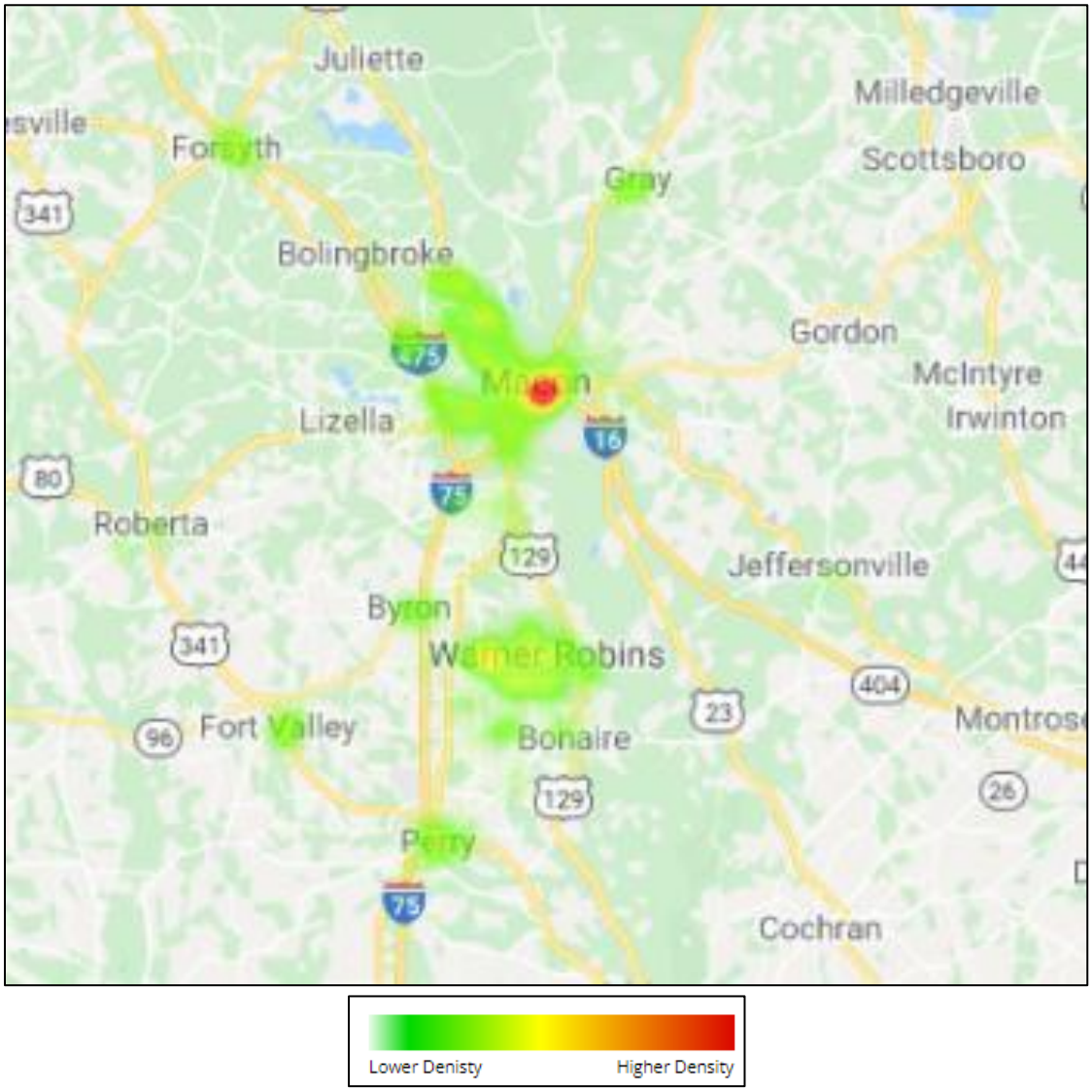
Table 4
Top Businesses by Employment in Macon-Warner Robins-Fort Valley CSA in 2021[18]

Rank	Company Name	Employee Size	Description (Primary NAICS)	Business Type
1	Robins Air Force Base	39868	National Security	Governmental
2	Medical Center-Radiology Svc*	5000	Diagnostic Imaging Centers	Not for Profit
3	Houston County Board Of Edu	3000	Elementary And Secondary Schools	Governmental
4	Houston Heart Institute*	2500	Freestanding Ambulatory Surgical And Emergency Center	Not for Profit
5	Utility Service Co Inc	2000	Water Supply And Irrigation Systems	Private
6	Central Ga Technical Clg Child	2000	Child Day Care Services	Governmental
7	Houston Medical Ctr	1880	General Medical And Surgical Hospitals	Not for Profit
8	Perdue Farms Inc*	1650	Poultry Processing	Private
9	Us Air Force*	1200	Software Publishers	Governmental
10	Blue Bird Body Co	2200	Automotive Body, Paint, And Interior Repair And Maintenance	Private
11	Frito-Lay Inc*	1100	Other Snack Food Manufacturing	Private
12	Georgia Farm Bureau Mutual Ins	1000	Business Associations	Private
13	Directorate Of Contracting*	1000	All Other Specialty Trade Contractors	Governmental
14	Mercer University	700	Colleges, Universities, And Professional Schools	Not for Profit
15	USPS	650	Postal Service	Independent Agency
16	Ricoh USA*	599	Office Equipment Merchant Wholesalers	Private
17	Graphic Packaging Intl LLC*	550	Paperboard Mills	Private
18	Walmart Supercenter	530	Department Stores	Private
19	Armstrong World Industries	517	Floor Covering Stores	Private
20	Academy Sports + Outdoors	500	Sporting Goods Stores	Private

*Notes: *also appears in the top 20 list of businesses by revenue*

[18] "Reference USA Establishment Data Macon Warner Robins MSA," *Reference USA.*

Figure 16
Location of Business Establishments in Middle Georgia[19]



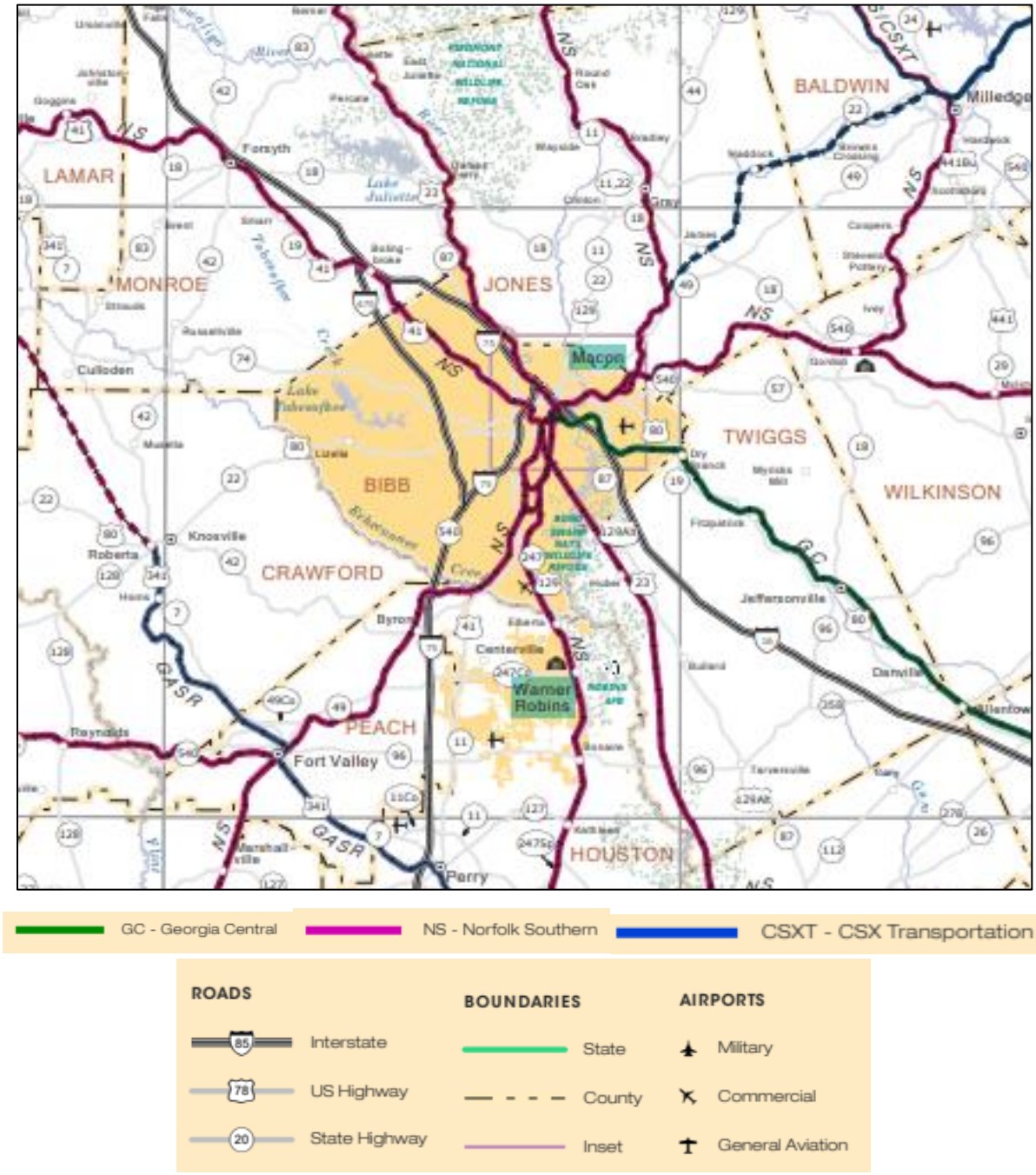
[19] "Reference USA Establishment Data Macon Warner Robins MSA," *Reference USA.*

Economic Infrastructure and Assets

Transportation

One feature of the Macon economy that has remained constant in importance, although taking different forms throughout the years, is Macon's transportation hub status. Originally, the Ocmulgee River that runs through Macon was how initial settlers traversed the region. Fast forwarding to the industrial ages, Macon was home to one of the Southeast's largest switch yards. These rail routes remain and enable Macon to act as a transportation hub for freight and logistics. In addition to this freight advantage, Macon also lies at the intersection of a plethora of highways such as Interstate 16, 75, and 475 along with US Routes 23,41,80, 129, as seen in Figure 17. Macon's convenient connection to the Southeast's largest city transport resource, Atlanta, greatly assists in transportation as well. Macon has two airports, the Macon Downtown Airport and the Middle Georgia Regional Airport. These airports do not see major use, but often have small scale passenger use. These transportation economic infrastructures assist the region in attracting logistics businesses and enable resource transportation for their manufacturing and trade industries.

Figure 17
Transportation Routes in Macon-Warner Robins-Fort Valley MSA Region[20]



[20] "Georgia Official Railroads Map," GDOT Division of Intermodal and UGA Carl Vinson Institute of Government, 2019.

Military

The Macon CSA is home to the largest industrial complex in Georgia, the Robins Air Force Base.[21] This massive military location employs a large portion of the locality, attracts residents, contracts local economy services, contributes money to non-basic businesses, and advances the STEM sectors in Macon. Due to Robins Air Force Base's influence as an anchor institution, other military related services have been attracted to the region such as the software development focus of the Air Force and military contracting.

Image 1
Warner Robins Air Force Base[22]

Universities & Higher Education

The region has many universities that help train the local workforce. Some of these institutions include Central Georgia Technical College, Wesleyan College, Middle Georgia State University, and Mercer University. Some of these institutions are orientated toward workforce development while others also explore research and business partnerships. Three such examples are Mercer Engineering Research Center's partnership with the military,[23] the software lab between the US

[21] "About Robins." *Robins Air Force Base.* n.d.
[22] Sue Sapp, *C-5 Modification at Warner Robins Air Materiel Area*, 2011, photography.
[23] "Mercer Engineering Research Center An Operating Unit of Mercer University," *MERC*. n.d.

Air Force, Mercer University, and Middle Georgia State University,[24] and hospital partnerships with Mercer University's School of Medicine.[25]

Image 2
Mercer University[26]

Medical Services

Macon is home to many central Georgia health network businesses including Atrium Navicent Health and Houston Healthcare. The Medical Center, Navicent Health resides in Macon and is the second largest hospital in Georgia and a nationally recognized Level 1 Trauma Center. These medical networks not only employ many locals but train them in delivering valuable services. These health care centers have economic connections beyond the local interest. For example, Atrium, a Carolina based medical business, recently acquired Navicent Health. Many medical residents nation-wide are employed at these hospital networks and national medical research interests take place within the walls of these centers.[27]

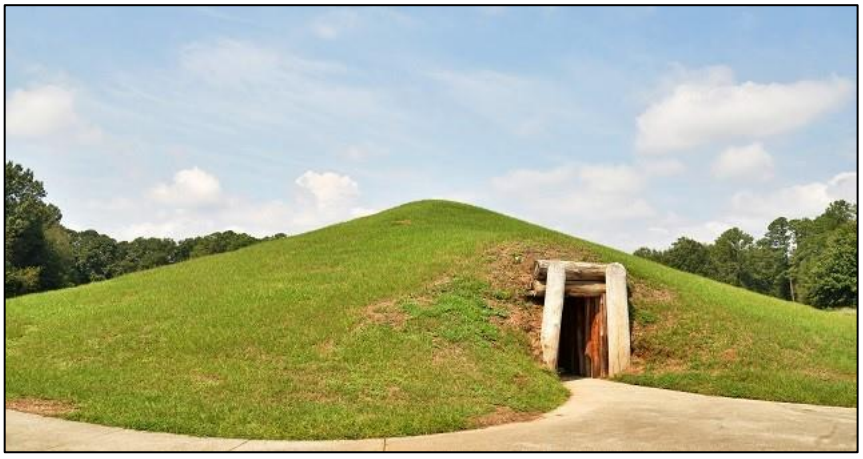
[24] Rachel Gambill, "Ceremony Marks Opening of Robins Software Lab at Site of Iconic Music Label," *Macon-Bibb County*, 2020.
[25] "Navicent Health and Emory Healthcare Announce Surgical Partnership," 2020, *Atrium Health Navicent.*
[26] Haley Garrett, "Mercer University Trustees Approve Operatin Budget, New Doctoral Program," *WGXA News,* April 16, 2021.
[27] "Navicent Health and Emory Healthcare Announce Surgical Partnership," 2020, *Atrium Health Navicent.*

Image 3
The Medical Center[28]

Cultural

The city of Macon has a rich history and features several economically noteworthy institutions that take advantage of this. Primarily, this takes the form of the tourism business and livability to attract more residents to the economic region. The Ocmulgee River contains historical significance for the regions development and is home to sites like the Ocmulgee Mounds National Historical Park, a prehistoric American Indian site.[29] Other cultural attractions include the GA Sports Hall of Fame, Tubman Museum, Allman Brothers Band Museum, and Grand Opera House.

Image 4
Ocmulgee Mounds National Historic Park[30]



[28] "Navicent Health and Emory Healthcare Announce Surgical Partnership," 2020, *Atrium Health Navicent.*
[29] "Ocmulgee Mounds," *National Park Service,*. n.d, https://www.nps.gov/ocmu/index.htm.
[30] "National Park Getaway: Ocmulgee National Monument." *National Park Service.* n.d. Photography.

Government Structures and Economic Development Entities

Image 5
Key Regional Economic Developers

The Macon CSA is guided by a regional commission, Middle Georgia Regional Commission (MGRC), that receives federal funding. It is an Economic Development District under the EDA. It documents, analyses, and organizes connections and resources between the local, state, and federal economic development initiatives according to the regions Comprehensive Economic Development Strategy (CEDS). Macon is not an isolated economy, so the counties in the Macon CSA must coordinate their own respective economic development governmental agencies to work "individually" and in "tandem". The "in tandem" part is how the Middle Georgia Regional Commission adds value. More specifically, in the CEDS, many county industrial authorities have projects that are joint efforts between more than one county authority.[31]

A not-for-profit private organization in the region is the Community Foundation of Central Georgia. The goal of this foundation is to "support the causes and organizations that they care about, which enhances the quality of life for the people of Central Georgia."[32] This foundation acts as a source of funding that helps to fill certain gaps of funding in the Macon CSA or supplement any federal and state funding.

[31] "2021 CEDS Annual Update," *Middle Georgia Regional Commission,* 2021.
[32] "History and Mission," *Community Foundation of Central Georgia,* n.d.

Figure 18
County and City Level Economic Developers[33]

Each county in the Macon CSA Region has an economic authority which includes the Houston Development Authority, the Macon-Bibb County Industrial Authority, the Development Authority of Peach County, etc. These county authorities deal with their "individual" county development goals. The goal of each of these development authorities are all somewhat similar in attempting to grow job availability, attract new businesses, grow current businesses, and handle behind-the-scenes upkeep for all the administrative systems for governmental business interactions.[34]

Furthermore, each city also has a Chamber of Commerce. The Chamber of Commerce is a voluntary community organization that has "the purpose of advancing the positive growth and development" of its city.[35] They do this by provides a space for business connections to be made, marketing, training to occur, and knowledge transfer.

Macon-Bibb County specifically is home to the Macon-Bibb County Industrial Authority (MBCIA), the Greater Macon Chamber of Commerce (MEDC), and the Macon-Bibb County Economic Opportunity Council (Macon-Bibb EOC). The Macon-Bibb EOC is a little bit unique from the rest of the Macon CSA's economic development players. The Macon-Bibb EOC used to be a part of the county government but was incorporated as a private non-profit in 1985. Its mission is to "reduce poverty by providing collaborative comprehensive services and resources that empower economically disadvantaged families to achieve self-sufficiency."[36] The EOC receives both federal and state sources of funding.[37] This organization may have been especially helpful given the economic hardships that hit the area after the textile industry left. Currently, vacancy, blight, and crime are large issues in the region. The MGRC has a goal of helping its countries revitalize these areas of the region in addition to its normal business promoting initiatives.[38]

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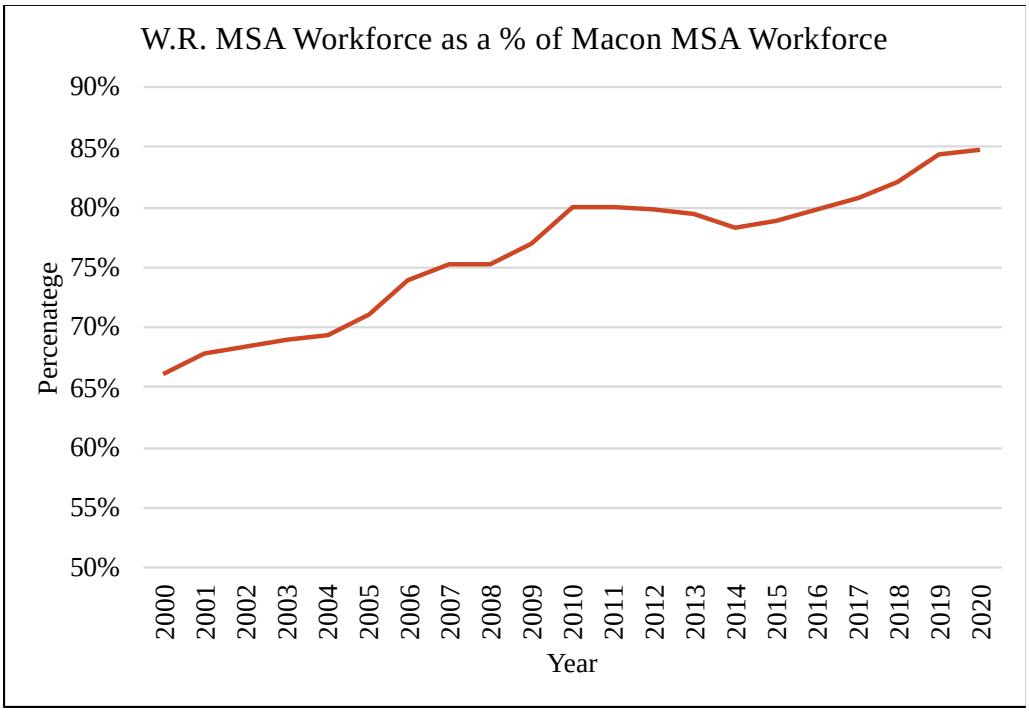
[33] "2021 CEDS Annual Update," *Middle Georgia Regional Commission,* 2021.
[34] "Houston Development Authority: Be Houston," *Houston Development Authority.* n.d.
[35] "About the Chamber." *Greater Macon Chamber of Commerce.* n.d.
[36] "About Us," *Macon-Bibb County Economic Opportunity Council*.
[37] "About Us," *Macon-Bibb County Economic Opportunity Council*.
[38] "2021 CEDS Annual Update." *Middle Georgia Regional Commission, 2021*.
https://www.middlegeorgiarc.org/wp-content/uploads/2021/12/MG-EDD-2021-CEDS-Annual-Report.pdf.

Figure 19[39]



Economic Base

A location quotient (LQ) is a useful metric to measure the relevant presence of an industry in a given region compared to the nation. A location quotient of 1.00 indicates that an industry's presence in a region is proportional to the industry's presence in the overall nation. A location quotient of less than 1 indicates that the region has less than typical presence of the industry in question, while a location quotient greater than 1 indicates that the presence of the industry is greater than would be expected given the national average.

Using data from the Bureau of Labor Statistics, location quotients were calculated for 57 industrial sectors within the Macon-Warner Robins CSA.[40] These industries can broadly be categorized into goods producing industries and service producing industries. The location quotients for each in 2000, 2010, and 2018 are shown in Figure 20.

Figure 20

[39] "Civilian Labor Force in Macon-Bibb County, GA (MSA) and Warner Robins, GA (MSA)", *St. Louis FRED.*
[40] "Business Employment Dynamics." *U.S. Bureau of Labor Statistics.* https://www.bls.gov/bdm/#data.

Goods Producing Industries vs. Service Producing Industries Location Quotients over Time

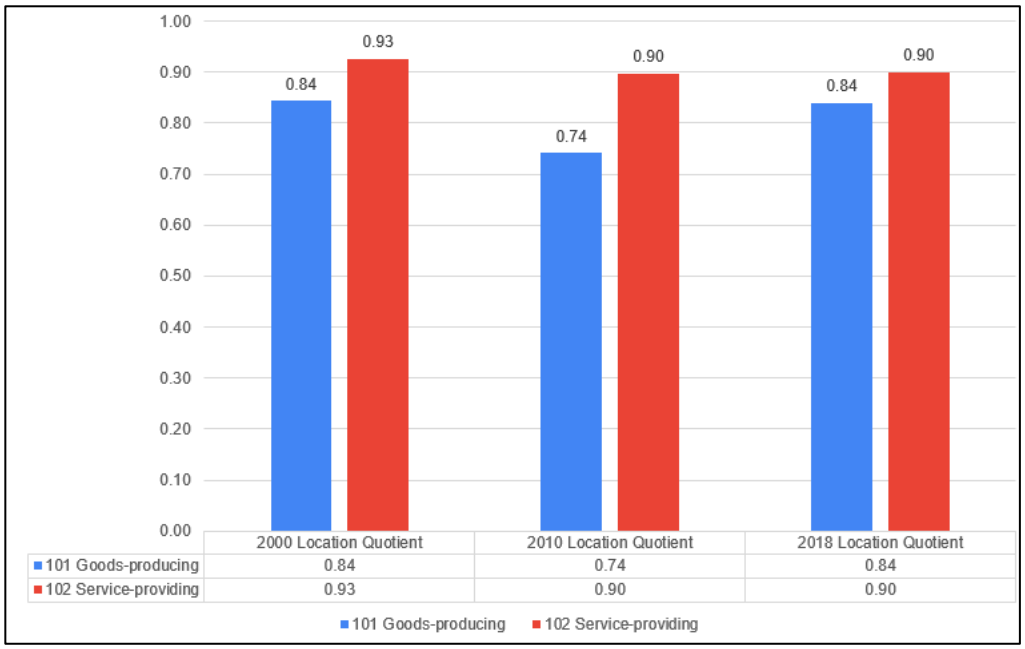


Figure 21 shows that the Macon-Warner Robins CSA is relatively more of a service economy than a manufacturing or agricultural economy. The figure also shows that the location quotients for each category have been generally stable between 2000 and 2018. Both location quotients are less than 1.0, which can be explained by the presence of Robins Air Force Base, which employs a substantial portion of the local population without falling into either category. Figure 21 further shows the location quotient change over time for the six largest industries in the region with available data.

Figure 21

Large Industries Location Quotient Over Time

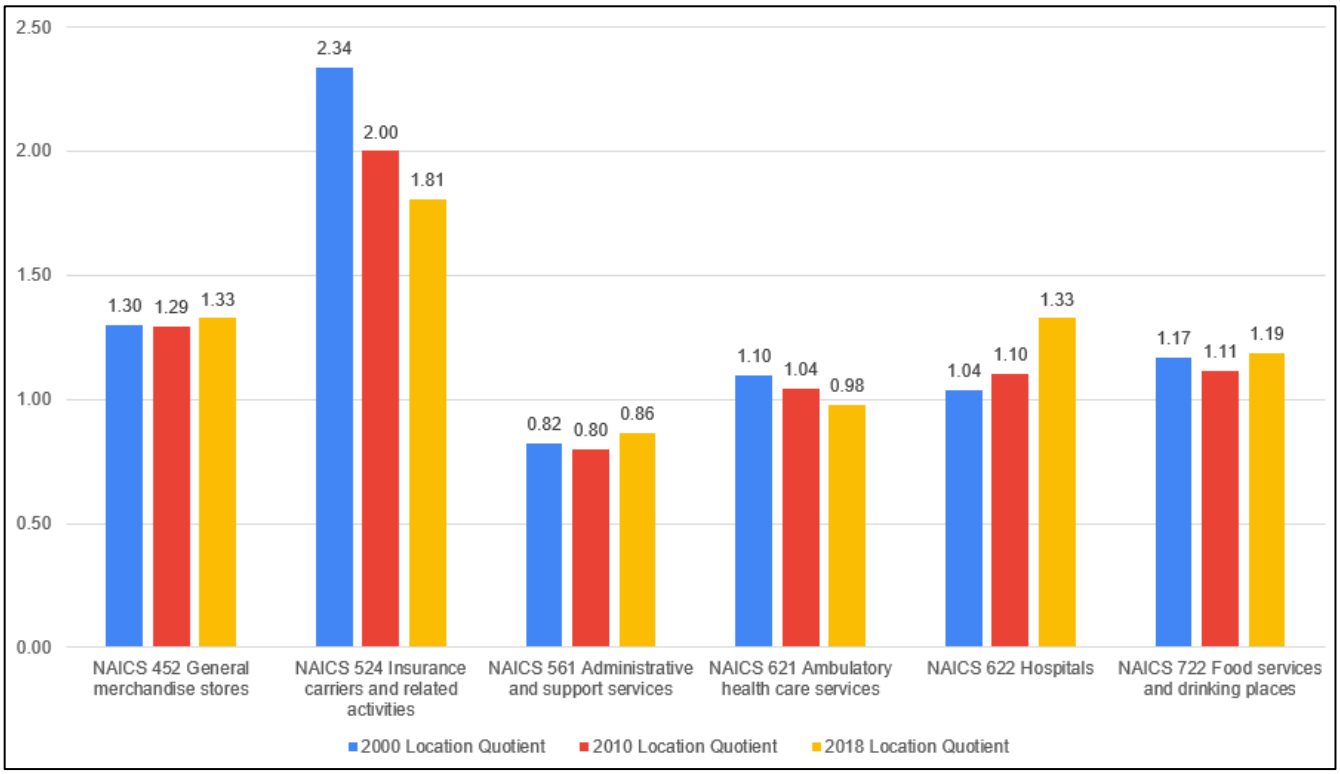


Figure 21 shows that of the large industries in the Macon-Warner Robins CSA, the insurance industry is the largest relative to the national average, and the location quotient for insurance companies has risen from 1.81 to 2.34 between 2000 and 2018. Other large industries in the CSA have maintained relatively stable location quotients, which is to be expected because location quotient is a function of total employees in an industry and having more employees in an industry minimizes volatility caused by individual firms opening or closing. These other industries are also relatively near a 1.0 location quotient, despite being some of the largest industries in the CSA, indicating that these industries employ a sizable portion of the national population.

Other industries with a large location quotient in 2018 include NAICS 212 Mining, except oil and gas, and NAICS 322 Paper Manufacturing. Mining had a location quotient of 1.68 in 2018, up from 1.61 in 2010, but a steep decline from 3.61 in 2000. Meanwhile, paper manufacturing had a location quotient of 3.17 in 2018, a notable increase from 2.16 in 2010 and 2.13 in 2000. This shows that despite the Macon-Warner Robins CSA's relative bias towards a service economy, the CSA does have a few key manufacturing industries remaining. A full list of location quotients for industries is contained within Appendix A.

Shift-share Analysis: sectoral change

A shift-share analysis between 2019 and 2018 was conducted for 47 major industries within the Macon-Warner Robins CSA using data from the Bureau of Labor Statistics. A shift share analysis provides insight into the reasons for job growth or decline in a region. Namely, were changes in employment primarily caused by growth or decline in overall employment across the nation, growth and decline in overall employment across the industry, and/or growth or decline in overall employment in the region relative to the nation?

These three components are referred to as national share, industry mix, and regional shift, respectively. For the Macon-Warner Robins CSA, seven industries experienced employment shifts greater than 200 employees between 2018 and 2019.

Table 5 shows that the largest shifts in the region were often primarily attributable to the regional shift in industry, as opposed to national changes in overall employment or national changes in employment specific to that industry. The exception is Ambulatory health care services, which saw an increase in employment primarily because of an overall increase in ambulatory health care services across the nation. Five of the six largest shifts in employment were positive, with only the clothing industry experiencing a large decline in employment.

Table 5

Table 5: Largest Industry Shifts 2018-2019 Macon-Warner Robins CSA

Industry	National Share	Industry Mix	Regional Shift	Shift Share
NAICS 448 Clothing and clothing accessories stores	13	-78	-144	-210
NAICS 541 Professional and technical services	29	69	873	971
NAICS 561 Administrative and support services	66	-35	480	511

NAICS 621 Ambulatory health care services	79	195	-57	217
NAICS 622 Hospitals	50	29	122	202
NAICS 812 Personal and laundry services	65	46	144	255

Each of the top five growing industries were service industries, as opposed to goods producing industries. This suggests that the Macon-Warner Robins CSA may be transitioning towards a service economy, which generally results in higher economic prosperity within a region. Table 6 contains a shift share analysis for goods producing industries and service producing industries within the Macon-Warner Robins CSA. The table shows that many more service jobs were created than goods producing jobs between 2018 and 2019. Further, the regional shift component for goods producing jobs is negative, indicating that the region is lagging relative to the nation in goods producing jobs. Likewise, the regional shift component for service jobs is positive and larger than the national share and industry mix combined, indicating that the region is vastly outpacing the nation in service job creation. A full list of shift share analyses is contained within Appendix Table B.

Table 6
Goods & Services Shift Share Analysis Macon-Warner Robins CSA 2018-2019

Industry	National Share	Industry Mix	Regional Shift	Shift Share
101 Goods-producing	171	177	-105	242
102 Service-providing	873	186	1442	2502

SWOT Analysis

Strengths

Paper manufacturing: this sector classifies under the heavy industry category, and has helped alleviate some of the decline in this category in the region. The paper mills are all located in the Macon MSA, as opposed to the combined Macon-Warner Robins greater region, giving the Macon MSA specifically a location quotient of 5.17 and the combined region a LQ of 3.17, for the highest of any sector. Irving Tissue, expected to employ 350 workers by the end of 2022, began construction of a new facility in 2017 in Macon, and their addition increases this burgeoning cluster even more. Logistics and location were the top two reasons cited by the company's president.[41]

Regional service hub: The region has a long history as the center of the entire Middle Georgia region, with notable location quotient tallies for gas stations (1.12), general merchandise stores (1.3), sports, hobby, and book stores (1.37), hospitals (1.04) and restaurants/drinking establishments (1.17). Similarly, the regional shift share for service-providing industries was 1442 jobs, 57.6% of the total shift in service employment since 2018.

Weaknesses

Manufacturing stagnation/decline: The goods-producing sector has seen no growth since 2000, holding steady at 0.84 after seeing a slight dip during the 2008 recession. The lack of growth is troubling, as is the position of regional competitive disadvantage. Upon conducting a shift-share analysis, it was revealed that the regional factor contributed to 105 manufacturing jobs less than we would expect otherwise.

OPPORTUNITIES

Major revitalization project: After declining from its position as one of the top malls in the state, the Macon Mall is in the midst of a major revitalization project after the city acquired the property.[42] Among other changes, the new public-private partnership will include the state's second largest amphitheater, which will be built adjacent to the mall. The whole project will be financing through a tax-increment financing (TIF) plan.[43] This redone Macon Mall may be able to help reclaim the Clothing Stores (NAICS 448) job loss of 210 from 2018-2019, 68.5% of

[41] "Irving Consumer Products to invest $400 million in Macon-Bibb County," *Georgia USA,* August 9, 2017.
[42] Ashton Packer, "The rise, fall, and rebirth of the Macon Mall," *WGXA News,* December 8, 2021.
[43] Edna Ruiz, "Macon Mall coming back to life through public-private partnership," *Macon-Bibb County,* Sept. 17, 2021.

which was caused by a negative regional shift, as well as the decline in wholesale nondurable goods from 0.58 to 0.43 LQ from 2010-2018. Given its status as regional hub, both of these are service-related industries that one would expect specialization in.

Industrial shift: The region's notable strengthening in business services and related sectors has helped the city (and by extension, Middle Georgia) to diversify from manufacturing, extractive industries/agriculture/processing, and services/consumer goods to a greater concentration in business activities. This is especially notable as the first two sectors have experienced decline in recent years.

THREATS

Inflation's impact: The historically high inflation rates of 2021-present, prompted by a severe rise in consumer spending which itself was prompted by federal spending, is on the verge of prompting rate hikes from the Federal Reserve.[44] Along with wages failing to keep pace with the inflation, this macroeconomic action has the potential to cut consumer spending in the short to mid-term, which would likely hit Macon's service industries hard, many of which are just now recovering from the COVID-19 pandemic.

[44] Jeff Cox, "The market has adjusted its views of how the Federal Reserve will raise interest rates," *CNBC,* Feb. 23, 2022.

Business Attraction Case Study

Irving Tissue | Macon, GA

Background Information

Having characterized some of the Macon Area's economic aspects, a local manufacturing plant opening is studied to more closely observe how a real-life economic development deal has and will shape the area. The characterization of the manufacturing sector in this report so far shows that it produces high revenues per firm and relatively high wages but seems to be stagnant in employment. More specifically, the previous analysis sections show that the Macon region experiences an advantage in the paper manufacturing sector with a location quotient of 3.17 and positive regional (Appendix, Table A & B). This investigation shows a study case in this broad characterization of the manufacturing sector.

Irving Tissue struck a deal in 2017 to build a new plant that became operational in 2019. Irving Tissue is a Canadian paper manufacturing company started in 1882. They own household brands like Scotties, Royale, and Majesta. The company operates in Canada and the US. They employ about 18,000 people. Irving Tissue operates five manufacturing plants. Two of the plants are in the US including the Macon plant. The other US plant is in New York and is more than 100 years old.[45]

This company considered eight different sites in six different states. Only three sites continued with incentive negotiations, and Macon was selected.[46] Irving Tissue stated that the infrastructure and logistic strength of the region along with its strategic location in the Southeast motivated the final choice. Here, we see that the Macon CSA's economic infrastructure advantage in transportation and logistics plays a large role in attracting businesses. They plan to use the rail infrastructure to transport wood from New Brunswick, Canada and Maine to Macon.[47]

The Irving Plant is situated at 1897 Allen Rd, Macon, GA 31216. It is inside the new Sofkee Industrial Park next to a recently opened tire manufacturing plant, as seen in Figure 22. The Sofkee Industrial Park is owned by the MBCIA (Macon-Bibb County Industrial Authority). With respect to the Macon CSA, the plant is located in southern Macon and above Warner Robins, as shown in Figure 23.

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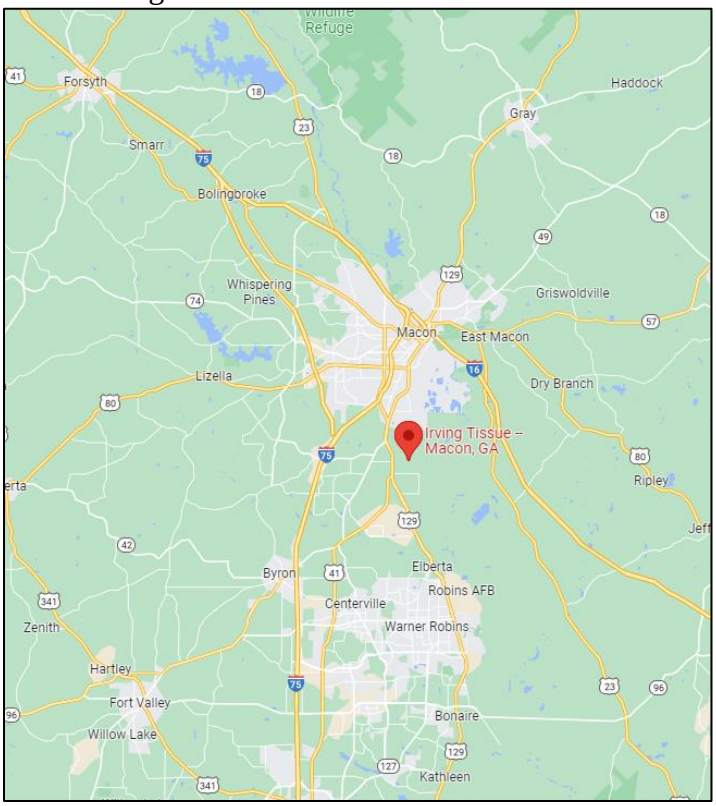
[45] "About Us," *Irving Consumer Products.*
[46] "Irving Tissue," *Global Location Strategies.*
[47] Linda Morris, "Canada-based company plans big development in Bibb County, creating 200 jobs," Macon Telegraph, August 10, 2017.

Figure 22
Irving Plant Aerial[48]

Figure 23
Irving Plant Location in the Macon CSA[49]



[48] Image courtesy of Google Maps.
[49] Image courtesy of Google Maps.

The plant was built and staffed in two separate phases. The first phase is a new manufacturing building construction and an initial hiring wave. The first phase took place from 2017-2019. The second phase is an expansion that doubles product through put and a second hiring wave that nearly doubles initial employment. The second phase took place from 2019-2022 (see Table 8). The investment manifested in a 700,000 square foot facility and equipment.

Table 7[50, 51, 52]
Irving Plant Development Timeline

Phase	Year	Investment (2022 USD)	Employment (Jobs)
Phase 1	2017-2019	544,144,721.22	200
Phase 2	2019-2022	446,777,269.20	150
Total	2017-2022	990,921,990.42	350

Note: Utilizes Inflation CPI Adjusted Values.

To attract this nearly billion-dollar investment from Irving Tissue, incentive packages were offered. As a word of caution, these details were not comprehensively publicly provided. The details were investigated through media outlets and online searches, so the completeness of the presented incentives is not guaranteed. The detailed values of incentives are converted to 2022 USD values in this report. The incentives were mainly local consolidated county ones with some significant state benefits. The MCBIA led this incentive effort proposing development assistance and revenue bonds. The development assistance cost of the site and building was shared equally between the MCBIA, Macon-Bibb Consolidated County, and the Macon-Bibb County school district. The structure of this development assistance took the form of PILOT payments over 15 years.[53] Essentially, Macon's government would give away $5,482,224.62 for the development of the Irving plant. Additionally, the MCBIA approved $463,101,890.40 in taxable revenue bonds to be used for the Irving plant.[54] This is a 46.7% capital coverage of the massive plant construction and equipment purchasing with lenient bond default consequences for Irving. It seems that Macon is taking the approach of high initial investment hoping that later taxation and non-direct effects will justify the present cost.

The specific state incentive package is unknown, but a minimum incentives package could be assumed per Georgia's published state incentives. The state incentives that the Irving plant could qualify for would be Job Tax Credit (JTC) and tax exemptions for manufacturing. The plant employs 350 individuals. Macon-Bibb is a Tier 1 JTC Region, so it would receive $14,000,0000

[50] "CPI Inflation Calculator," *Bureau of Labor Statistics.*
[51] "Irving Consumer Products to invest $400 million in Macon-Bibb County," *Georgia USA,* August 9, 2017.
[52] "Irving Tissue to Expand, Create 150+ Jobs in Macon," *Georgia USA,* November 13, 2019.
[53] "A Resolution of the Macon-Bibb County Commission," *Macon-Bibb County.*
[54] Linda Morris, "Revenue bonds for three projects totaling $565 million approved," *Macon Telegraph,* Nov. 15, 2017.

in tax credit over a 10-year span. The tax exemptions would include forgoing the 6-8.9% sales and use tax for purchasing and repairing manufacturing machinery equipment, raw materials and packaging needed, energy used in manufacturing, primary materials handling equipment, and pollution control equipment. Assuming the lowest exemption rate, 6%, this state benefit would be at least $3,110,485.24 in equipment purchases alone. In total, at minimum, they would be receiving $17,110,485.24 from the state in tax credit and exemptions.[55]

The federal government did not offer many incentives to Irving to locate their next plant in the US, but the EDA did award a $1,900,000 development grant for the Irving site's transportation infrastructure construction. The money in this grant is used for roads and rail lines to the Irving site.[56] A summary break down of the incentive structure is given in Table 9. Overall, $24,492,709.86 was waived in costs for Irving Tissue, and Irving Tissue received $487,594,600.26 in usable capital from the governments.

Table 8[53, 55, 56]
Irving Plant Incentive Breakdown

Incentive	Government Level	Value (USD)
Development PILOT payments	County	5,482,224.62
Taxable Revenue Bonds	County	463,101,890.40
Job Tax Credit	State	14,000,000
Tax Exemptions for Manufacturing	State	3,110,485.24
EDA development grant	Federal	1,900,000
TOTAL GIVEN		24,492,709.86
TOTAL IMMEDIATE CAPITAL PROVIDED		487,594,600.26

Note: Values are 2022 Inflation Adjusted

These incentives offered by the MBCIA sum up to a large amount. The government indicated that they wanted the Irving Tissue plant due to the company's expenditures, the high salary STEM jobs, and promotion for their business and logistics infrastructure. Mayor Reichart of Macon-Bibb believes that the Irving Tissue plant will support local residents through its large initial monetary investment and the community minded business character of Irving Tissue. Mayor Reichart is particularly optimistic about the "number and quality of jobs and the salaries", as the jobs are "high-paying jobs in advanced technology."[57] This deal also offers good publicity for the state to attract other large manufacturing companies to the region. Governor Kemp declared that the deal "speaks to the strength of Georgia's booming manufacturing industry,

[55] "Business Incentives 2022," *Georgia USA,* https://79590748.flowpaper.com/BusinessIncentivesBrochure/#page=4.
[56] "MBCIA Awarded $1.9 million Grant," *Macon-Bibb County Industrial Authority,* Nov. 8, 2018.
[57] "Irving Consumer Products to invest $400 million in Macon-Bibb County," *Georgia USA,* August 9, 2017.

made possible by our world-class workforce. As the No. 1 State for Business seven years in a row, we know that our existing industries create great opportunities..."[51]

Manufacturing Plant Input Output Analysis in Macon Area

With the costs of establishing the Irving plant discussed, these costs will be compared to the benefits of the plant. These benefits will be evaluated using IMPLAN's Input Output Model for the Macon MSA. Table 10 shows the event detail needed to input into IMPLAN.

Table 9
Input Information for IMPLAN Model

Events	Quantity	Sector	Year
1st Round Construction (Part 1)	156,666,667 USD	Construction of new manufacturing facility	2017
1st Round Construction (Part 2)	156,666,667 USD	Construction of new manufacturing facility	2018
1st Round Construction (Part 3)	156,666,667 USD	Construction of new manufacturing facility	2019
1st Round Employment	200 Employees	Sanitary Paper Product Manufacturing	2019
2nd Round Construction (Part 1)	133,333,333 USD	Construction of new manufacturing facility	2020
2nd Round Construction (Part 2)	133,333,333 USD	Construction of new manufacturing facility	2021
2nd Round Construction (Part 3)	133,333,333 USD	Construction of new manufacturing facility	2022
2nd Round Employment	150 Employees	Sanitary Paper Product Manufacturing	2022

Note: Assumed that payment for construction occurred evenly across construction years.

Based on IMPLAN's model and coefficients for the locality, the Irving Tissue plant resulted in $1,896,240,217.63 output and 12,219 employments for the region. This is almost a doubling of return on economic activity and 35 times the intended operation employment directly contributed by the new plant. The employment number should be taken with a large grain of salt as most of these employment numbers result from temporary construction jobs that will expire after a six-year period in 2022. If only permanent tissue plant employment is included in IMPLAN's IO analysis, then there would be 866 new employments for the region. This is only 2.47 times the new plant operation jobs compared to 35 times. It makes some sense that the output multipliers with construction should be used and the employment multipliers without construction should be used instead of all the multipliers resulting just from including the construction or just excluding

the construction. Table 11 shows that the plant resulted in a 2.474 employment Type 2 multiplier and a 1.521 Type 2 output multiplier for the region. These are both above 1 meaning that there are some indirect and induced effects that follow the direct investment from Irving Tissue in capital and new employees. The fact that the employment multiplier is greater than two indicates that these jobs are somewhat effective at contributing to greater employment opportunities in the region.

Table 10[58]
Multipliers for Irving Plant Economic Activity

	Multipliers			
	With Construction		Without Construction	
	Employment	Output	Employment	Output
Type 1	1.223	1.293	1.904	1.203
Type 2	1.478	1.521	2.474	1.285

Note: Uses IMPLAN IO Model

Non-direct industries that benefit the most in terms of employment and revenues from the creation of this plant are truck transportation (indirect), owner occupied dwellings(induced), and wholesale machinery equipment, supplies, and durable goods (indirect). Figure 24 shows the greatest outputs in indirect and induced sectors. However, this output may be biased due to IMPLAN ignoring that construction industry jobs are not permanent. The owner-occupied dwellings category ranks as the highest output and is an example of this bias. Construction workers need housing in the short term. Figure 24 might display a more accurate indirect and induced output in the long term where we see owner occupied dwellings fall to the 6th highest output at around 7 times less monetary output. This is seen because Figure 24 excludes the short-term construction impacts on the region as an input to the IMPLAN model. The most accurate output effects lie somewhere in between the values in Figure 24 and 25.

[58] *Implan*, https://app.implan.com/.

Figure 24
Top 15 Output Industries with Plant Construction Impacts

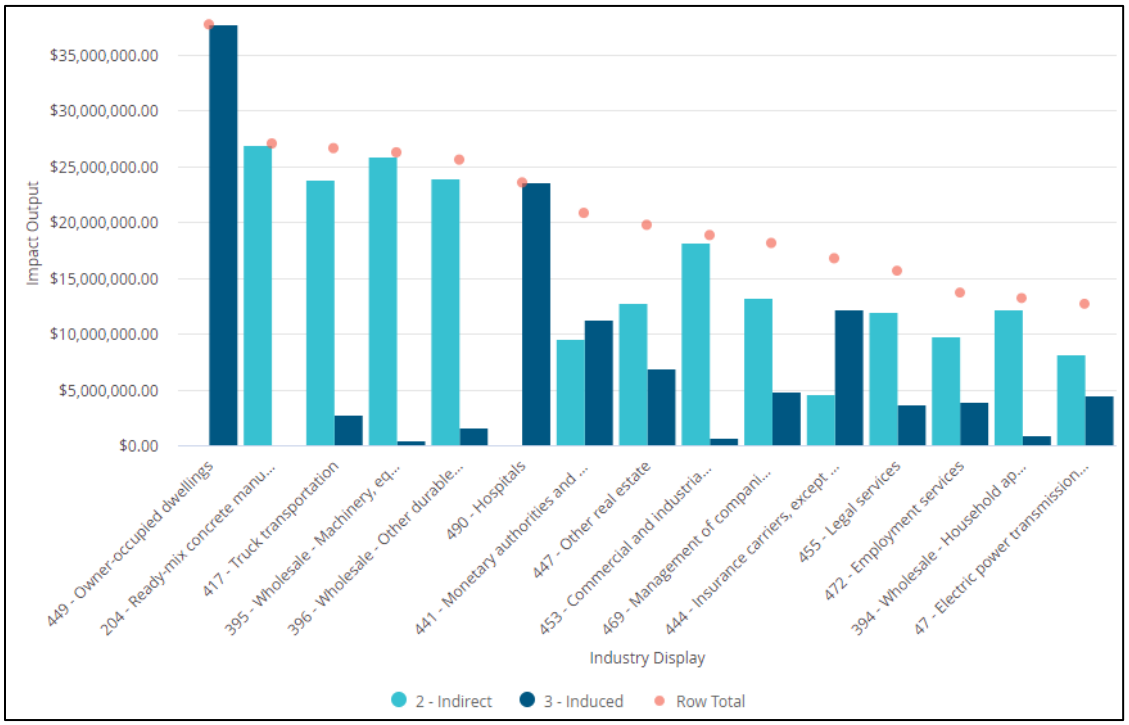
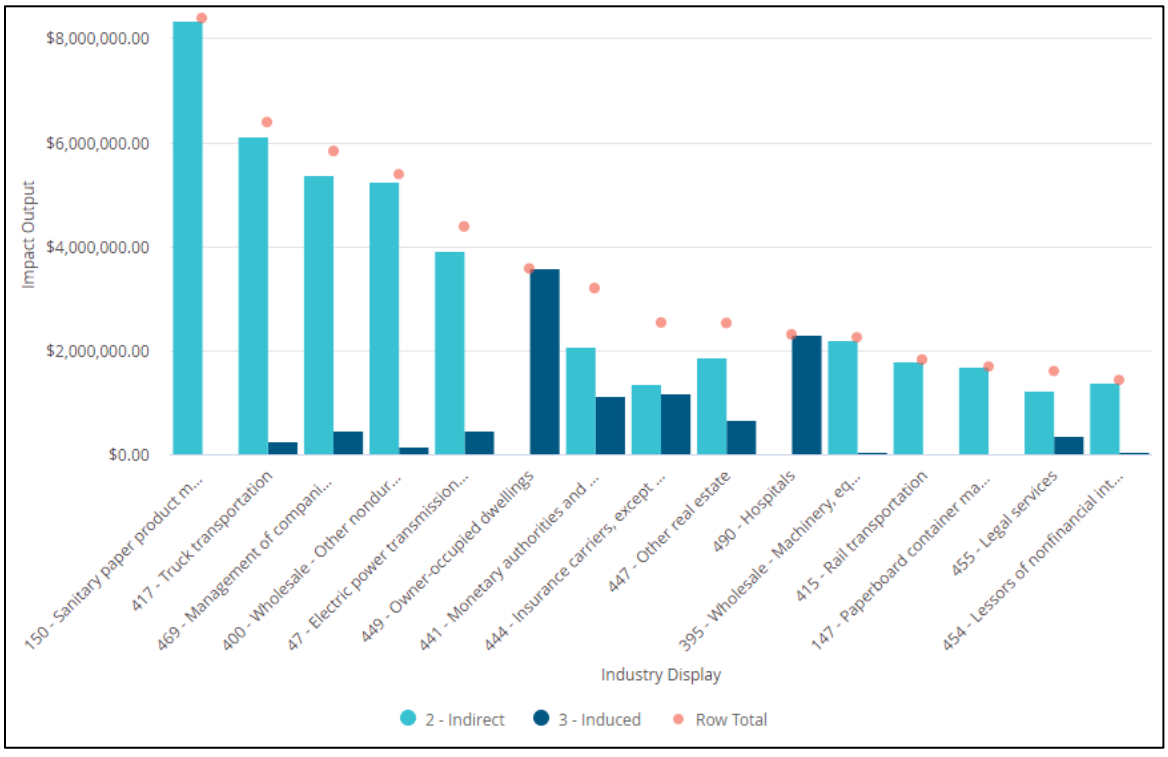


Figure 25
Top 15 Output Industries without Plant Construction Impacts



The non-direct industries that see these employment and economic output impacts are industries that are seen to be building strength in the region. Wholesale shows the high revenues per firm in the region and transportation has been a constant infrastructure advantage for the region throughout the century. This would be a strategic move if encouraging strengths in the Macon CSA is what the local government intended for this deal.

On the employment impact side, transportation is highly impacted just as it was in terms of output. Again, since the construction impacts are somewhat transient all the non-direct employment impacts will end up somewhere in between Figure 24 and 25. The employment impacts are about 4 times smaller without the inclusion of construction impacts. Wholesale of equipment ranks highly again as it did in output. A new sector to point out that appears prominently in both Figure 24 and 25 is the employment services sector. Restaurants and hospitals will see noticeable increased employment from induced effects.

Figure 26
Top 15 Non-Direct Employment Impacts with Plant Construction

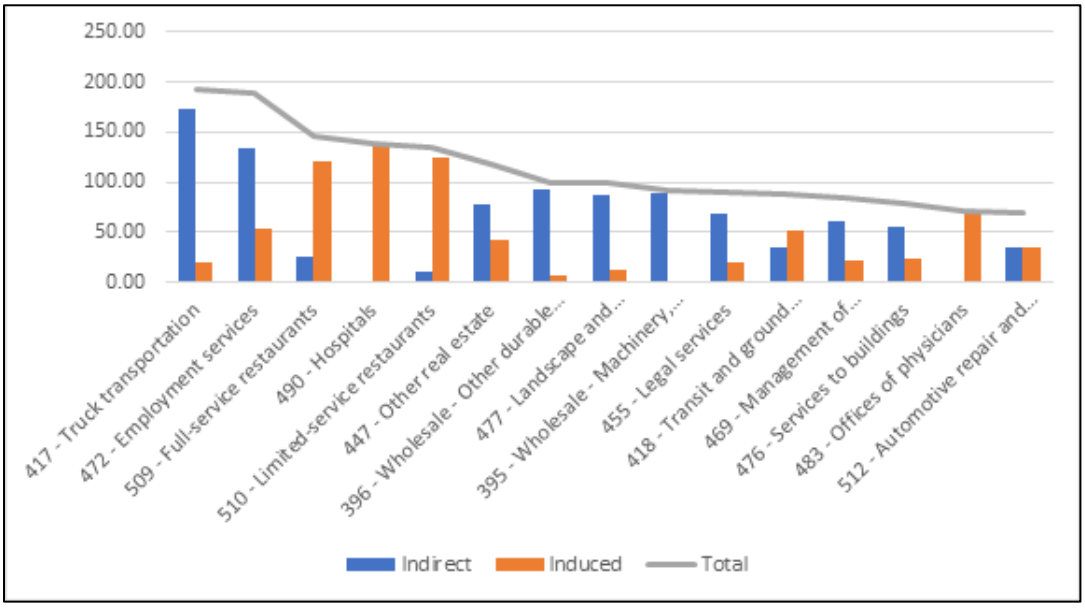
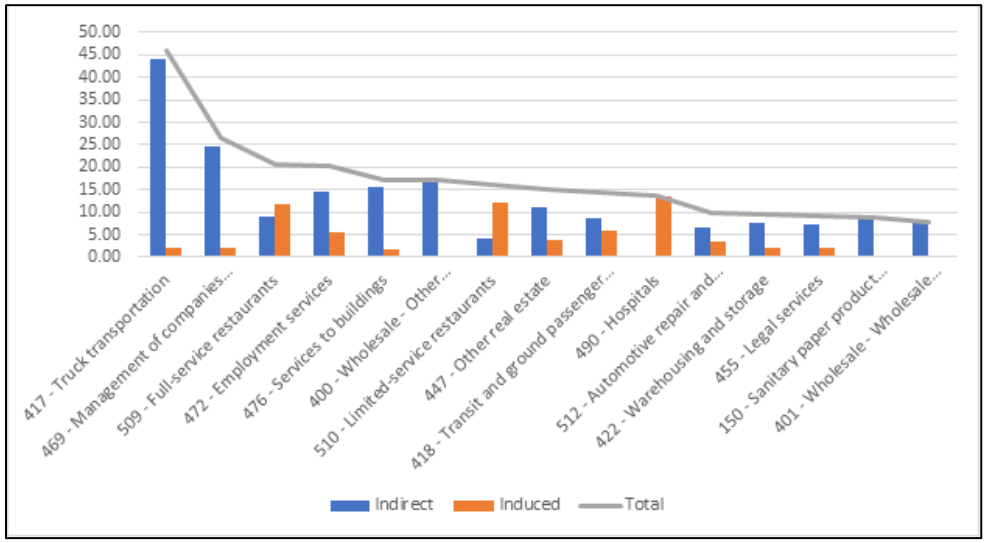


Figure 27
Top 15 Non-Direct Employment Impacts without Plant Construction



The new plant construction and its expansion would add much temporary work from 2017-2022. With respect to long-term growth, the plant would increase the amount of sanitary paper manufacturing jobs. The average wage for a job in this new plant is $63,676 (deduced from payroll). The pay is slightly below average for the region, but almost double the median income for the US and Georgia. For how much Irving is investing in creating and expanding the new manufacturing site, the Macon Irving plant is employing a relatively small amount of people. This may be due to factories having more advanced machines, improvement industrial processes, and higher skilled workers. These relatively few workers may have jobs that current innovation cannot replace, which means that these jobs may last a while.[59] Future innovation may change some of these jobs overtime, but, if these are higher skilled jobs, significant job loss may not be an issue. Additionally, Irving Tissue has a good history of employment characteristics, so these jobs also have a good chance of staying around in some capacity with similar pay. While this plant opening may not provide a massive plant employment impact on many citizens, it will generate quality jobs for a smaller population. This plant will continue to encourage and buildup the regional advantage of paper manufacturing jobs.

Beyond the worker impact of the Irving Tissue plant, the deal seems reasonable from a financial perspective as well. The total amount of money exempted and granted is $24,492,709.86 by the county, state, and federal governments with an addition $463,101,890.40 loaned for payback through bonds. Using IMPLAN's models, the county alone receives $20,003,350.03 in taxes for the first 6 years.[57] The county alone could cover the incentives offered by the county, state, and

[59] Drew Desilver, "Most Americans unaware that as U.S. manufacturing jobs have disappeared, output has grown," *Pew Research Center,* July 25, 2017, https://www.pewresearch.org/fact-tank/2017/07/25/most-americans-unaware-that-as-u-s-manufacturing-jobs-have-disappeared-output-has-grown/.

federal government in just over a year assuming that the bonds are not defaulted. Whether or not and how much the county bonds default is an important factor in determining the value of this deal. Table 12 shows the payback periods considering different government scopes. In addition, Appendix tables C-H show the theoretical book values. Different scopes of government give different incentives and collect different tax amounts. Government Scope in Table 12 is meant to describe the additional incentives given to Irving with additional levels of government and additional taxes collected from Irving with additional levels of government.

Table 11[57]
Irving Plant Payback Over Various Government Scopes

Government Scope	Payback Period (Years)	All Bonds Default
County	1	No
County	118	Yes
County + State	1	No
County + State	29	Yes
County + State + Federal	1	No
County + State + Federal	4	Yes

Note: Bond Interest is not accounted for, inflation is not adjusted for, taxation rate assumed to be constant to 2022 taxation rates, post construction taxation assumed to differ from construction taxation period

Overall, the deal is likely good for the region. The financial aspect of the deal seems solid. The payback period for given and exempted incentives offered is one year for all levels of government scope incentives and taxation. It is advised to keep an eye on the large amount of bonds approved. If all the bonds are assumed to default, which is very unlikely, then Table 12 shows that it would take the county a considerable amount of time to recover. The employment and output perspectives on the deal are good as well. Greater than one multipliers are seen in Table 11. While there are decent multipliers, it would be preferred if the total quantity of direct employments by the manufacturing plant were larger in total count given the amount of money involved in the project. It is beneficial for the region that most of these plant jobs are in STEM fields with a decent amount of pay and long-term employment. This plant should result in a positive amount of inter-industry and induced economic activity in both the short-term construction capital injection and the long-term paper plant employment. The inter-industry sectors that notably see activity are transportation, wholesale, and human/company management services. The impacted industries resulting from this plant confirms the strengths of the Macon CSA economy as discovered in the economic sector, economic infrastructure and assets, the location quotient analysis, the shift-share analysis, and SWOT analysis sections of this report.

It is important to note that this IMPLAN input output model has many limitations that apply to basic input output models and only some are explicitly reviewed in this paper. This is not a statistical analysis, so significance and confidence intervals on these IMPLAN models cannot be given. The static results presented in this analysis do not account for dynamic effects that may

have or will occur such as innovations in manufacturing processes and any effects from outside the Macon MSA region.

Cluster Analysis

Every city wants to have industrial specializations, for several reasons both economic and personal. For one, specialization breeds identity, which itself leads to civic pride and stability. Steel is more than a historic strength for Pittsburgh; it forms the core of the city's ethos and has largely dictated its trajectory. Secondly, the visibility of a prominent cluster can provide a snapshot of overall economic health. In addition, clusters generally are in exporting industries, meaning that successful ones both indicate at least a certain measure of economic competitiveness for the city and are likely to have high multiplication effects on local employment.

Even before Michael Porter's famed expository on cluster theory in the late 20th century, economists and politicians have recognized that although there is robustness in economic diversity, there is growth in specialization. More recent writings have confirmed this. Ron Martin and Peter Sunley write that "there is now much evidence that there are forms of positive feedback in regional and cluster development so that initial advantages and firm location decisions may initiate path dependent, self-reinforcing trajectories, and indeed Krugman (1996) argues that such feedbacks and spillovers are good examples of emergent effects."[60] There are potential downsides to clusters – namely, economic isomorphism and oligopoly, innovation-retarding complacency – but they persist both as an avenue of growth and organic result of urban economic evolution.

Although simple spatial concentration is the baseline for cluster identification, it is insufficient. To have the information-sharing and innovation that is the true hallmark of clusters, there must be relationships. As one scholar puts it, "it is the type of network relationships between organizations (firms, institutions) rather than their spatial clustering alone that determines the ability of regions to adapt."[61] These relationships vary depending on the industry and may not even be able to be quantified; in the case of Macon, a wide variety of research tools will be used to determine if these channels exist.

Cluster identification is notoriously difficult, but all agree it consists of more than location quotients. One Dutch economist, Arjen van Klink, provides a representative and agreeable definition, stating beyond specialization, clusters must include "economic interaction in a value chain, strategic inter-firm relations, specialization, cooperative competition, innovation and diffusion, shared cultural context and interpretation schemes."[62] Again, many of these criteria are

[60] Ron Martin and Peter Sunley (2007), "Complexity thinking and evolutionary economic geography," *Journal of Economic Geography* 7(5), https://doi.org/10.1093/jeg/lbm019.
[61] Kevin Morgan (2010), "The learning region," *Regional Studies 31(5),* https://www.tandfonline.com/doi/pdf/10.1080/00343409750132289.
[62] Arjen van Klink and Peter de Langen, "Cycles in industrial clusters," *Royal Dutch Geographical Society* 92(4), https://www.researchgate.net/publication/292452883_Cycles_in_industrial_clusters_The_case_of_the_shipbuilding_industry_in_the_Northern_Netherlands.

unquantifiable or even subjective; but even if they are not signifiers of cluster status, their presence can be thought of as signifiers of cluster strength.

Two potential clusters for Macon are the insurance activities (NAICS Code 524) and paper manufacturing (NAICS Code 322) sectors. Both significantly high location quotients, the first step to cluster identification; insurance stands at 2.34, up from 1.81 in 2000, while paper is currently at 3.17, also representing significant growth since the 2.13 figure in 2000. As one might expect given its status as an old, regional hub with a diverse mix of manufacturing, services, education, and governmental employers, the Macon CSA has few industrial specializations, and these two sectors stand out simply by having a specialization at all, and more so, by having a specialization that is as strong as it is.

As might be expected, examination of national input-output tables reveals that paper manufacturing is a fairly insular industry. That is, most of its inter-industrial connections are within very related fields. For instance, the top four industries that use paper mill products are paperboard container manufacturing at $0.173 per dollar of final product cost, stationery product manufacturing at $0.098 per dollar, paper bag and treated paper manufacturing at $0.078 per dollar, sanitary paper product manufacturing at $0.058 per dollar, and printing at $0.05 per dollar. Each of these four subfields falls under the classification of NAICS Code 322. In other words, there is high product usage between related industries, meaning that several of van Klink's cluster qualifications – diffusion, strategic relationships between related industries, and interaction among a value chain – exist at least at a baseline level of sales. In other words, although every intermediate industry sells their products to some other industry, the fact that paper manufacturing relies so heavily on channels within highly related industries indicates a likely and notable level of relationship strength.

Georgia ranks fourth in the nation for employment in the paper manufacturing industry, so the specialization extends beyond Macon.[63] Regardless of what subfield one considers, paper manufacturing is generally an input-intensive industry, meaning that it is helpful to be closer to the primary input (wood and other paper products) than the end consumers. Considering it this way, the Macon CSA is an ideal location for the industry – close to the major pine wood-producing forests of rural middle and southern Georgia, Alabama, and Florida, located at the intersection of rail and road lines, and yet relatively close to potential major intermediate purchasers and logistics hubs in Atlanta. Jacksonville, and to a lesser extent, Charleston, Savannah, Birmingham, and Tallahassee. Figure 27 demonstrates this potential economic advantage by mapping regional specialization in paper manufacturing – Macon sits at an ideal location to receive inputs and distribute outputs from the regionally-specialized Black Belt that spans the entire South. Indeed, Irving Tissue listed easy transportation and shipping access (rail lines, specifically) as their primary reason for selecting the Macon CSA for their new plant.[64]

[63] "Paper and Packaging," *US Cluster Mapping*, https://clustermapping.us/cluster/paper_and_packaging#related-clusters.
[64] "Irving Consumer Products to invest $400 million in Macon-Bibb County," *Georgia USA*, August 9, 2017.

Figure 27[65]
Paper Manufacturing Specialization by Economic Area

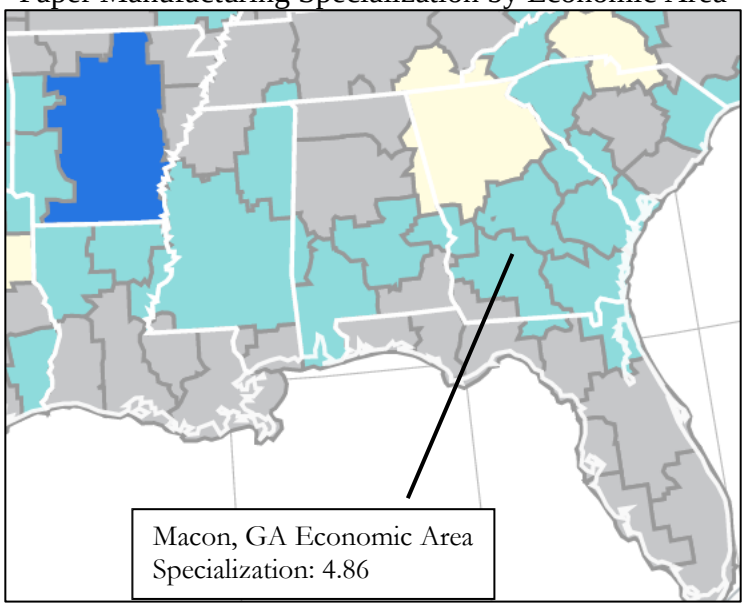


Table 12[66]
Top industry-to-industry inputs for major paper manufacturing subsectors
Listed as production cost required per dollar of delivery to final output[67]

Industry Description	Paper mills	Pulp mills	Paperboard mills	Paperboard mfg.
Paper mills	1.01835	0.00937	0.00789	0.17266
Petroleum refineries	0.06007	0.06755	0.06234	0.05534
Oil and gas extraction	0.05778	0.06383	0.06074	0.05109
Other basic organic chemical manufacturing	0.05725	0.04046	0.03805	0.03006
Forestry and logging	0.05546	0.10734	0.08518	0.03303
Electric power generation, transmission, and distribution	0.05397	0.03887	0.06194	0.04319
Other basic inorganic chemical manufacturing	0.05175	0.07091	0.04058	0.02228
Other durable goods merchant wholesalers	0.04892	0.08299	0.07847	0.03629
Pulp mills	0.04713	1.03476	0.00687	0.02289
Management of companies and enterprises	0.04230	0.03969	0.04342	0.03501
Sawmills and wood preservation	0.04154	0.16165	0.07726	0.02956
Other nondurable goods merchant wholesalers	0.03713	0.02192	0.02247	0.05904
Truck transportation	0.03032	0.03306	0.03028	0.04151
Petrochemical manufacturing	0.02569	0.02501	0.01707	0.01603

A look at inputs to paper manufacturing reveals what one might expect – as a relatively simple industry, the key requirements are chemicals, wood, and the transportation services to bring those two inputs to the factory. For most paper manufacturers, wood is a primary good sold directly from lumber brokers, while the chemicals used to process paper come from a variety of

[65] "Paper and Packaging," *US Cluster Mapping*, https://clustermapping.us/cluster/paper_and_packaging#related-clusters.
[66] "Interactive Data Tables," *Bureau of Economic Analysis*, https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=151&step=1.
[67] Karen Horowitz and Mark Planting (2009), "Concepts and Methods of the U.S. Input-Output Accounts," *Bureau of Economic Analysis*, https://www.bea.gov/sites/default/files/methodologies/IOmanual_092906.pdf.

suppliers. Although the specifics of the supply chain used by Macon CSA paper manufacturers is unknown, there are ten chemical companies within CSA boundaries, opening the door for hyper-local industrial connections.[68]

In terms of the location quotient, the broadly defined "wood products manufacturing" sector has risen incrementally since 2000, possibly in conjunction with growth in paper manufacturing. Although growing, it is important to note that this industry features a high sales, low employment dynamic. For instance, two of the largest companies by sales in the CSA sell paper – Graphic Packing International, a paperboard mill that has the second highest sales volume of any company, and the aforementioned Irving Tissue, a specialty paper mill selling roughly $215 million per year. However, Graphic Packing only employs 550 workers, while Irving employs 350. Although these employment figures are not insignificant, this is not an industry that, regardless of growth, can be expected to carry the employment load single-handedly for the region.

Institutionally, there is limited support for paper manufacturing. Education is the exception. In state, Georgia Tech does offer a specialized research degree for both master's and PhD in paper science engineering master's, but it is unclear how many yearly graduates there are.[69] It does, however, have the Renewable Bioproducts Institute (RBI), which moved to Georgia Tech from Wisconsin in 1989 A true university-to-industry center, the RBI brings together student and faculty researchers from multiple disciplines to solve three primary challenges: circular materials, bioindustrial manufacturing, and paper, packaging, and tissue manufacturing.[70] Even closer to Macon, however, is Auburn University, a mere 140 miles away from downtown Macon. Auburn features the Alabama Center for Paper and Bioresource Engineering, which brands itself as "the nation's only pulp, paper & bio-resource research and education center that offers undergraduate curricula with pulp, paper & bio-resource specializations for chemical, electrical, and mechanical engineering students, and a multidisciplinary research environment for engineering graduate students and faculty."[71] These two specialized centers, both in close proximity to Macon, give the city's paper manufacturers a truly unique advantage nationally over other CBSA's, provide a possible causal explanation for the local growth of this industry, and further confirm its status as a cluster.

Although still significant, the insurance industry has seen less comparative growth and is of less richness than the paper manufacturing industry. Unlike its counterpart, insurance is fundamentally a service industry, and relies on teams of customer service, sales, financial agents, actuaries, and other business professionals who work with people, their data, and their money, instead of raw materials like wood or steel. This is notable: unlike paper manufacturing, a natural-resource based, low-employment – high-output physical production industry that is sensitive to broader macroeconomic trends, insurance represents quite nearly the opposite. It is knowledge and service work instead of physical and value-added, white-collar instead of blue,

[68] "County Business Patterns 2017," *United States Census Bureau,* https://www.census.gov/data/datasets/2017/econ/cbp/2017-cbp.html.
[69] "Paper Science and Engineering Program," *Georgia Tech,* https://rbi1.gatech.edu/paper-science-engineering-program#requirements.
[70] "Renewable Bioproducts Institute," *Georgia Tech,* https://research.gatech.edu/rbi.
[71] "Alabama Center for Paper and Bioresource Engineering," *Auburn University,* https://www.eng.auburn.edu/research/centers/ac-pabe/index.

and worker-intensive instead of capital-intensive. To verify these assertions, we turn to the County Business Patterns data for industry-level results. Whereas the "forestry and logging" sector (NAICS 322) employed 1,064 workers in 2017, the "insurance carriers and related activities" sector (NAICS 524) employed 8,072.[72] Both industries are critical to Macon's success on their own merit and their own unique way, but the relative employment priority of the insurance sector is undeniable. If Macon is able to maintain and grow this sector and its ancillary industries, it will have achieved a significant win for diversification and long-term health.

Table 13[73]
Top industry-to-industry inputs for major insurance subsectors
Listed as production cost required per dollar of delivery to final output[74]

Industry Description	Insurance agencies, brokerages, and related activities	Insurance carriers (not direct life)	Direct life insurance carriers
Insurance agencies, brokerages, and related activities	1.89600	0.52587	0.16211
Funds, trusts, and other financial vehicles	0.04344	0.01206	0.00741
Securities and commodity contracts intermediation and brokerage	0.02873	0.01442	0.01129
Insurance carriers, except direct life	0.02408	1.16351	0.06203
Other financial investment activities	0.02307	0.01021	0.00579
Other real estate	0.01963	0.04980	0.02309
Monetary authorities and depository credit intermediation	0.01390	0.01122	0.04338
Employment services	0.00799	0.00490	0.00419
Management consulting services	0.00790	0.00424	0.00364
Direct life insurance carriers	0.00743	0.00436	1.00134
Legal services	0.00570	0.02404	0.03163
Accounting, tax preparation, bookkeeping, and payroll services	0.00564	0.01643	0.02153
Management of companies and enterprises	0.00550	0.00733	0.00665
Nondepository credit intermediation and related activities	0.00421	0.00445	0.00455
Full-service restaurants	0.00363	0.00437	0.00167
Nonresidential maintenance and repair	0.00361	0.00418	0.00305
Wired telecommunications carriers	0.00336	0.00586	0.00235
Services to buildings and dwellings	0.00317	0.00457	0.00385
Advertising, public relations, and related services	0.00283	0.00445	0.00415
Civic, social, professional, and similar organizations	0.00053	0.00605	0.01054

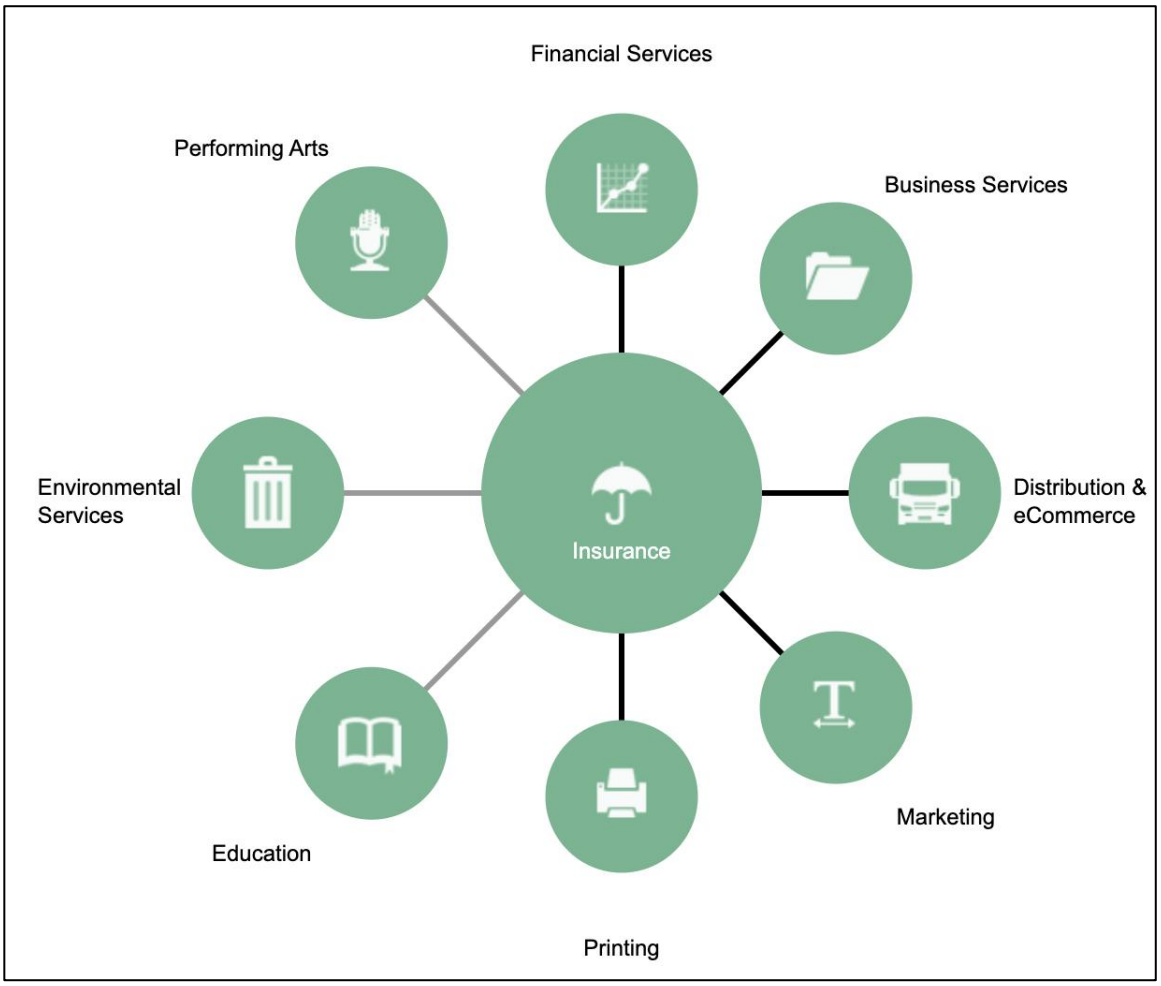
As Table 13 shows, the companies required to support the insurance sector are divergent from those of paper manufacturing, further solidifying the assertion that these operate in totally different economic spheres. All of the auxiliary industries listed above are similarly in the service sector, with many being the ones generally thought of as "business services:" legal,

[72] "County Business Patterns: 2019," *United States Census Bureau,* https://www.census.gov/data/datasets/2017/econ/cbp/2017-cbp.html.
[73] "Interactive Data Tables," *Bureau of Economic Analysis,* https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=151&step=1.
[74] Karen Horowitz and Mark Planting (2009), "Concepts and Methods of the U.S. Input-Output Accounts," *Bureau of Economic Analysis,* https://www.bea.gov/sites/default/files/methodologies/IOmanual_092906.pdf.

consulting, human resources, various financial services, telecommunications, advertising, and accounting. With Macon seeking to solidify its status as a regional hub in this changing economic era, prosperity and steady growth in a services-exporting industry like insurance could matriculate to comparably employment-heavy sectors.

Michael Porter's Cluster Mapping project provides additional support to these inter-industry linkages through Figure 28 below. The thicker the line of linkage, the more reliant the relationship. Logistics and printing both appear prominently on the list, along with the host of business services, with logistics confirming a regional advantage jointly taken advantage of by the paper manufacturing and insurance industries and a possible overlap, if only in sales, between insurance and paper/printing. In addition, Porter also ranks the Macon metropolitan area as being fiftieth in the nation in employment in insurance, reaffirming the fact that it is punching above its weight nationally.

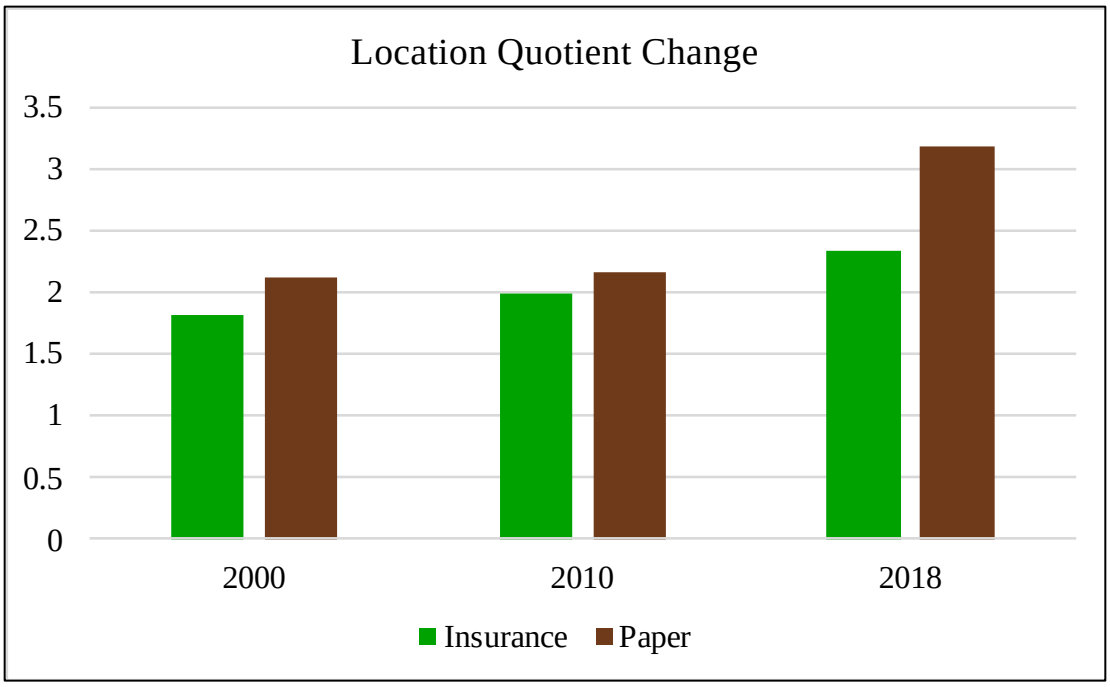
Figure 28[75]
Insurance Cluster – Linkages



[75] "Insurance Services," *US Cluster Mapping*, https://clustermapping.us/cluster/insurance_services#related-clusters.

As with paper manufacturing, there is no reason why the Macon CSA should not continue to exhibit strength in insurance. The potential exists for these industries to build off of the other's strength and existence; for instance, the more local accounting, legal, or printing options there are, the more comfortable insurance firms may be in relocating to Macon. This quantifiable phenomenon is called urbanization economies of scale, and is particularly true for professional, service industries like insurance. Moreover, service sectors are increasingly establishing footholds outside of major metropolitan areas. If an insurance company feels confident in the growing network of business service companies in Macon, has the capacity to interact with clients remotely or make the short drive to the Atlanta airport, and wants to take advantage of Georgia's fifth-lowest cost of living in the nation in a small, culturally rich town, they need look no further than the Macon CSA.

Figure 29
From Table A (Appendix)



In terms of policy, there are major risks with leaning too heavily into industrial policy or sectoral strategies. While there are easily implementable actions that a local government can take, including distribution of major grants or tax breaks to boost employment or capital investment in the sector of choice, officials must query their souls to determine their motivations – is it to build the most vibrant, innovative, competitively independent, and diverse economy, or do those feelings crop from self-aggrandizement, the need for quantifiable proof of policy success, or the psychological reasons for cluster development listed previously?

To give one example of thought for cluster theory, we can turn to Germany, where economic developers and political philosophers have long pondered this question. One guiding concept that has emerged from the debate of the past century has been adherence to *Ordnungspolitik*, or an approach of "regulatory/constitutional policy," whereby economic development officials seek to

concentrate on the rules of the economy to create socially and economically beneficial externalities. Instead of interfering in the marketplace itself (for instance, by choosing a particular industry to foster), they instead should enhance the economic framework overall. As one author puts it, "the constitutive requirement for a beneficially working competitive market order was that it must be a privilege-free order, an order in which all persons enjoy the same legal status. As the essential liberal principle, they regarded that 'the state should on no account be allowed to confer privileges,' to grant preferential treatment to particular persons or groups from which others are excluded."[76]

With this reasonable and sound principle in mind, Table 14 shows several key policy steps that could be made to improve the competitiveness and growth of these two specific clusters in ways that could strengthen the broader local economy, and that, although they may be preferential, do not require the expensive favoritism decried above.

[76] Viktor Vanberg (2017), "Ordoliberalism and ordnungspolitik," *Aktionskreis Freiburger Schule,* https://www.eucken.de/wp-content/uploads/Ordoliberalism-and-Ordnungspolitik.pdf.

Table 14
Appropriate Cluster Policy Options for the Macon CSA

Action Type	**Description**	**Purpose**
Apprenticeship program	Prominently include these two industries in creation of a high school-to-industry apprenticeship or internship program through the GA DOE.[77]	To increase the supply of skilled and local labor to promote the flourishing of these two industries specifically, and the local economy generally.
Institutional connections	Establish stronger relationships with paper research centers at Auburn and Georgia Tech.	To strengthen relationships within the local cluster, and expose them to innovation in paper manufacturing.
Industrial connections	Promote any existing trade organizations or business fellowships, and encourage creation of such if none exist.	To ensure that if these two clusters decline, it is not through lack of communication or shared knowledge within the industries or among similar industries.
Ensure logistics superiority	Fund improvement in rail, river, and highway transportation, especially to the ports of Savannah and Jacksonville and consider subsidizing education of workers or relocation of companies.	To strengthen this critical commonality that links the present and future success of these two clusters, and the rest of Macon's exporting industries.
Cost and quality of life	Continue to work with local officials and private sector to ensure that the cost of living/quality of life ratio is as small as possible.	To attract companies that may have been scared of crime rates/public school system, as well as providing them with recreational, cultural, and connectivity (Internet) that matches Atlanta, Charleston, or Jacksonville.

[77] "Youth Apprenticeship Program," *Georgia Department of Education*, https://www.gadoe.org/Curriculum-Instruction-and-Assessment/CTAE/Pages/Youth-Apprenticeship-Program.aspx.

Innovation and Entrepreneurship Assets

The innovation and entrepreneurship assets can be thought of as organizations in five different categories. Figure 30 shows the categorization of different Macon MSA organizations: General Entrepreneurship, Military Related Software, Military Related Engineering, Maker Spaces, and Medical Innovation.[78]

Figure 30
Organization Asset Categories

The general entrepreneurship group of organizations tend to have the most defined assistive infrastructure and the greatest connections. Mercer Innovation Center (MIC) is one of the largest players in the scene and is a branch of Mercer University. MIC Provides three main programs. The most tangibly impactful program is the MIC Fellowships which is just four years old. The other two programs are Co.Starters and the Next Big Pitch Idea Competition. The MIC fellowship comes with many diverse perks such as up to $20,000 in startup funds, access to Mercer facilities, office space in their incubator, opportunities to pitch to Georgia investors, Mercer University interns, coaching from businesses and faculty, and access to workshops and an entrepreneurial community. Additionally, they sometimes work with the Advanced Technology Development Center and Atlanta Technology Village. They have had eight past tenants and currently have 4 new tenants. The current tenants range from biomedical solutions, KalMed Healthcare and KRS MedTech, to cloth ware start-ups, Royalty Headwear. Co.Starters

[78] "Innovation in Middle Georgia," *Middle Georgia Innovation Project,* https://www.478innovates.com/innovation-in-middle-georgia.

is the second initiative from MIC that offers a 9 week cohort-based program to build small-businesses. There is a $199 cost to attend. Co.Starters focuses on creating lean and effective business models that are practical and can be tested immediately. The last program sources entrepreneurs from Mercer undergraduate populations and is called the Next Big Idea Pitch Competition. This program offers up to $6000 in prize money for innovative undergraduate projects. MIC is funded by Mercer University and in part by the Community Foundation of Central Georgia, previously mentioned in the Government Structures and Economic Development Entities section of this report.[79]

Figure 31
MIC Center Interaction with Mercer Students

The other large player in the general entrepreneurship category is NewTown Macon. NewTown Macon is a bit nontraditional in this entrepreneurial space, as they are a public-private partnership that serves as an economic and community development organization for Macon. NewTown's interest in the entrepreneurial scene of the Macon MSA is to see the downtown economy and space revitalized as entrepreneurs grow their businesses in Macon. As such, they are also a part of the National Main Street Network. NewTown Macon has been a major driver in the noticeable downtown revitalization so far and was started by the Peyton Anderson Foundation's funding. Ideally, NewTown wants to see Macon entrepreneurs develop the downtown space and inhabit the downtown area with their newly successful businesses.

To see this happen, NewTown Macon provides unprecedented resource structures to entrepreneurs due to their private-public position. NewTown Macon launched a Business Improvement District (BID) in central Macon. They established Middle Georgia's first Community Development Financial Institution (CDFI) called NewTown Loans. This CDFI give micro loans, commercial and residential real estate loans, and term loans. They are a secondary

[79] "Mercer Innovation Center Announces Fourth Class of Fellows, Companies-in-Residence," *Mercer Innovation Center*, http://mic.mercer.edu/2019/08/22/mercer-innovation-center-announces-fourth-class-of-fellows-companies-in-residence/.

lender and line of credit for new business owners and non-traditional applicants such as female entrepreneurs, racial minorities, and first-time borrowers. NewTown Macon redevelops and acquires downtown properties as well.

The last notable entrepreneurial oriented programs are the developer's academy and the entrepreneur's academy. These programs are designed to create a pipeline for individuals to succeed in their own businesses and slot them into downtown Macon infrastructure. In its most recent year, NewTown saw major funding from membership dues, COVID-19 PPP, campaign contributions, and distributions from NewTown Loans. NewTown Macon operates with a bit by the creative class theory in creating physical spaces and amenities that attract productive people. They do not just stop at attraction though. They have also created many systems to help native Macon entrepreneurs grow their businesses through the aforementioned CDFI and training academies.[80]

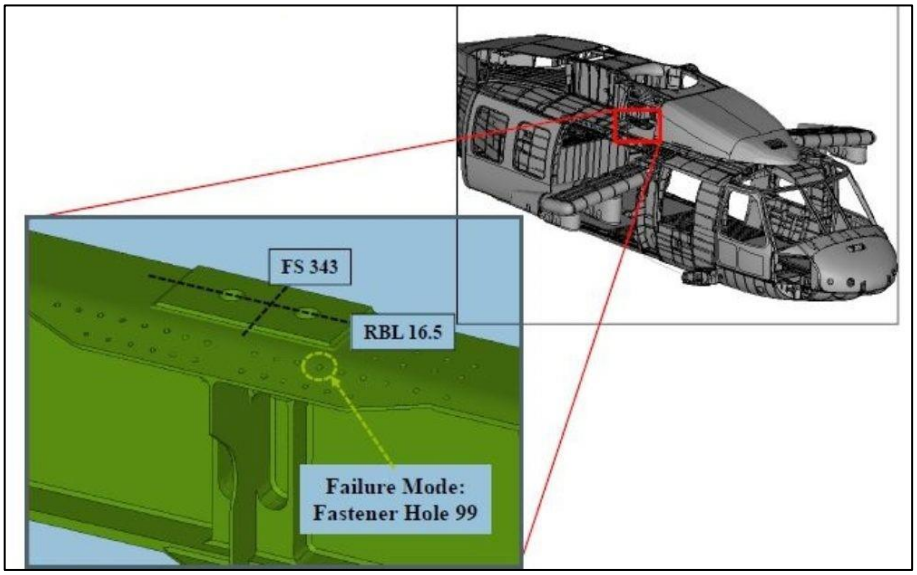
Figure 32[81]
Newtown Macon Developing Downtown Macon

The next notable categories of organizations fall into the Military Software and Military Engineering Innovations. These organizations range from more education military funnels to full on operational military teams and project innovations. These organizations exist almost entirely because of the proximity of the Robins Air Force to the central arteries of the Macon MSA in addition to Robins Air Force base representing a major financial investment for the US Military compared to other air force bases in Georgia. The air force chose to invest resources into innovative software development specifically in the region. The organizations that are involved in most official innovations are Blue Sky Labs and MERC. Blue Sky Labs is intended to operate as a Silicon Valley type location in downtown Macon. This lab is supposed to work on air logistics and support software. Engineering squadrons operate in Blue Sky labs in conjunction with university professionals from Mercer and other university computer science schools.[82]

[80] "NewTown Macon," *NewTown Macon,* https://newtownmacon.com/.
[81] "Growing Home: NewTown Macon," *Georgia Power Community and Economic Development,* https://www.selectgeorgia.com/news-and-updates/growing-home-newtown-macon/.
[82] Rachel Gambill, "Ceremony marks opening of Robins software lab at site of iconic music label," *Macon-Bibb County,* https://www.maconbibb.us/blueskylabopens/.

On the non-software engineering side, MERC is a subdivision of Mercer University that acts more as a development and research contractor to the air force. They are a team of professionals that specialize in engineering analysis. They are funded by the University and military contracts.[83] A partnership orientated toward general education development from the air force is seen in the Center for Software Innovation. This center is based in the Middle Georgia State University Warner Robins Campus School of Computing facilities. These software projects are more to engage a more general population in innovation such as IT professionals, entrepreneurs, business owners, non-profit leaders, faculty, and undergraduate students. These programs take the form of education courses, training sessions, and collaborative software solution projects.[84]

Figure 33
Failure Modes of Helicopters in MERC's Acrule Research Project[85]



The maker space category is comprised of Spark Macon Startup Space and Fire Starter Fab Labs. Spark Macon was launched by the Middle Georgia Regional Commission's (MGRC) efforts and is targeted for entrepreneurs to have a place to prototype products, initial commercial production, office space, and access to innovation experts. To access these resources, entrepreneurs or other types of community member must pay anywhere from $440-$3600 per year for varying levels of access.[86] Fire Starter was created as a joint effort between many public organizations and is more orientated for a wider audience including STEM education and community hobbyists. The Fire Starter lab has a larger variety of manufacturing resources than Spark Macon. The Fire Start Labs is funded by a large amount of public and private entities in Houston County and does not charge guests or members for most services including use of their equipment and attending

[83] "Mercer Engineering Research Center," *Mercer Engineering Research Center,* https://www.merc-mercer.org/.
[84] "Center for Software Innovation," *Middle Georgia State University*, https://www.mga.edu/computing/software-innovation.php.
[85] "Accrule," *Mercer Engineering Research Center,* https://www.merc-mercer.org/project/acrule/.
[86] "About Sparkmacon," *SparkMacon Startup Space,* http://www.sparkmacon.com/about/.

fabrication classes.[87] In the Economic History and Sectoral Structure section of this report, it was seen that most firms in the Macon MSA were non-employer firms. As such, these non-employer firms might have a large opportunity to take advantage of these product development infrastructures that were previously non easily available to companies of their size.

Figure 34
Fire Starter Fab Labs Wood Working Space[88]

Lastly, there is the medical innovation space in the Macon MSA. The only mover specifically in this space is the Center for Disruption and Innovation. This Center is a partnership between Mercer biomedical engineering and business schools with Atrium Health Navicent. This center is targeted at innovation in clinical research, effectiveness, cost, efficiency, technological applications, and consumer healthcare.[89] There is limited information available about this innovation partnership, but this team up direction utilizes the strength of the region's medical knowledge as the following knowledge assets section investigate in detail.

Many of these entrepreneurial and innovative organizations are a part of the Middle Georgia Innovation Project. The Middle Georgia Innovation Project is somewhat self-descriptive and is

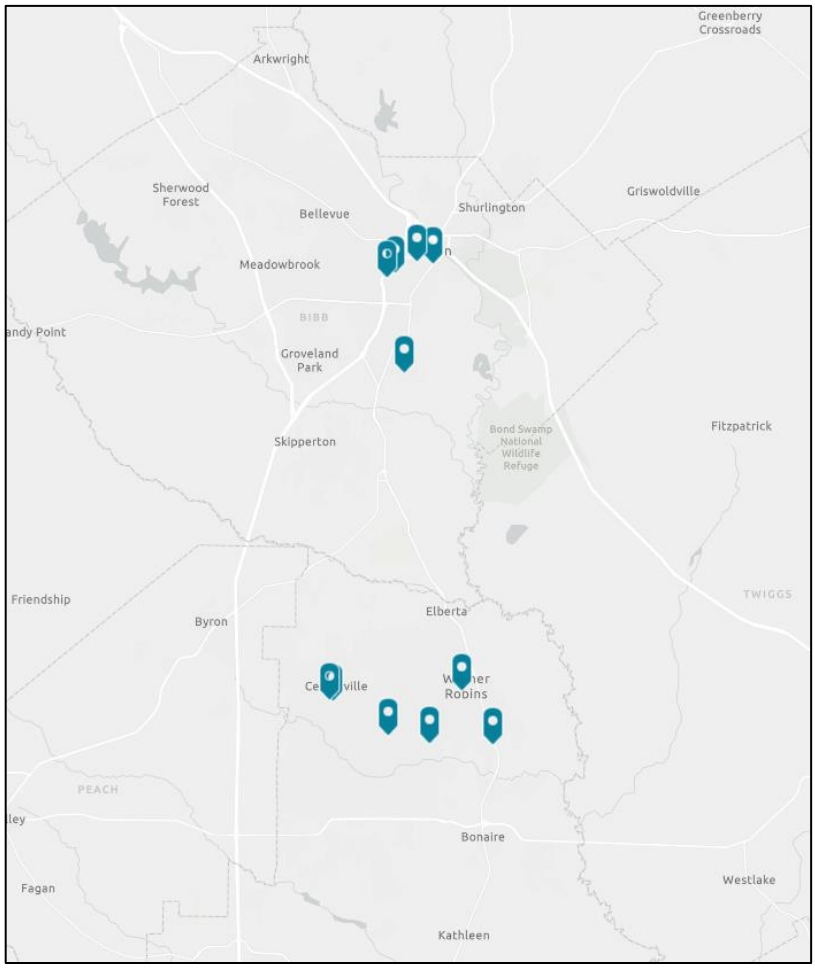
[87] "About the FABLab," *FireStarter FABLab,* https://www.firestarterfablab.com/about.
[88] Image 103, *FireStarter FABLab,* https://www.firestarterfablab.com/Gallery/78979234#photo.
[89] "Navicent Health & Mercer University Announce Center for Disruption & Innovation," November 12, 2015, *Atrium Health*, https://www.navicenthealth.org/community/single_news/navicent-health-mercer-university-announce-center-for-disruption-innovation.

focused on creating innovation to attract new industry, businesses, and workforce.[90] The location of organizations in the Innovation Project plan are shown in Figure 35. We see that there is a sharp concentration of these innovative assets located in Warner Robins and downtown Macon. This makes sense as Warner Robins is the largest residential area in the region and downtown Macon is reemerging as an attractive local to live in due to many efforts including NewTown Macon's. This is a tab bit concerning though as the rest of the region still sees no investment compared to these two resource rich regions. The organizations reviewed create a structure for current and new entrepreneurs in the region to thrive. By creating a cluster of talent and entrepreneurial resources, the Macon MSA is hoping to attract larger fish in the pond to move to take advantage of the talent available. If large companies do not move to Macon, however, they are still left with many budding small companies that could make it big for Macon. There are certain players that stand appear often in the starting, operation, or funding of these innovation efforts that have begun to pop up around Macon in the last decade. Groups that have intentionally pushed forward these entrepreneurial development efforts are MGRC, the US Air Force, Mercer University, Middle Georgia State University, NewTown Macon, local foundations, and the Development Authorities in the MSA such as the MCBIA and Houston Development Authority. Macon has no lack of a strong government hand guiding the creation and funding of the entrepreneurial scene whether it happens to be from the local governments, the US military, or the state board of education.

In addition to the more traditional ways of thinking about innovation, the city has already made uses of some of the creative assets in the region. The former downtown studio of the Allman Brothers was repurposed into the space where Blue Sky Incubator was formed and was named accordingly. NewTown Macon, the Robins base, and the local universities had a had in this. A path that connected downtown Macon to the Ocmulgee River, Mounts, and Park was established as well, so that residents of downtown Macon could have easier access. These place making efforts have been used to encourage local residents to the downtown area and to attract new residents into the area from a creative class perspective.

[90] "Innovation in Middle Georgia," *Middle Georgia Innovation Project,* https://www.478innovates.com/innovation-in-middle-georgia.

Figure 35
Middle Georgia Innovation Corridor Organization Locations[91]



While is it difficult to say that the entrepreneurial ecosystem is thriving, it is certainly growing in its current beginning phases. There are many new organizations that have been established. However, the scene has primarily only grown because these new organizations have been established by public entities for the most part, but whether each program grows or not without a public entity established a new organization with outside funds remains to be seen. The areas most lacking in the Macon ecosystem are entrepreneur mentors, advisors and support systems, local and global markets, human capital/workforce, and culture. These softer parts of the ecosystem most likely will not be solved by pure public funding, top-down decision making, and universities that do not specialize in entrepreneurship. Additionally, the Macon MSA is not well connected nationally and internationally as far as business networks or target markets go. Finding appropriate market demand that go beyond the demand of the local military needs will go a long way to see local entrepreneurs succeed and build up the local scene with entrepreneurs of other regions of the world. On the other hand, this top-down approach to developing the entrepreneurial scene has established parts of the ecosystem that are often difficult to have

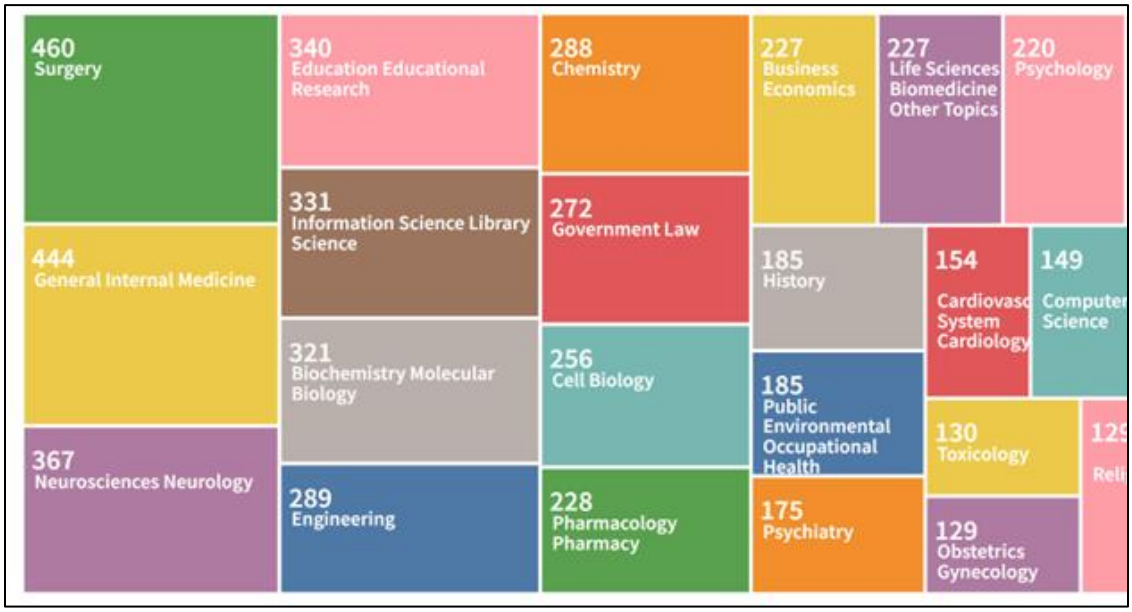
[91] "Middle Georgia Innovation Corridor Exploration Map," *Middle Georgia Innovation Corridor Exploration Map,* https://storymaps.arcgis.com/stories/0dc65ae9e45941c99d8aa67464be70ca.

without public powers stepping in such as funding, education, physical environment, regulatory framework, and infrastructure. The public entities are certainly pushing a digital software forward entrepreneur and innovation scene, but such pursuits may not suit the local advantages of the region.

Knowledge Assets

Knowledge within Macon is a difficult asset to measure. What are representative indicators of knowledge? What counts as useful knowledge? These are all questions that have many different answers. For the purposes of feasibility, the indicators used to measure knowledge assets will be bibliometrics of research articles and patents. While bibliometrics will be used going forwards, they have many limitations as they were not intended to be used as indicators. Some limitations include only being representative of early stages of technology development that have not yet been commercialized and being retrospective rather than predictive. First research articles will be reviewed and then patents in the area.

Figure 36: Topic of Research Articles Based in the Macon Area[92]

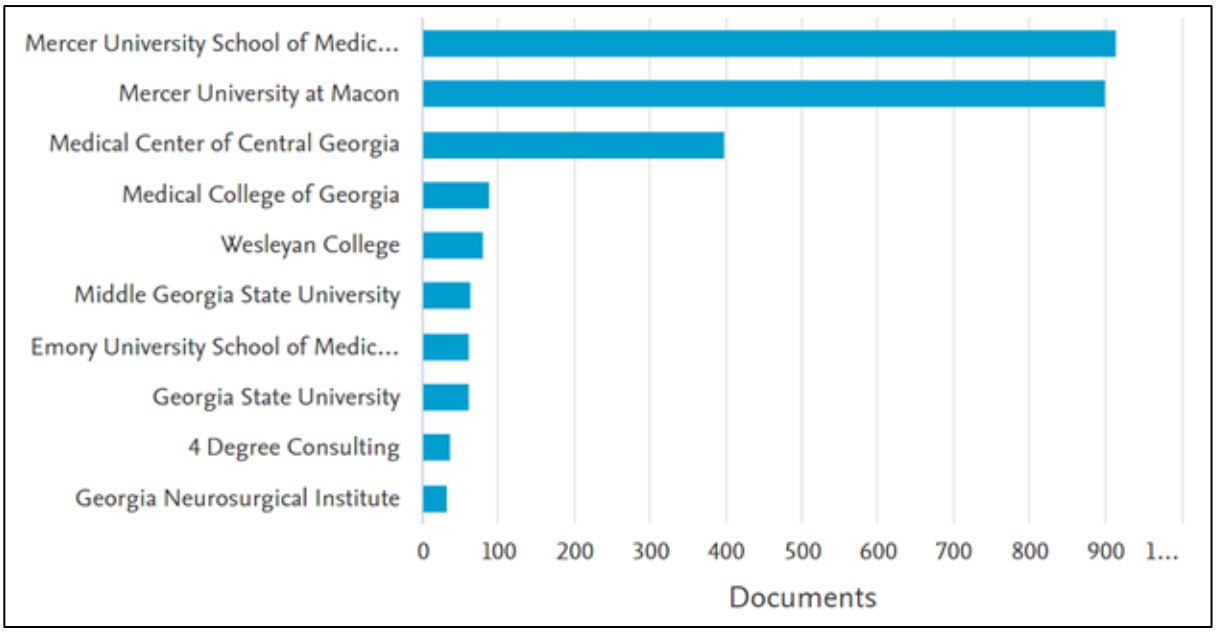


Most of the research articles in the Macon MSA are on the medical related topics. In other words, the primary knowledge asset of the region might be medical knowledge. Topics such as Surgery, General Internal Medicine, Neurosciences Neurology, Biochemistry Molecular Biology, Chemistry, Cell Biology, and Pharmacology Pharmacy fall within this category as seen in Figure 36. These medical papers are likely attributed to the large Atrium Health Navicent Hospital and Mercer Medical School in the region. This will be expanded on further in this section. The topic of Education appearing in research is hardly surprising since many universities are in the area with most of them meant to educate rather than act as research institutions. The topic of Government Law also pops up in the treemap due to Mercer's Law School. The topic of Information Science and Library Science appears which is most likely representative of the

[92] Web of Science, *Clarivate*, https://www.webofscience.com/wos/woscc/basic-search.

software skills that the military has attempted to develop in conjunction with universities. Engineering here is also the same story as this software research.

Figure 37
Research Articles Categorized by Organization Affiliation[93]



Looking at the affiliations of these articles in Figure 37, it become obvious that Mercer University is the main source of these articles. This might show that most of the knowledge in the region is being generated from Mercer University. The high rate of medical publications can be explained through the Mercer University School of Medicine's dominant publication numbers. Additionally, half of these affiliations are medical institutions. Mercer's School of Medicine has access to an immense amount of data and resources that would help its research due to its proximity to the most equipped hospital in the region. These affiliations also show that Macon's medical institutions are communicating with other state medical institutions like Emory in Atlanta and Medical College of Georgia in Augusta. The medical knowledge that benefits one of these institutions may also pour over into their peer state medical schools.

[93] Scopus, https://www.scopus.com/search/form.uri?display=basic#basic.

Figure 38
Documents Published in Macon Over Time from 1896 to 2015[94]

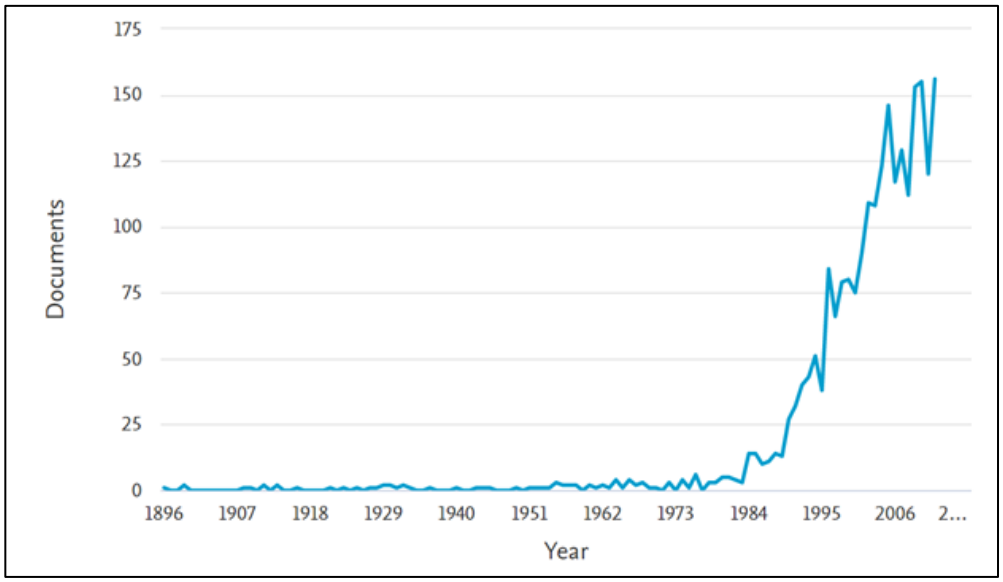
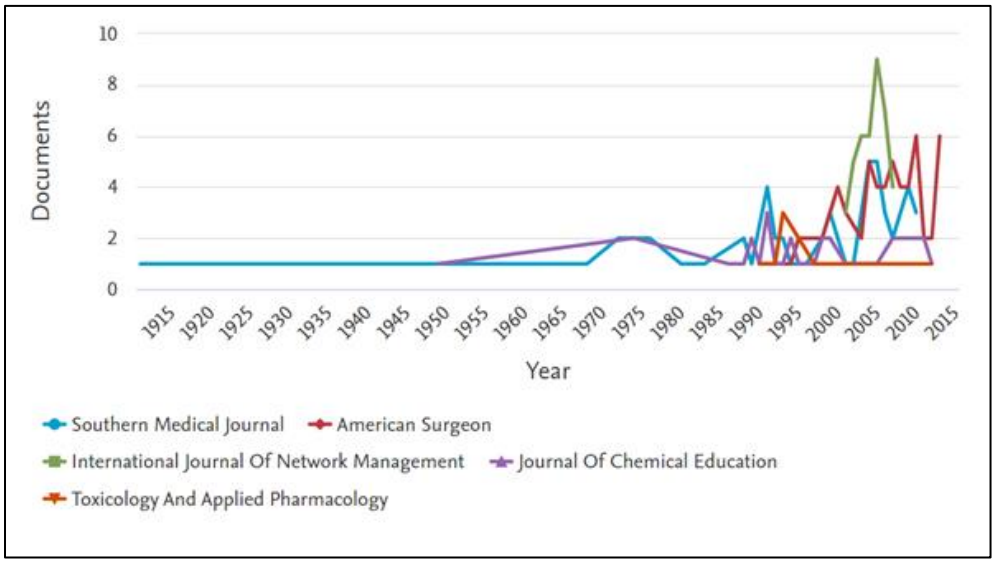


Figure 38 shows that research articles in the region have been growing at a fast pace since 1984. This may indicate that the knowledge assets of the region are only increasing as time goes on which is a good sign for the Macon MSA. There have been some fluctuations in the short-term number of publications, but it seems to have a large continual increase over decades.

Figure 39
Articles over Time by Year and Publication Source[95]



[94] Scopus, https://www.scopus.com/search/form.uri?display=basic#basic.
[95] Scopus, https://www.scopus.com/search/form.uri?display=basic#basic.

Looking at which journals appear most prominently in Macon research, all of them but one are medically related. The standout in Figure 39 is the International Journal of Network Management. We can see a quick rise and sudden decline of these articles in the mid 2000s. This may be the influx of articles that represent the Information and Library Science topic in Figure 36. This sudden injection of articles may represent when the military began to partner with universities to increase the software competitiveness and innovation in the region. The sudden drop off near 2010 is a tab bit concerning though since many of the new official initiatives started in the entrepreneurial scene have taken off after 2010.

It has been observed that the knowledge has increased in output over time and is largely medical knowledge written by medical universities. However, all of this is for naught if the knowledge is useless. A look into the quality of the research is shown in Table 15. The H-index is a measure the quality of a researcher's work. The higher the H-index the better it is. An H-index of 20 is a relatively good level. Table 15 shows that a range between 41, very good, and 16, average for full professor, exists for the top 10 research article authors by number of articles in Macon. An average H-index of 25.5 exists which shows a relatively good quality of research based upon the number of other research articles that cite it. Therefore, it seems that there is some substantive quality to the knowledge being produced in the region.

Table 15
Top Research Article Authors by Number of Articles

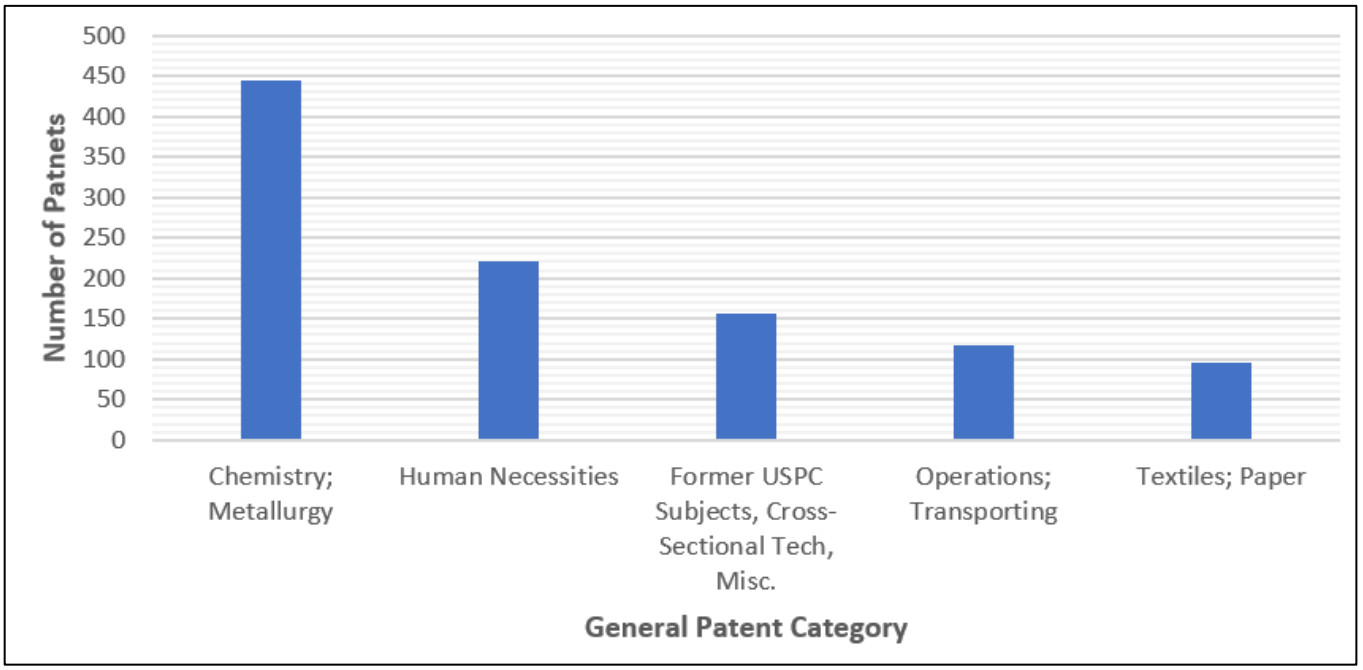
Number of Research Documents	Name	H-index
99	Zalups, R. K.	41
67	Walid, M. S.	16
65	Robinson, J. S.	26
59	Fountas, K. N.	33
58	Lane, J. E.	19
51	Newman, W. H.	22
49	Dalton, M. L.	19
49	Lauterbach, E. C.	29
41	Castresana, M. R.	16
41	Nakayama, D. K.	34
Average H-index		25.5

Data: SCOPUS

Moving away from research articles and onto patents, we can get another measure of knowledge in the Macon MSA that adds more details. PatentsView shows that 768 patents were associated with Macon by inventor location, 258 Inventors appeared on Macon patents, and the Macon patents were assigned to 42 different organizations.[96]

[96] PatentsView, https://patentsview.org/.

Figure 40
The Number of Patents in Macon by Patent Category[97]



Macon shows many patents in Chemistry and Metallurgy, Figure 40. The Chemistry and Metallurgy patents are in a category of their own with almost twice the next most popular category of Human Necessities. If we look close into what types of chemistry the patents are on in Table 16, we discover that the most popular chemistry patents tend to be related to medical uses such as inorganic materials. The next highest patent category is Human Necessities. These patents tend to also be medical related as they represent devices for insertion and surgery amongst other medical uses. Once again, the medical knowledge hub shows up substantially. The last two prominent categories are Operations & Transporting and Textiles & Paper which make intuitive sense. These logistics industries and manufacturing industries hark back to Macon's original textile and railroad economy. While the textile economy has left, the paper manufacturing specialization in the Macon MSA is still very much alive as discussed in study case on Irving Tissue of this report. The logistics industries are where local development authorities are hoping to take Macon in order to capitalize on its location to distribute to all of middle Georgia and its proximity to major transport infrastructure.

[97] PatentsView, https://patentsview.org/.

Table 16
Most Popular Patent Classes[98]

Class	Number of Patents	General Class Description	Detailed Class Description
C01P	132	Chemistry; Metallurgy	Indexing scheme relating to aspects of solid inorganic compounds
C09C	131	Chemistry; Metallurgy	Treatment of inorganic materials to enhance pigment or filling
Y10T	114	Former USPC Subjects, Cross-Sectional Tech, General Tech, Misc.	Technical subjects covered by former us classification
D21H	95	Textiles; Paper	Pulp compositions; coating or impregnating paper
A61M	63	Human Necessities	Device for introducing/taking media to body; sleep or stupor control
A61B	62	Human Necessities	Diagnosis; Surgery; identification
C08K	59	Chemistry; Metallurgy	Use of substances as compounding ingredients
C09D	51	Chemistry; Metallurgy	Coating compositions
A44B	49	Human Necessities	Buttons, pins, buckles, etc.
C04B	48	Chemistry; Metallurgy	Rock building materials, etc.
Y10S	43	Former USPC Subjects, Cross-Sectional Tech, General Tech, Misc.	Technical Subjects Covered by Former USPC Cross-Reference Art Collections [XRACs] and Digests
B29C	36	Operations; Transporting	Repairing, shaping, or joining materials
H04W	32	Electricity	Wireless Communication Networks
B29D	26	Operations; Transporting	Producing articles from plastic state
A61F	23	Human Necessities	Biomedical assistive or invasive products
C11D	23	Chemistry; Metallurgy	Detergents, soaps
A24B	23	Human Necessities	Manufacture/prep of tobacco
B01D	19	Operations; Transporting	Separation
B29L	19	Operations; Transporting	Specific Indexing Scheme
B65D	18	Operations; Transporting	Containers for storage and transport and packaging.

To get a better idea of how these patents are being translated into commercial products and services that can benefit the local economy, the assignees are focused on. The assignees can inform us of what types of organizations are filing these patents. In Table 17, we see that these top assignees by patent quantity are actually owned by somewhat small companies that offer company services and products instead of large institutions that may or may not be able to make market products from their patents. This means that the knowledge may be making its way into the local market and that Macon might see outcomes due to these knowledge assets in the region being used well. We can see a diverse use of this patent knowledge into products that range from batteries in electric vehicles to sanitation equipment for Macon.

[98] PatentsView, https://patentsview.org/.

Table 17
Largest Assignees by Quantity of Patents[99]

Assignee	Patent Quantity	Latest Active Year	Assignee Industry
Southern Spine, LLC	18	2020	Biomedical Product
The Corporation of Mercer University	18	2020	Education; Research
Smisson-Cartledge Biomedical LLC	16	2016	Biomedical Product
Nanomist Systems, LLC	14	2019	Sanitation; industrial; cooling
Blankenship Corporation	12	1999	Professional, Commercial, Supplies Merchant Wholesalers
Premergy, Inc.	11	2021	Battery; EV
Adventure Products	7	2016	Fishing Net Equipment
Donald MacMillan & Son, Inc.	7	1982	Funeral Services
U.S. Arms Company LLC	5	2020	Firearm Manufacturing

The final topic of consideration on patents is the quality. Just as the quality of the research articles was verified, the quality of the knowledge contained in patents is just as important to quantify. The top patents by citation in Macon are shown in Table 18. The average citation count for the top 10 cited patents in Macon is 243.3. Table 18 shows some heavy hitting patents in terms of quality which we are measuring through other patents that cite the top patents in question. 50% of the top 10 patents are for biomedical solutions. The most cited patent is about stem cell used for cartilage repair. This is a foundational technology which is incredibly important. It should be noted that the smoking patent descriptions are somewhat of an outlier since they are all have multiple inventors living in multiple place with one of them residing in Macon in addition to the assignees being located out of Georgia. So, it would be safe to ignore these solutions are representative of knowledge in Macon. It appears that the medical knowledge sphere keeps revealing itself in both the research and patent bibliometric investigations of the Macon MSA area. One large caveat that would require more attention would be the bias that medical paper publishing cycles or medical patent filing lend to this bibliometric analysis. Medical products are a lucrative industry that might see more patent filings that other types of technology by nature of being lucrative. Research papers on medical topic might also receive more funding than other sectors of research. Medical research publishing is also more

[99] PatentsView, https://patentsview.org/.

institutionalized than research in other sectors of knowledge. Many other sectors of knowledge may be overlooked in the Macon region due to the flood of medical knowledge that appears in research and patents.

Table 18
Top Cited Patents[100]

Patent Title	Citations	Class Description
Mesenchymal stem cells for cartilage repair	501	Biomedical Solution
Non-combustible smoking device and fuel element	334	Smoking
Mesenchymal stem cells for cartilage repair	286	Biomedical Solution
Pluripotent mesenchymal stem cells and methods of use thereof	270	Biomedical Solution
System and method for determining the price of an expiration less American option and issuing a buy or sell ticket on the current price and portfolio	243	Computing; Calculating; Counting
Smoking article using steam as an aerosol-generating source	234	Smoking
Method and apparatus for intubation of a patient	154	Biomedical Device
Rapid infusion system	143	Biomedical Device
Interface bus for utility-grade network communication devices	134	Network Communication
Smokeless method and article utilizing catalytic heat source for controlling products of combustion	134	Smoking

[100] PatentsView, https://patentsview.org/.

Alignment with Broader Strategic Direction of Georgia

The Macon-Warner Robbins CSA has a large population itself, but it is a relatively small component of the entire state of Georgia. It is desirable for some strategic economic planning to be conducted at the state level, and it is desirable for locations like the Macon-Warner Robbins CSA to be in alignment with the economic priorities of the state. The Georgia Department of Economic Development highlights six centers of innovation within the state; Aerospace, Agricultural Technology, Energy Technology, Information Technology, Logistics, and Manufacturing[101]. Of these, the Macon-Warner Robbins CSA has the strongest connection to Aerospace and Manufacturing.

The U.S. Air Force Warner Robbins Air Logistics Complex is one of the largest military depots in the United States. According to the 2021 Robbins AFB Economic Impact Report, the airbase is responsible for a $5.46 billion-dollar economic impact on the state of Georgia[102]. Robbins AFB frequently does contract work with civilian aerospace companies, including Boeing, Lockheed Martin, Northrop Grumman, Raytheon, General Atomics, and Rolls-Royce. In 2021, Robbins AFB completed $228 million dollars' worth of contracts within Houston and Bibb County.

Likewise, the Macon-Warner Robbins CSA has higher than typical location quotients for several manufacturing industries, including Paper Manufacturing (3.17), Nonmetallic Mineral Product Manufacturing (1.18), Transportation Equipment Manufacturing (1.37), Miscellaneous Manufacturing (1.01). Manufacturing industries in the region benefit from local transportation infrastructure, relative proximity to nearby ports, and affordability of land. Unlike the Aerospace sector, which is primarily supported by the Robbins AFB, the Manufacturing sector within the region is supported by multiple firms, including the Irving Paper Plant discussed previously.

The Macon-Warner Robbins CSA currently does not have a strong connection to energy technology, though there may be motivation for the region to invest in that sector. Plant Scherer is a coal fired power plant just north of Macon and is responsible for generating over 3,500 MW of energy, making it the 5th largest power station in the United States and the largest power station fueled solely by coal. Consequently, it is also the largest producer of greenhouse gas emissions in the United States and is listed within the top 20 largest producer of greenhouse gas emissions worldwide. Plant Sherer has been the subject of lawsuits and environmental controversy over the last decade, and Georgia Power is currently considering options to close the

[101] *Georgia Department of Economic Development*, https://www.georgia.org/
[102] "2021 Robbins AFB Economic Impact Report," 2021, *Robbins Air Force Base,* https://www.robins.af.mil/Portals/59/documents/2021%20Economic%20Impact%20Statement.pdf

power station entirely and replace its power generation capacity with renewable energy sources.[103]If those new renewable energy power stations are constructed within the Macon-Warner Robbins CSA, there could be additional growth within the Energy Technology sector in the region.

The existing aerospace industry, manufacturing industry, and the potential future energy technology industries are supported by a strong existing base of knowledge resources concentrated within Mercer University. As discussed previously, the Macon CSA is the origin of many patents, and is notably productive with metallurgy, tech, and paper manufacturing patents. Mercer also collaborates with Robbins AFB on targeted research endeavors.

Image 5
Plant Scherer

[103] 'Georgia Power Renewable Plan" (2022), *Georgia Power,* https://www.gpb.org/news/2022/02/01/georgia-power-plan-confirms-move-coal-renewables

Appendix

Table A: Location Quotients

Industry	2018 Location Quotient	2010 Location Quotient	2000 Location Quotient
101 Goods-producing	0.84	0.74	0.84
102 Service-providing	0.90	0.90	0.93
NAICS 111 Crop production	1.29	0.22	0.36
NAICS 112 Animal production and aquaculture	0.11	0.00	0.00
NAICS 113 Forestry and logging	0.55	0.33	0.00
NAICS 115 Agriculture and forestry support activities	0.54	0.15	0.27
NAICS 212 Mining, except oil and gas	1.68	1.61	3.61
NAICS 237 Heavy and civil engineering construction	0.41	0.00	0.00
NAICS 238 Specialty trade contractors	0.61	0.71	1.09
NAICS 311 Food manufacturing	0.13	0.10	0.69
NAICS 313 Textile mills	0.00	0.82	0.65
NAICS 314 Textile product mills	0.06	0.00	0.00
NAICS 321 Wood product manufacturing	0.59	0.56	0.51
NAICS 322 Paper manufacturing	3.17	2.16	2.13
NAICS 323 Printing and related support activities	0.32	0.00	0.31
NAICS 325 Chemical manufacturing	0.12	0.00	0.00
NAICS 326 Plastics and rubber products manufacturing	0.23	0.24	0.00
NAICS 327 Nonmetallic mineral product manufacturing	1.18	1.36	1.09
NAICS 332 Fabricated metal product manufacturing	0.45	0.36	0.37
NAICS 335 Electrical equipment and appliance mfg.	0.20	0.61	0.00
NAICS 336 Transportation equipment manufacturing	1.39	0.16	0.00
NAICS 337 Furniture and related product manufacturing	0.27	0.18	0.71

NAICS 339 Miscellaneous manufacturing	1.01	1.07	1.59
NAICS 423 Merchant wholesalers, durable goods	0.00	0.06	0.05
NAICS 424 Merchant wholesalers, nondurable goods	0.43	0.58	0.51
NAICS 441 Motor vehicle and parts dealers	0.67	0.51	0.42
NAICS 442 Furniture and home furnishings stores	0.56	0.42	0.36
NAICS 443 Electronics and appliance stores	0.27	0.27	0.00
NAICS 445 Food and beverage stores	0.46	0.39	0.35
NAICS 446 Health and personal care stores	0.98	1.15	0.98
NAICS 447 Gasoline stations	1.12	1.14	0.48
NAICS 448 Clothing and clothing accessories stores	0.89	1.02	1.13
NAICS 451 Sports, hobby, music instrument, book stores	1.37	2.02	0.82
NAICS 452 General merchandise stores	1.30	1.29	1.33
NAICS 453 Miscellaneous store retailers	0.30	0.00	0.49
NAICS 454 Non-store retailers	0.40	0.37	0.28
NAICS 484 Truck transportation	0.71	0.68	0.64
NAICS 485 Transit and ground passenger transportation	0.41	0.08	0.40
NAICS 511 Publishing industries, except internet	0.16	0.41	0.61
NAICS 512 Motion picture and sound recording industries	0.16	0.22	0.32
NAICS 517 Telecommunications	0.14	0.11	0.08
NAICS 522 Credit intermediation and related activities	0.64	0.24	0.86
NAICS 523 Securities, commodity contracts, investments	0.03	0.00	0.00
NAICS 524 Insurance carriers and related activities	2.34	2.00	1.81
NAICS 531 Real estate	0.53	0.23	0.72
NAICS 541 Professional and technical services	0.35	0.47	0.32

NAICS 551 Management of companies and enterprises	0.04	0.10	0.04
NAICS 561 Administrative and support services	0.82	0.80	0.86
NAICS 562 Waste management and remediation services	0.13	0.87	0.71
NAICS 611 Educational services	0.00	0.16	0.15
NAICS 621 Ambulatory health care services	1.10	1.04	0.98
NAICS 622 Hospitals	1.04	1.10	1.33
NAICS 624 Social assistance	0.97	0.45	1.07
NAICS 711 Performing arts and spectator sports	0.00	0.09	0.00
NAICS 712 Museums, historical sites, zoos, and parks	0.25	0.00	0.00
NAICS 713 Amusements, gambling, and recreation	0.23	0.22	0.23
NAICS 722 Food services and drinking places	1.17	1.11	1.19
NAICS 812 Personal and laundry services	0.56	0.58	0.86
NAICS 814 Private households	0.06	0.03	0.13
NAICS 999 Unclassified	0.00	0.33	0.00

Table B
Location Quotients by Industry-Year

Industry	National Share	Industry Mix	Regional Shift	Shift Share
101 Goods-producing	171	177	-105	242
102 Service-providing	873	186	1442	2502
NAICS 111 Crop production	6	-11	117	112
NAICS 112 Animal production and aquaculture	0	0	-3	-3
NAICS 113 Forestry and logging	0	-1	-6	-6
NAICS 115 Agriculture and forestry support activities	2	0	-78	-77
NAICS 212 Mining, except oil and gas	3	-2	-10	-8
NAICS 237 Heavy and civil engineering construction	3	13	93	109

NAICS 238 Specialty trade contractors	27	76	-18	85
NAICS 311 Food manufacturing	1	1	72	75
NAICS 313 Textile mills	No data	No data	No data	No data
NAICS 314 Textile product mills	0	0	0	0
NAICS 321 Wood product manufacturing	3	-2	-50	-50
NAICS 322 Paper manufacturing	10	-9	135	136
NAICS 323 Printing and related support activities	1	-4	-5	-8
NAICS 325 Chemical manufacturing	1	2	-5	-2
NAICS 326 Plastics and rubber products manufacturing	No data	No data	No data	No data
NAICS 327 Nonmetallic mineral product manufacturing	4	-3	-97	-96
NAICS 332 Fabricated metal product manufacturing	7	3	-44	-34
NAICS 335 Electrical equipment and appliance mfg.	1	0	-8	-7
NAICS 336 Transportation equipment manufacturing	21	29	-90	-39
NAICS 337 Furniture and related product manufacturing	1	-3	-19	-21
NAICS 339 Miscellaneous manufacturing	6	4	18	28
NAICS 423 Merchant wholesalers, durable goods	No data	No data	No data	No data
NAICS 424 Merchant wholesalers, nondurable goods	8	-8	60	60
NAICS 441 Motor vehicle and parts dealers	12	-3	-48	-39
NAICS 442 Furniture and home furnishings stores	2	-6	26	22
NAICS 443 Electronics and appliance stores	1	-6	12	7
NAICS 445 Food and beverage stores	13	-19	-9	-15
NAICS 446 Health and personal care stores	10	-24	13	-1
NAICS 447 Gasoline stations	10	2	-28	-16
NAICS 448 Clothing and clothing accessories stores	13	-78	-144	-210
NAICS 451 Sports, hobby, music instrument, book stores	No data	No data	No data	No data
NAICS 452 General merchandise stores	No data	No data	No data	No data
NAICS 453 Miscellaneous store retailers	3	0	-3	0
NAICS 454 Non-store retailers	No data	No data	No data	No data

NAICS 484 Truck transportation	10	18	33	61
NAICS 485 Transit and ground passenger transportation	2	2	11	15
NAICS 511 Publishing industries, except internet	1	4	-14	-9
NAICS 512 Motion picture and sound recording industries	2	5	-161	-154
NAICS 517 Telecommunications	No data	No data	No data	No data
NAICS 522 Credit intermediation and related activities	No data	No data	No data	No data
NAICS 523 Securities, commodity contracts, investments	No data	No data	No data	No data
NAICS 524 Insurance carriers and related activities	55	97	-160	-8
NAICS 531 Real estate	9	22	-133	-102
NAICS 541 Professional and technical services	29	69	873	971
NAICS 551 Management of companies and enterprises	1	2	-12	-10
NAICS 561 Administrative and support services	66	-35	480	511
NAICS 562 Waste management and remediation services	No data	No data	No data	No data
NAICS 611 Educational services	No Data	No Data	No Data	No Data
NAICS 621 Ambulatory health care services	79	195	-57	217
NAICS 622 Hospitals	50	29	122	202
NAICS 624 Social assistance	No Data	No Data	No Data	No Data
NAICS 711 Performing arts and spectator sports	14	55	-76	-7
NAICS 712 Museums, historical sites, zoos, and parks	0	1	-52	-51
NAICS 713 Amusements, gambling, and recreation	0	1	-3	-2
NAICS 722 Food services and drinking places	73	54	-40	87
NAICS 812 Personal and laundry services	65	46	144	255
NAICS 814 Private households	3	5	-31	-23
NAICS 999 Unclassified	No Data	No Data	No Data	No Data

Table C
County Payback Values if Bonds Default

Year	Irving Incentive Account	Related Tax Revenue from Irving
2017	-$471,694,600.26	$20,003,350.03
2018	-$451,691,250.23	$20,003,350.03
2019	-$431,687,900.20	$20,003,350.03
2020	-$411,684,550.17	$20,003,350.03
2021	-$391,681,200.14	$20,003,350.03
2022	-$371,677,850.11	$20,003,350.03
2023	-$351,674,500.08	$3,185,220.73
2024	-$348,489,279.35	$3,185,220.73
2025	-$345,304,058.62	$3,185,220.73
2026	-$342,118,837.89	$3,185,220.73
2027	-$338,933,617.16	$3,185,220.73
2028	-$335,748,396.44	$3,185,220.73
2029	-$332,563,175.71	$3,185,220.73
2030	-$329,377,954.98	$3,185,220.73
2031	-$326,192,734.25	$3,185,220.73
2032	-$323,007,513.52	$3,185,220.73
2033	-$319,822,292.79	$3,185,220.73
2034	-$316,637,072.07	$3,185,220.73
2035	-$313,451,851.34	$3,185,220.73
2036	-$310,266,630.61	$3,185,220.73
2037	-$307,081,409.88	$3,185,220.73
2038	-$303,896,189.15	$3,185,220.73
2039	-$300,710,968.42	$3,185,220.73
2040	-$297,525,747.69	$3,185,220.73
2041	-$294,340,526.97	$3,185,220.73
2042	-$291,155,306.24	$3,185,220.73
2043	-$287,970,085.51	$3,185,220.73
2044	-$284,784,864.78	$3,185,220.73
2045	-$281,599,644.05	$3,185,220.73
2046	-$278,414,423.32	$3,185,220.73
2047	-$275,229,202.60	$3,185,220.73
2048	-$272,043,981.87	$3,185,220.73
2049	-$268,858,761.14	$3,185,220.73
2050	-$265,673,540.41	$3,185,220.73
2051	-$262,488,319.68	$3,185,220.73

2052	-$259,303,098.95	$3,185,220.73
2053	-$256,117,878.22	$3,185,220.73
2054	-$252,932,657.50	$3,185,220.73
2055	-$249,747,436.77	$3,185,220.73
2056	-$246,562,216.04	$3,185,220.73
2057	-$243,376,995.31	$3,185,220.73
2058	-$240,191,774.58	$3,185,220.73
2059	-$237,006,553.85	$3,185,220.73
2060	-$233,821,333.12	$3,185,220.73
2061	-$230,636,112.40	$3,185,220.73
2062	-$227,450,891.67	$3,185,220.73
2063	-$224,265,670.94	$3,185,220.73
2064	-$221,080,450.21	$3,185,220.73
2065	-$217,895,229.48	$3,185,220.73
2066	-$214,710,008.75	$3,185,220.73
2067	-$211,524,788.03	$3,185,220.73
2068	-$208,339,567.30	$3,185,220.73
2069	-$205,154,346.57	$3,185,220.73
2070	-$201,969,125.84	$3,185,220.73
2071	-$198,783,905.11	$3,185,220.73
2072	-$195,598,684.38	$3,185,220.73
2073	-$192,413,463.65	$3,185,220.73
2074	-$189,228,242.93	$3,185,220.73
2075	-$186,043,022.20	$3,185,220.73
2076	-$182,857,801.47	$3,185,220.73
2077	-$179,672,580.74	$3,185,220.73
2078	-$176,487,360.01	$3,185,220.73
2079	-$173,302,139.28	$3,185,220.73
2080	-$170,116,918.56	$3,185,220.73
2081	-$166,931,697.83	$3,185,220.73
2082	-$163,746,477.10	$3,185,220.73
2083	-$160,561,256.37	$3,185,220.73
2084	-$157,376,035.64	$3,185,220.73
2085	-$154,190,814.91	$3,185,220.73
2086	-$151,005,594.18	$3,185,220.73
2087	-$147,820,373.46	$3,185,220.73
2088	-$144,635,152.73	$3,185,220.73
2089	-$141,449,932.00	$3,185,220.73
2090	-$138,264,711.27	$3,185,220.73
2091	-$135,079,490.54	$3,185,220.73
2092	-$131,894,269.81	$3,185,220.73

2093	-$128,709,049.09	$3,185,220.73
2094	-$125,523,828.36	$3,185,220.73
2095	-$122,338,607.63	$3,185,220.73
2096	-$119,153,386.90	$3,185,220.73
2097	-$115,968,166.17	$3,185,220.73
2098	-$112,782,945.44	$3,185,220.73
2099	-$109,597,724.71	$3,185,220.73
2100	-$106,412,503.99	$3,185,220.73
2101	-$103,227,283.26	$3,185,220.73
2102	-$100,042,062.53	$3,185,220.73
2103	-$96,856,841.80	$3,185,220.73
2104	-$93,671,621.07	$3,185,220.73
2105	-$90,486,400.34	$3,185,220.73
2106	-$87,301,179.61	$3,185,220.73
2107	-$84,115,958.89	$3,185,220.73
2108	-$80,930,738.16	$3,185,220.73
2109	-$77,745,517.43	$3,185,220.73
2110	-$74,560,296.70	$3,185,220.73
2111	-$71,375,075.97	$3,185,220.73
2112	-$68,189,855.24	$3,185,220.73
2113	-$65,004,634.52	$3,185,220.73
2114	-$61,819,413.79	$3,185,220.73
2115	-$58,634,193.06	$3,185,220.73
2116	-$55,448,972.33	$3,185,220.73
2117	-$52,263,751.60	$3,185,220.73
2118	-$49,078,530.87	$3,185,220.73
2119	-$45,893,310.14	$3,185,220.73
2120	-$42,708,089.42	$3,185,220.73
2121	-$39,522,868.69	$3,185,220.73
2122	-$36,337,647.96	$3,185,220.73
2123	-$33,152,427.23	$3,185,220.73
2124	-$29,967,206.50	$3,185,220.73
2125	-$26,781,985.77	$3,185,220.73
2126	-$23,596,765.05	$3,185,220.73
2127	-$20,411,544.32	$3,185,220.73
2128	-$17,226,323.59	$3,185,220.73
2129	-$14,041,102.86	$3,185,220.73
2130	-$10,855,882.13	$3,185,220.73
2131	-$7,670,661.40	$3,185,220.73
2132	-$4,485,440.67	$3,185,220.73
2133	-$1,300,219.95	$3,185,220.73

2134	$1,885,000.78	$3,185,220.73
2135	$5,070,221.51	$3,185,220.73
2136	$8,255,442.24	$3,185,220.73

Note: Bond Interest is not accounted for, inflation is not adjusted for, taxation rate assumed to be constant to 2022 taxation rates, post construction taxation assumed to differ from construction taxation period

Table D
State and County Payback Values if No Bonds Default

Year	Irving Incentive Account	Related Tax Revenue from Irving
2017	-$22,592,709.86	$51,039,379.08
2018	$28,446,669.22	$51,039,379.08
2019	$79,486,048.30	$51,039,379.08
2020	$130,525,427.38	$51,039,379.08
2021	$181,564,806.46	$51,039,379.08
2022	$232,604,185.55	$51,039,379.08
2023	$283,643,564.63	$8,168,262.85
2024	$291,811,827.48	$8,168,262.85
2025	$299,980,090.33	$8,168,262.85
2026	$308,148,353.18	$8,168,262.85
2027	$316,316,616.04	$8,168,262.85

Note: Bond Interest is not accounted for, inflation is not adjusted for, taxation rate assumed to be constant to 2022 taxation rates, post construction taxation assumed to differ from construction taxation period

Table E
State and County Payback Values if Bonds Default

Year	Irving Incentive Account	Related Tax Revenue from Irving
2017	-$485,694,600.26	$51,039,379.08
2018	-$434,655,221.18	$51,039,379.08
2019	-$383,615,842.10	$51,039,379.08
2020	-$332,576,463.02	$51,039,379.08
2021	-$281,537,083.94	$51,039,379.08
2022	-$230,497,704.85	$51,039,379.08
2023	-$179,458,325.77	$8,168,262.85
2024	-$171,290,062.92	$8,168,262.85
2025	-$163,121,800.07	$8,168,262.85
2026	-$154,953,537.22	$8,168,262.85

2027	-$146,785,274.36	$8,168,262.85
2028	-$138,617,011.51	$8,168,262.85
2029	-$130,448,748.66	$8,168,262.85
2030	-$122,280,485.81	$8,168,262.85
2031	-$114,112,222.96	$8,168,262.85
2032	-$105,943,960.10	$8,168,262.85
2033	-$97,775,697.25	$8,168,262.85
2034	-$89,607,434.40	$8,168,262.85
2035	-$81,439,171.55	$8,168,262.85
2036	-$73,270,908.70	$8,168,262.85
2037	-$65,102,645.84	$8,168,262.85
2038	-$56,934,382.99	$8,168,262.85
2039	-$48,766,120.14	$8,168,262.85
2040	-$40,597,857.29	$8,168,262.85
2041	-$32,429,594.43	$8,168,262.85
2042	-$24,261,331.58	$8,168,262.85
2043	-$16,093,068.73	$8,168,262.85
2044	-$7,924,805.88	$8,168,262.85
2045	$243,456.97	$8,168,262.85
2046	$8,411,719.83	$8,168,262.85

Note: Bond Interest is not accounted for, inflation is not adjusted for, taxation rate assumed to be constant to 2022 taxation rates, post construction taxation assumed to differ from construction taxation period

Table F
Federal, State, and County Payback if Bonds Default

Year	Irving Incentive Account	Related Tax Revenue
2017	-$487,954,600.26	$172,615,861.71
2018	-$315,338,738.55	$172,615,861.71
2019	-$142,722,876.84	$172,615,861.71
2020	$29,892,984.88	$172,615,861.71
2021	$202,508,846.59	$172,615,861.71
2022	$375,124,708.30	$172,615,861.71
2023	$547,740,570.01	$23,208,101.88
2024	$570,948,671.89	$23,208,101.88
2025	$594,156,773.77	$23,208,101.88
2026	$617,364,875.65	$23,208,101.88
2027	$640,572,977.53	$23,208,101.88

Note: Bond Interest is not accounted for, inflation is not adjusted for, taxation rate assumed to be constant to 2022 taxation rates, post construction taxation assumed to differ from construction taxation period

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