



Spring 5-2023

## **Competing for Innovation: A Case Study of Knoxville and Similar Metropolitan Areas**

Lucille G. Marret

*University of Tennessee, Knoxville, lucgmarr@vols.utk.edu*

Follow this and additional works at: [https://trace.tennessee.edu/utk\\_bakerschol](https://trace.tennessee.edu/utk_bakerschol)



Part of the [American Politics Commons](#), [Comparative Politics Commons](#), [Economic Policy Commons](#), [Economic Theory Commons](#), [Growth and Development Commons](#), [Human Geography Commons](#), [Infrastructure Commons](#), [Other Business Commons](#), [Policy Design, Analysis, and Evaluation Commons](#), [Public Economics Commons](#), [Public Policy Commons](#), [Regional Economics Commons](#), [Strategic Management Policy Commons](#), and the [Urban Studies Commons](#)

---

### **Recommended Citation**

Marret, Lucille G. "Competing for Innovation: A Case Study of Knoxville and similar Metropolitan Areas." University of Tennessee - Knoxville, 2023.

This Article is brought to you for free and open access by the Supervised Undergraduate Student Research and Creative Work at TRACE: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Baker Scholar Projects by an authorized administrator of TRACE: Tennessee Research and Creative Exchange. For more information, please contact [trace@utk.edu](mailto:trace@utk.edu).

**Competing for Innovation: A Case Study of Knoxville and similar Metropolitan Areas**

**Lucille G. Marret**

**Baker Scholars, 2023**

**Advisor: Dr. William Lyons**

**Table of Contents**

Abstract	2
Introduction and Context	2
Key Terms	5
Research Question	6
Methods	6
Hypothesis	7
Metropolitan Statistical Area Profiles and Key Resources	7
Knoxville, Tennessee	7
Ann Arbor, Michigan	13
Greenville, South Carolina	16
Huntsville, Alabama	19
Metropolitan Statistical Area Comparisons	24
State Programs and Funding Opportunities	34
Michigan	34
South Carolina	36
Alabama	37
Tennessee	39
Discussion	41
Primary Hypothesis	41
Secondary Hypothesis	44
Conclusion	45
References	47

**Abstract**

Knoxville competes with other mid-sized metropolitan areas for economic development and business attraction at the national level. Cities such as Greenville, SC, Huntsville, AL, and Ann Arbor, MI have similar resources and attributes to Knoxville, yet they are consistently surpassing Knoxville in business attraction and expansion. It is necessary for policy makers to understand what factors are contributing to underperformance in order to better support Knoxville's efforts to create an innovation fund. Comparing available assets and access to funding for each MSA reveals that Knoxville has the necessary resources through the University of Tennessee and Oak Ridge National Laboratory to compete successfully, but lacks the history of sustained support for early-stage funding and innovation at the state level.

**Introduction and Context**

Knoxville, Tennessee has long been painted as a part of the larger, rural Tennessee landscape despite having the resources and the means to become a technology and resource powerhouse. Outside of the urban centers of Nashville and Memphis, Tennessee has been home to a number of large manufacturing operations and lower-skilled labor jobs. Knoxville, however, has a different set of assets and goals to differentiate the area from the rest of the East Tennessee region. Despite being ranked the 33rd best city to live in and the 17th best place for young professionals, Knoxville is not competing at the highest levels for business attraction and expansion (U.S. News, 2022). In order to retain these young professionals and continue to thrive as a viable place to live, Knoxville must recognize and address the challenges to economic development on both the local and state level to better compete with comparable markets.

The field of economic development is incredibly broad, and best practices vary quite significantly. Not every area has the same goals, and more specifically, not every area is trying to

attract high-value innovation projects. Those that do attract such projects and new industries typically have some similarities. “Production and Innovation Systems” and “policy and local planning systems” form the general framework to best understand why certain innovation hubs form in certain areas (Winden, 2012, p. 25). Production and Innovation systems refer to the industries, infrastructure, and institutions in place that stimulate economic activity in the area. For an innovation hub, this looks like universities, accelerator programs, research laboratories, and a robust business climate. These are the systems that are not likely to change. Once a larger region has a focus, it is much more difficult to completely shift the industries and businesses of the area as these systems are path dependent, or built upon one another (Winden, 2012, p. 26). However, this does not mean that once a region develops one industry or specialization they are unable to change. Internal actors, like businesses and universities, can help to push industries in different directions, but this is more successful in areas in which there is some support already in place. This leads to the second part of the framework. Policy and planning systems refer to the political aspect of economic development and the impact policy can have on shaping the direction of innovation. These systems can give rise to change-makers that recognize potential pathways for the development of new innovation within the existing system.

With this framework in mind, it is clear that innovation hubs form in areas with highly developed institutions and collaborative policymakers with the vision for an innovative future. The most prominent and successful institutions are research universities. Cities with large research universities tend to look towards innovation industries to match their graduates. Having access to technology and talent in the same region lends itself to innovation. Universities are then able to act as an intermediary, “seeking to actively foster interactions and spillovers to link research with application and commercialization, and taking on roles of catalyzing and animating

economic and social development” (Youtie, 2008, p. 1189). Universities act as a central point connecting the business climate and current industries with emerging opportunities. However, even without a prominent university, there is still a possibility of innovation if there are other institutions in place to become this intermediary. In many areas, this comes in the form of a research or science park. While many of these have a connection to a university, they can be independent. Research parks are intended to “promote economic development and increase the economic impact of scientific research” (Winden, 2012, p. 9). In many areas, they have a focus that compliments the already existing industries in the region to ensure the success and continued growth of these industries. This has a snowball effect as the existing businesses and research attract new businesses in the same region helping to further research and keep the cycle moving. This clustering of industries in different areas goes back to the point that it is difficult to change the industry focus of a region once it has taken hold. Therefore, it is important for local areas to support the industries they have in order to continue to grow and see continued success as the industries themselves shift internally.

Even with these intermediaries driving innovation, there must be a desire from the both business and political communities to be successful. Without complementary policies and support, industries will move. Therefore, the larger systems must be invested in the vision of a particular region and recognize the area’s ability to contribute to this region. In this case, state and local policies have to align with the goals of the business community in order to be successful.

The three Metro Statistical Areas used for the case study were strategically chosen due to their similarities within the framework given above. Huntsville and Greenville are the closest to Knoxville and reside in the same region. Huntsville in particular was chosen in part for its

similarities as a southern city directly on the Tennessee border. Both have a similar history of development, and both are within the Tennessee Valley Authority's power grid. Greenville, also a southern city, was chosen for its focus on the automotive industry and its similarities in population. Greenville, like Huntsville, is considered an up-and-coming city with a growing population, particularly in the young adult demographic. While neither of these are home to major research universities, they both have strong ties to state universities and third-party research institutions. Ann Arbor is the only city located outside of the South. This offers an interesting contrast as the industries and development of the Midwest have differed from that of the South. However, Ann Arbor often competes with Knoxville, particularly in the automotive industry, representing a somewhat similar industry cluster. Ann Arbor, like Knoxville, has the state's flagship university and growing knowledge hub as a result. Each of these locations are in different states with historically different policy agendas. This offers an opportunity to understand directly how policy impacts innovation hubs. The combination of policy differences and innovation systems can be compared to understand why some metropolitan statistical areas are more successful than others at attracting new businesses and maintaining an innovation hub.

### ***Key Terms***

#### *Metropolitan Statistical Area*

The US Office of Information and Regulatory Command defines a Metropolitan Statistical area as "a Core Based Statistical Area associated with at least one urbanized area that has a population of at least 50,000. The Metropolitan Statistical Area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of

social and economic integration with the central county or counties as measured through commuting” (Office of Management and Budget, 2010, p. 37252).

### *Principal City*

A principal city is “The largest city of a Core Based Statistical Area, plus additional cities that meet specified statistical criteria” (Office of Management and Budget, 2010, p. 37252).

## **Research Question**

### *Primary Research Question*

What are the best practices for the Knoxville Metropolitan Statistical Area to compete in economic development with similar markets?

### *Secondary Research Question*

Can the Knoxville Metropolitan Statistical Area compete with similar markets without policy changes at the state level to compliment local development goals?

## **Methods**

This study synthesizes relevant open-source data and public records to compare metropolitan statistical areas in a case study. In order to answer the primary research question, data from local and regional economic development bodies will be compared regarding the variables of foreign direct investment, early-stage funding, and access to technology resources. This will be a combination of empirical and qualitative sources. These key variables, along with supporting demographic data, will be used to create an economic development profile of each metropolitan statistical area that can be compared to one another both for current industries and for changing industries. The secondary research question will be addressed through the analysis



of current policies from the respective state legislatures and corresponding gubernatorial agendas. These policies will then be compared to previously stated policies of the metropolitan statistical areas to determine whether the policies are complementary.

## **Hypothesis**

There are two key hypotheses that will be addressed in this study. The first hypothesis addresses the primary research question in comparing metropolitan statistical areas. The secondary hypothesis builds upon the first while addressing the secondary research question about state-level policies.

### *Primary Hypothesis*

The Knoxville metropolitan area is underperforming in support for early stage businesses while over performing in access to technology for research and development and foreign direct investment.

### *Secondary Hypothesis*

The Knoxville metropolitan area cannot compete with similar markets because policies for funding at the state level do not support the initiatives at the local level in Tennessee, while they are complementary in Alabama, Michigan, and South Carolina.

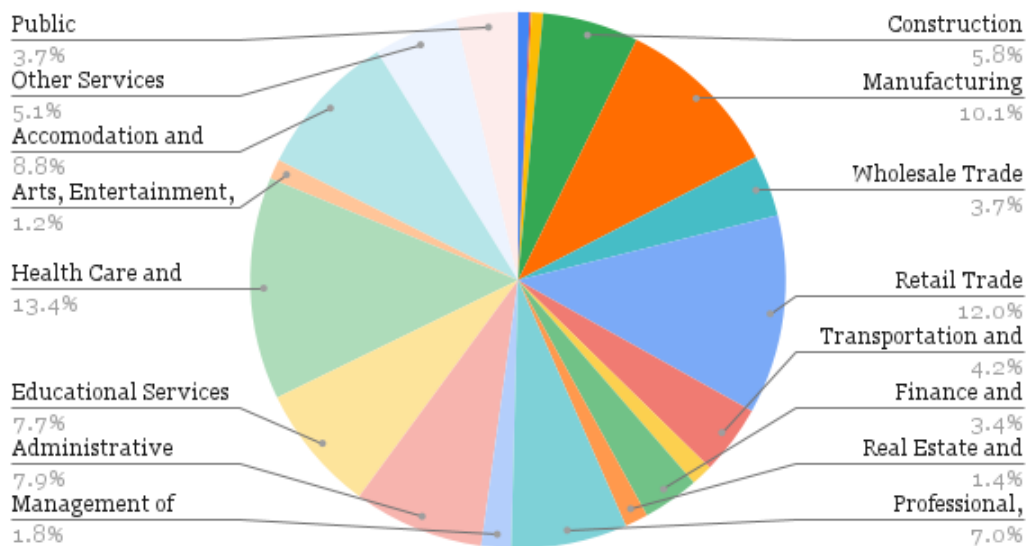
## **Metropolitan Statistical Area Profiles and Key Resources**

### ***Knoxville, Tennessee***

The Knoxville, Tennessee Metropolitan Statistical Area, henceforth referred to as Knoxville, covers the five counties of Anderson, Blount, Knox, Loudon, and Union County with Knoxville as the principal city. Knoxville is located in the Southern Region of the United States in the valley of the Great Smoky Mountains of East Tennessee. It is the third largest city by

population in the state of Tennessee with 893,412 residents reported in 2021 (U.S. Bureau of Economic Analysis, 2022). Compared with other regions of the state, East Tennessee has less of a focus on agriculture. Out of the workforce of the greater region, only 2,454 are employed in the agriculture, forestry, fishing, and hunting industry (Tennessee Department of Labor and Workforce Development, 2021, p. 68). Instead, the workforce of East Tennessee, and more importantly, Knoxville, is largely found in service industries. As seen in Figure 1, the largest industry in the MSA is Health Care and Social Assistance. The industry is expected to be the fastest growing industry by a rate of 1.4% annually (Economic Overview Knoxville, TN MSA, 2021, p. 8). The largest employers in the area are Oak Ridge National Laboratory, Covenant Health, and the University of Tennessee. This clearly reflects the shift away from manufacturing jobs, as they are expected to decrease by 0.2% annually, to high-paying technical jobs (Economic Overview Knoxville, TN MSA, p. 9). This shift, however, requires a changing workforce and relies on a number of key assets for the continued growth of these industries and the greater region.

**Percentage of Total Workforce in Knoxville MSA, by Industry**



*Figure 1: U.S. Bureau of Economic Analysis, 2015*

Knoxville is home to the flagship university of the state, the University of Tennessee. The university has 33,805 students across 11 colleges (University of Tennessee, 2022). As a research-focused university, Tennessee is home to a number of partnerships and programs that are key to the economic development aims of the MSA. Up to this point, graduates of Tennessee have largely left the region as “the degrees awarded on UT’s campus do not align with the careers in Knoxville” (Talent Redefined, 2021, p. 5). As an example, graduates of the supply chain management program, a nationally ranked program in the Haslam College of Business, often move to larger markets as there is not a demand in Knoxville. In order to retain these graduates, Knoxville has to shift its focus to attracting high-quality businesses and employment opportunities to match the changing demographics of the region.

Outside of the College of Business, the University of Tennessee continues to push for innovation in the growing world of technology, research, and development. The UT Research Foundation has been instrumental in pushing for research and development through programs such as the Venture Launch Program and Spark Innovation Center. The Venture Launch program and Accelerator Fund are intended to help “[strengthen] the entrepreneurial culture will help retain graduates in the ecosystem as entrepreneurs” (Blackburn, 2023). The program recognizes the challenges of startups and is intended to “fill a gap in startup capital for projects and ideas with early market validation, a strong value proposition, a feasible commercial path and a good chance at follow-on funding within two years of securing seed capital” (Blackburn, 2023). This is a particular challenge for Knoxville as there are few state or regional grants for incentives for startups. Also found within the UT Research Foundation, the Spark Innovation Center has also positioned itself as a resource for startups in Knoxville. Spark has utilized the available resources of the University’s research park to develop a clean-energy-focused startup accelerator that has

seen a significant amount of success. Following the accelerator, the center has an incubator program to help early-stage companies develop their technology and business model over the course of two years. The incubator also helps to bridge the funding gap by providing introductions to investors and relevant companies while providing the startups with laboratory space and access to resources. Across the first two years, the Spark Innovation Center has been wildly successful by creating 26 full-time, high-quality positions and totaling over \$33 million in grants and investments (Spark Innovation Center). Both of these programs are essential to Knoxville's shift towards research and development, particularly for clean energy.

The University of Tennessee is partnered with Oak Ridge National Laboratory to “[conduct] basic and applied research to deliver transformative scientific and technological solutions to compelling problems in energy and security” (The University of Tennessee). The partnership includes multiple programs including joint-faculty positions, Ph.D. programs, and research initiatives. In more recent years, the University of Tennessee-Oak Ridge Innovation Institute was funded to better leverage resources and unify the goals of the partnership. UT-ORII is one of the most promising new additions to the economic development goals of Knoxville as it offers opportunities for start-up funding and workforce development. As stated by the Executive Director the goal of the institute is to “[match] our workforce with the business climate and needs” to “propel us forward in Tennessee and beyond” (The University of Tennessee-Oak Ridge Innovation Institute). The business climate and needs of Knoxville are shifting away from traditional manufacturing to more technical skills. To assist in this transition, UT-ORII is engaging in workforce development for both university and K-12 students by providing early opportunities for enrichment in science, technology, engineering, and math. UT-ORII also contributes to the attraction of new businesses for the workforce they are creating through a

series of grants for collaborative research and startups. Research teams from ORNL and the University of Tennessee can apply for grants or seed funding for innovative, multidisciplinary projects. These innovating startups are a part of the changing business climate and the types of industries that Knoxville wants to attract.

The national lab is, in its own right, a major asset for the region as one of the largest employers and the driving force behind innovation. The laboratory is home to a supercomputer, a robust nuclear and clean energy program, and a materials engineering division, among others. Although it is government owned and operated, there are opportunities for companies to partner with the lab and commercialize the technology being developed there. In the past, the laboratory has been limited in its interactions with the business community, but as the focus of the work being done at the lab has shifted from largely energy and nuclear-focused to a broad spectrum of issues, there have been more opportunities for collaboration. Knoxville is the only place in the nation that “boasts both a national lab and a land-grant research university” (McDermott, 2021). Therefore, if Knoxville wants to continue to recruit new companies and grow new industries, it must rely on both ORNL and the University of Tennessee.

Knoxville has quickly become a new option for clean technology and energy companies, as there is access to technology at ORNL and the University of Tennessee. Larger companies such as Volkswagen have also moved some of their research and development to Knoxville helping to show the viability of Knoxville’s business climate, particularly in the clean energy and electric vehicle spaces. The shift toward new technological industries is not only occurring in the academic realm of ORNL or the University of Tennessee. There has also been a more recent shift within the business community itself to recruit both startups and well-established highly technological companies. For startups, this can be seen through the introduction of a Techstars

cohort in Knoxville. The twelve-week program began with its first of three classes in 2021 with a theme of industries of the future. Companies in the program are from a wide variety of industries including pharmaceutical drug manufacturing and vehicle safety. However, each company is using deep technology, such as artificial intelligence to “[build] novel technologies that address our world's biggest challenges” (McDermott, 2021). These companies partner with local entities and commercialize technology from ORNL, portraying Knoxville’s vast resources and potential for entrepreneurs in developing industries. However, the accelerator alone does not make Knoxville an innovation hub. Instead, it “[creates] a larger awareness of Knoxville-Oak Ridge as a tech corridor and create an opportunity for the region to persuade some of these promising startups to stay and grow their businesses here” ultimately leading to Knoxville establishing itself as “a premiere innovation hub for addressing the major challenges of the future” (McDermott, 2021). Techstars may only be one startup accelerator, but it reflects the ways in which Knoxville is pushing for innovation and the changing business climate that comes with this shift.

With resources like the University of Tennessee and Oak Ridge in such close proximity, Knoxville has the potential to become a true innovation hub and leader in emerging industries. However, this is only possible if the available resources are being used to their fullest potential.

Outside of emerging innovation and startups, Knoxville also looks to attract foreign direct investment. Currently, five percent of the workforce in Knoxville is employed by foreign-owned companies, or about 12,800 employees (International Trade Administration, 2020). Since 2011, there have been thirty-two foreign-based projects that have come to Knoxville with fourteen in Knox County and eleven in Anderson County.

### *Ann Arbor, Michigan*

Ann Arbor and the surrounding Washtenaw County make up the Ann Arbor Metropolitan Statistical Area. It is located southwest of the Detroit, Michigan MSA, the largest city in the state. The area has a population of 369,390 and a workforce of 265,544 (Bureau of Economic Analysis, 2021). Ann Arbor is home to the University of Michigan, one of the country's premier public research universities, and a robust business climate. The largest employer in the MSA is The University of Michigan followed by Trinity Health Michigan and General Motors (Ann Arbor Spark Top Regional Employers, 2023). The Midwest was traditionally known for manufacturing, particularly automotive manufacturing. However, at this point, only 12,500 people are employed in manufacturing in the MSA (Federal Reserve Economic Data). Instead, the region has placed a focus on eight key industries markets they have deemed the most important and viable for the region. Ann Arbor SPARK, the driving force behind economic development and business attraction, has defined the industries as advanced automotive and mobility; artificial intelligence; life science; clean energy; IT and software platforms; research and development; software development; and data security.

These key industries are supported by a wide range of programs and assets that are key to Ann Arbor's success in attracting established businesses and startups alike. The American Center for Mobility is an automotive research and development center with a focus on emerging automobile technology such as autonomous and electric vehicles. The center offers space for companies to test new technologies and engage in collaborative research. It is equipped for high-power demand projects with space for safety tests. Many of the projects housed at the center are startups conducting joint research projects that are either grant or government funded. The center has helped to grow the research and development sector of the automotive industry

already found in the greater Midwest region by combining “private industry, start-ups, government, standards bodies, and academia” into one industrial complex (American Center for Mobility). This integrated approach is a theme across the MSA as the business climate seems to support both emerging and existing business models to ensure the most success for the region.

The region is also home to the National Vehicle and Fuel Emissions Laboratory. The laboratory was established to develop “new and cost-effective technologies and components to reduce vehicle or engine emissions and increase fuel efficiency” (Environmental Protection Agency). As the primary research laboratory for the Environmental Protection Agency, the NVFEL is the location for the creation and testing of new sustainability standards. As such, its purpose is not to create new technology for commercialization and business development. However, it is still an asset for the community due to the quality of labor it brings to the region and the overall increased focus on overcoming challenges in the automobile space.

Much of the research and development in the area stems from the University of Michigan. The university has 32,282 undergraduate students and 15,377 graduate students (University of Michigan Facts and Figures). It is widely considered one of the top public universities with a focus on innovation and research. As such, it has been a driving force in Ann Arbor. The university offers a variety of programs that benefit the business climate of the area, but two key programs are MCity and the Economic Growth Institute. Similar to the mission of the American Center for Mobility, MCity is a research center for automobile technology. It is an affiliate of the University of Michigan’s School of Engineering, but it has expanded past academia. Contained within the institute are opportunities for collaborative research and early-stage entrepreneurial projects. It includes an incubator for startups and opportunities for students to work in the lab with up-and-coming companies. The center has invested \$28.2



million in research and funded 25 projects (MCity). As such, it has been able to bring new companies to the area and supplied them with the resources to succeed. The success of the center extends past technological automotive research as the mission of the center is to “bring together industry, government, and academia,” combining work in engineering, law, public policy, and urban planning to develop actionable solutions (MCity). This integrated approach is central to the success of the growing automotive research hub.

The second key asset of the University of Michigan is the Economic Growth Institute. The institute was established to “[leverage] the University of Michigan’s resources, research, technologies, and expertise to foster innovation and create positive economic impact for local, state, and national communities and economies by working with small- and medium-sized enterprises” (Economic Growth Institute). The institute is strategic by only working with companies believed to be critical to the economic development goals of the times. They will work with startups developing their first product and existing business trying to expand. Although they are not exclusive to Ann Arbor, they work with many of the companies previously mentioned as well as a multitude of other large employers to find ways to best serve their community while maintaining a healthy business model. The institute acts as a middle-man, connecting the resources of the university with local companies, government agencies, and other assets. Most importantly, however, the institute is an important player in pushing new ideas and providing research-backed arguments for the support of innovation. There is a clear recognition that industries can change, and the University of Michigan can and should help support this shift.

Some of the lesser-known programs driving economic growth through the University of Michigan are the Artificial Intelligence Partners program and the Medical Innovation Center. Both of these centers are research-based institutions with the goal of commercializing emerging

technologies, as is the trend with most of the university's programs. In almost all industries found in Ann Arbor, the University of Michigan is likely playing at least a small role in attracting and keeping companies in the area through its robust resources and network of opportunities.

Ann Arbor, Michigan has been wildly successful at attracting new businesses while supporting existing businesses. They have established themselves as a hub for innovation, particularly in the automotive and mobility space, while also supporting other technology ventures. They have adapted from manufacturing to research and development at a rapid speed to keep up with changing industries and continue to lead the way in economic development practices.

### ***Greenville, South Carolina***

The Greenville-Anderson Metropolitan Statistical Area is based around the principal city of Greenville and the surrounding counties of Anderson, Greenville, Laurens, and Pickens. It has a total population of 940,774 with a labor force of 558,712 (Bureau of Economic Analysis, 2021). It is seen as one of the fastest-growing areas in the region with a 15% increase in population since 2015 (City of Greenville, 2022, p. 5). The area sits at the foothills of the Blue Ridge Mountains in upstate North Carolina along the North Carolina border. The largest employers in the region are Prisma Health, Greenville County Schools, and Michelin North America (Greenville Area Economic Development). In their most recent economic development strategic plan, ending in 2022, Greenville focused on creating innovation districts or clusters, talent attraction, and STEM opportunities. The six key industry clusters, or innovation districts, are automotive; production technology and heavy machinery; advanced materials; life sciences; business services; and fintech.

Greenville has a highly educated workforce with 47.2% of the population obtaining an associate's degree or higher and 23.3% obtaining a bachelor's degree (Greenville Area Development Corporation Key Data). As such, there is a push for jobs that match this level of employment to retain these highly skilled individuals while also attracting new residents. As such, Greenville has been aggressive in its pursuit of new companies with high-paying jobs by leveraging its key resources through local universities and innovation programs.

The six industry clusters Greenville is looking to attract are all strategic as they provide opportunities for new innovation as well as opportunities for large foreign direct investment projects. This is particularly utilized by the automotive industry as the largest contributor to the gross regional product (City of Greenville, 2022, p. 12). Companies such as Bosch and Proterra have strong holdings in the region and conduct a large portion of their US research and development in Greenville. The focus on research and development, rather than manufacturing, is driven by two key assets: the Clemson University International Center for Automotive Research and the International Transportation Innovation Center. The International Transportation Innovation Center is a part of the larger South Carolina Technology and Aviation Center. It is a test site for automotive technology with four test tracks representing a variety of terrains. The goal of the test track center is to “attract nationally renowned companies” and “accelerate economic and community development in South Carolina” (International Transportation Innovation Center). The center has attracted hundreds of projects over the last fourteen years and continues to be a world-class test site for all types of mobility and transportation companies.

CU-ICAR was founded in 2007 to conduct research, provide educational opportunities, and contribute to the creation of high-quality jobs in the automotive industry (CU-ICAR). The center

itself has created over 700 new jobs attracting local and global talent alike. However, the economic development impact extends past just those employed by the center. The center has attracted twenty-one industry partners to the region helping to grow the automotive industry and providing numerous opportunities for growth in the region. CU-ICAR has also helped to develop a talent pipeline for automotive companies in the region. Many of those working at the center are students from Clemson University School of engineering, a nationally ranked program. At the center, they are exposed to the many company partners and the potential for employment opportunities in Greenville. The combination of strong talent and available resources makes CU-ICAR, and Greenville as a whole, very attractive for both new and existing companies. The most recent industry cluster for Greenville is fintech. Fintech refers to software used for financial services. As one of the fastest-growing sectors, it is largely occupied by startups and driven by initiatives from Furman University and NEXT Upstate. While Furman University is not a large research institution, it still offers resources for entrepreneurs through the Hill Institute for Innovation and Entrepreneurship. The institute is student-focused, encouraging students to connect with the local community and provide opportunities for angel funding. Across all programs, there is a clear theme of both innovation and business. Instead of being solely focused on innovation in one industry, the institute provides broad opportunities for any industry by leveraging the resources available in the community. In more recent years, the city of Greenville has looked to strengthen the institute and use it to continue to attract innovative businesses to the region.

NEXT Upstate, like the Hill Institute, looks to connect entrepreneurs with local resources to accelerate their growth. NEXT provides startups with learning labs, mentoring, and CEO Services. It acts as the middleman by connecting startups with the vibrant business climate and

venture capital firms. In 2021, NEXT supported 165 companies with the goal of becoming the “#1 hub in the Southeast for innovation and technology-enabled startups” (NEXT SC, 2021, p. 1). This lofty goal is an indication of the commitment to bring quality jobs and companies that want to have a lasting presence in the area. NEXT has distinguished itself as the most impactful asset for attracting startups helping to further the aims of the Greenville strategic plan for economic development.

Greenville has been largely successful in growing its economy with a 10% overall increase over the last five years (City of Greenville, 2022, p. 5). They have a robust pool of talent and a flourishing business climate to match the workforce. With high-paying jobs and a low cost of living, Greenville remains a viable option for young professionals. They have seen growth in nearly every industry and have built momentum to continue to see growth across all six industry clusters.

### ***Huntsville, Alabama***

The Huntsville Metropolitan Statistical area covers both Limestone and Madison counties and the principal city of Huntsville. It is located in the northern part of the state along the Tennessee border. Huntsville is the largest city, by population, in the state of Alabama with 502,728 residents and 322,289 members of the labor force (Bureau of Economic Analysis). The largest employers in Huntsville are the US Army at Redstone Arsenal, Huntsville Hospital, and NASA at the Marshall Space Flight Center (Huntsville Madison County Chamber, 2021, p. 1). This is reflected in the 44.8% of people who hold a bachelor’s degree or higher (US Census, 2020). Huntsville’s business community is largely centered around research and development, defense logistics, and biotechnology.

The largest employer in the area, Redstone Arsenal is a cornerstone of the economic development and industry advancement of the region. As an army post, much of the defense logistics work being done is unknown to the general public. However, it still acts as a major component of the business climate through defense contracts and subsequent economic growth. The estimated direct impact through procurement and personnel is \$6,871,638,000 while the indirect impact through subsequent spending and subcontracts is an estimated \$1,049,513,000. After estimating the induced impact from the economic activity generated by employees, the total estimated annual impact of Redstone Arsenal is \$10,569,780,000 (The Economic Impact of Redstone Arsenal, 2012, p. 11). Without Redstone Arsenal, Huntsville would lose billions of dollars in personal, projects, and subcontracts for other companies. The industries most impacted by Redstone Arsenal are “computer systems design services; management, scientific, and technical consulting services; scientific research and development services; custom computer programming services and guided missile and space vehicle manufacturing” (The Economic Impact of Redstone Arsenal, 2012, p. 14). These are some of the same key industries that Huntsville looks to attract, and Redstone Arsenal is a major selling point for many potential businesses. When looking at potential locations, access to large government contracts and projects that the arsenal can supply is an important consideration and draw for many companies.

Contained within Redstone Arsenal is NASA’s Marshall Space Flight Center. The flight center serves as the home of the Space Launch System and much of the United States' space exploration infrastructure. The space center not only directly employs 6,000 workers and contractors, but it is also estimated to support “more than 24,500 jobs that generate \$1.5 billion in income” for a total economic impact of \$3.8 billion in Huntsville alone (“Marshall Space Flight Center Economic Impact Report,” 2017, p. 4). Much like the greater Redstone Arsenal,

this includes both the government-contracted jobs as well as jobs in the community to support the influx of employees. The economic impact of the space center also extends into the business community through the Space Act Agreement and programs such as the Small Business Innovation Research program. The Space Act Agreement allows for industries and universities to participate in collaborative research on-site to further technological gains for both government and private use. The Small Business Innovation Research Program aims to encourage entrepreneurs and small businesses in the space technology industry by providing equitable government contracts and opportunities for research. Many of the programs housed under the small business initiatives target minority-owned businesses in order to “Foster and encourage participation in innovation and entrepreneurship by socially and economically disadvantaged small businesses” (“Marshall Space Flight Center Economic Impact Report,” 2017, p. 11). This is an interesting approach as it addresses both the specialized nature of the industry and the need for diverse voices to drive innovation. The program has been incredibly successful by investing \$173 million in small businesses and supporting over 2,000 jobs, largely filled by minority populations (“Marshall Space Flight Center Economic Impact Report,” 2017, p. 11). Looking at Figure 2, it is clear that the Marshall Flight Center is central to the business community in Huntsville. With an output ranking in the top five industries in Madison County, the flight center has helped to create a well-established niche for space technology and advanced research. This indicates a strong industry area for Huntsville that is a unique draw for employers and employees alike.

### Marshall's output in comparison to top industry sectors in Madison County\*



Figure 2: “Marshall Space Flight Center Economic Impact Report,” 2017, p. 11

Outside of Redstone Arsenal, economic development centers around Cummings Research Park. It is “the second largest research park in the country and the fourth largest in the world” (Huntsville Madison County Chamber of Economic Development). It houses over 300 companies, employs 26,000 employees, and engages more than 13,500 students across two colleges and universities (Cummings Research Park). It is the connecting link between most of the economic development efforts in Huntsville. According to the master plan, Cummings Research Park is intended to be the “home for entrepreneurial firms, essential networking, and broader placemaking activities” (CRP Master Plan, 2016, p. 4). The park itself is a complete community including lab and office space as well as apartment complexes and single-family homes. It is also home to both Calhoun Community College and the University of Alabama Huntsville. This community environment makes the park especially appealing to potential



businesses as the labor pipeline is well established while offering employees an attractive place to live and work.

One notable cornerstone tenet of the park is the HudsonAlpha Institute for Biotechnology. The institute was founded to advance life sciences and genome research; encourage entrepreneurship and economic development; and create educational opportunities for students and the greater public (The Story of HudsonAlpha). Today, the institute is a leader across the biotechnology space with projects ranging from disease diagnosis to genome sequencing. There are over fifty biotechnology companies on the campus with a job impact of 2,685, including 1,590 employed by HudsonAlpha or a subsidiary company (HudsonAlpha Generated over \$4 Billion for Alabama's Economy, 2023). Well-established companies can look to the HudsonAlpha campus for site selection and find an area with a thriving community and a talent pipeline. For entrepreneurs, the institute helps provide office and lab space as well as connections to associate companies for capital and joint projects. The institute has worked since its opening in 2006 to build an entrepreneurial culture that encourages collaboration across projects and divisions of the biotechnology industry.

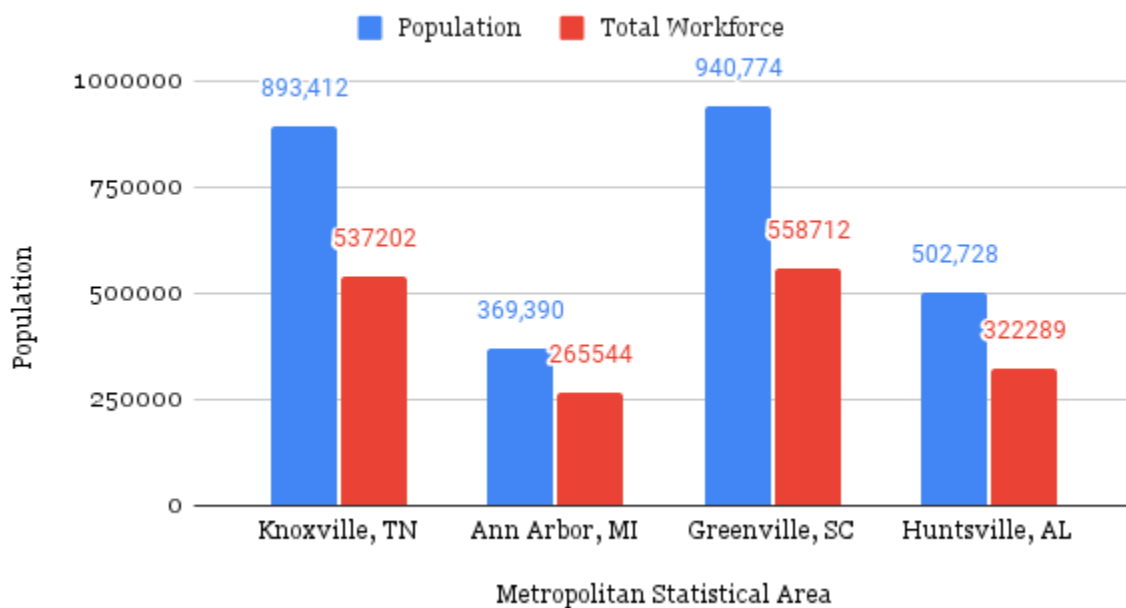
Cumming Research Park is truly the center point of the business community as it has woven together companies from Redstone Arsenal, Marshall Flight Center, and the HudsonAlpha Institute for Biotechnology. It exemplifies the key industries that Huntsville hopes to attract and offers a very tangible business community for each of these industries by supporting thousands of jobs and hundreds of companies from startups to well-established brands. It is a vibrant area that is attractive to companies, students, and members of the workforce alike as it continues to attract top companies and talent to the region.

## Metropolitan Statistical Area Comparisons

As stated, these three metropolitan statistical areas were chosen for their similarities in resources and industries as well as overarching goals of technological advancement. With an understanding of the key assets for each area, one can compare each city's utilization of various assets for economic development to Knoxville's economic development efforts.

First, basic demographic data can be compared to better understand where Knoxville sits in relation to Ann Arbor, Greenville, and Huntsville. As seen in *Figure 3*, Greenville is the largest MSA being compared while Ann Arbor is the smallest. Furthermore, Knoxville and Greenville are the most comparable both in total population and in total workforce. In contrast, Ann Arbor is 58.7% smaller than Knoxville by population.

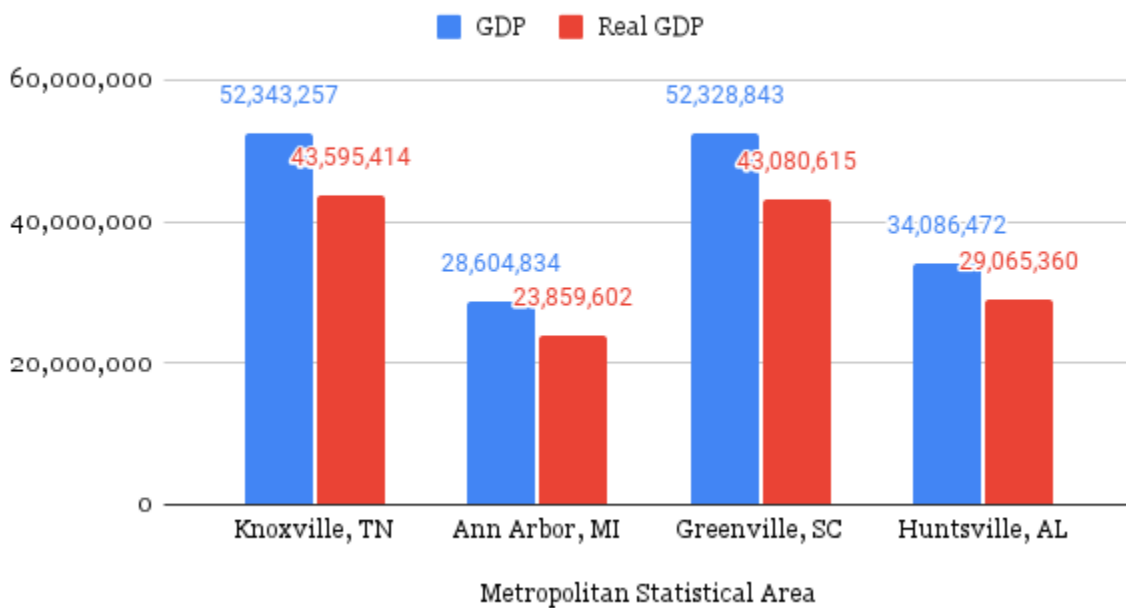
### Population and Total Workforce by MSA



*Figure 3:* Population and Total Workforce by MSA using data from the Bureau of Economic Analysis, 2021

Population and workforce are important to address in relation to the Gross Domestic Product and Real GDP. The distributions are similar as Knoxville and Greenville are once again the most comparable as seen in *Figure 4*. However, Knoxville, despite being the smaller of the two areas, has both a larger GDP and real GDP. These differences are marginal, further indicating that Knoxville and Greenville are comparable Metropolitan Statistical Areas.

### GDP and Real GDP by MSA

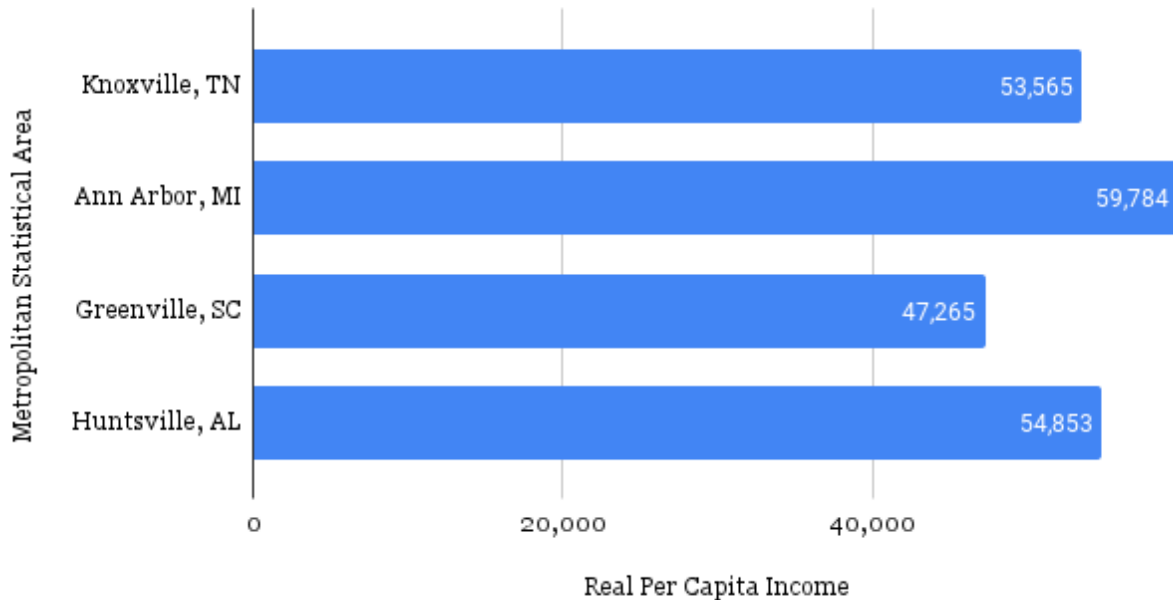


*Figure 4:* GDP and Real GDP by MSA using data from the Bureau of Economic Analysis, 2021

While Knoxville and Greenville are much larger than Ann Arbor and Huntsville, they are more comparable in income per capita. The real per capita personal income, seen in *Figure 5*, is used to account for the cost of living differences between the given areas. While Ann Arbor may be the smallest by population and GDP, it has the highest per capita personal income at \$59,784. Following behind Ann Arbor is Huntsville, while Knoxville ranks third out of the four MSAs. This is an important statistic to note as it broadly indicates the quality of jobs and the value of the

work being done in each area. While Ann Arbor may have a smaller workforce than Knoxville, they are also being employed in higher paying, higher value jobs.

### Real Per Capita Income by Metropolitan Statistical Area



*Figure 5: Real Per Capita Income by Metropolitan Statistical Area using data from the Bureau of Economic Analysis, 2021*

Turning towards employment, it is important to reiterate the differences in education between the MSAs as those with higher levels of education are more likely to attract and retain innovation, research and development, or higher skilled jobs rather than manufacturing or unskilled labor. The educational attainment in Ann Arbor further supports the higher real per capita income as 55.9% of Ann Arbor residents aged twenty-five and older have a bachelor's degree or higher (Slagter, 2021). In comparison, 30.9% of Knoxville residents aged twenty-five and older have a bachelor's degree or higher (Economic Overview Knoxville, TN MSA, 2021, p. 3). Of the four areas, Knoxville has the lowest educational attainment. Huntsville has the second highest attainment at 44.8% followed by Greenville at 37.8% (US Census, 2020; Key Data,

2021). Each metropolitan area is home to at least one university with Ann Arbor containing one of the largest research institutions in the nation. The University of Michigan is a major contributor to the educational attainment in Ann Arbor as the area was named the most educated city in the United States in 2021 despite a large racial disparity in educational attainment (Slagter, 2021). While the local universities are a large factor in the percentage of residents with bachelor's degrees or higher, they are not the only factor to consider. As industries move and create hubs in different areas, they also attract high-level talent to those areas. Therefore, it is clear that Ann Arbor, as well as Greenville and Huntsville, are attracting talent to the region simultaneously to the growth of industries at a higher percentage than Knoxville.

While each of these areas have different but comparable, sizes and demographics, they are often competing for many of the same projects and industries. As such, when companies are looking at potential areas, they are comparing many of the key assets a city has to determine what is the best community for their business. When comparing Knoxville with any of the given cities, many companies will look for available opportunities for growth, collaborative research, and a community that fosters innovation.

Knoxville has the University of Tennessee, a large research university with quality students and faculty. However, until recent years, the University system was fairly separated from the business community with little interaction between the innovation occurring on campus and companies that could use such technology. There were few programs to help recruit companies to work with students, so graduates were unlikely to find jobs in Knoxville to match their qualifications. In more recent years, this has shifted as the University has opened up to the Knoxville community and begun working to establish a thriving innovation culture that extends past academic pursuits. This is an interesting comparison to Ann Arbor as it is home to the

University of Michigan. The University of Michigan is larger, more established, and better funded than the University of Tennessee. As such, the University of Michigan has several programs nationally ranked across multiple industries. With such a wide variety of top graduates, the University of Michigan has helped to establish a talent pipeline in the local community. This has driven innovation and the recruitment of companies that desire graduates from the University. Programs like MCity and the Economic Growth Institute are more established than similar programs at Tennessee, like SPARK and the autonomic work being done at the research park. While both have a multitude of programs, the University of Michigan's programs cover a wider variety of industries and have built deeper connections with the local community over time.

One major aspect of building an innovation hub is the need for startups and entrepreneurs. Knoxville has a variety of accelerators and programs to attract startups. In particular, SPARK and TechStars have been successful at attracting new companies and helping them create connections with the local community past their time in the program. However, the majority of these companies are not staying in Knoxville. For example, of the first cohort of Knoxville TechStars companies, only one remained in Knoxville permanently at the conclusion of the program. This is a stark contrast to Greenville and Huntsville. In Greenville, the CU-ICAR accelerator has attracted and maintained a multitude of companies that have remained with the center past the official end of their program. This is in part due to the continued availability of resources at the center for companies of all sizes. Furthermore, Greenville NEXT is an accelerator more broadly designed to support all of Greenville's target industries. However, from the beginning of the program, one of the aims is to bring in companies who are committed to staying in Greenville to build the area into an innovation hub. While this is an aim of TechStars

and SPARK in Knoxville, it has not yet come to fruition as it has in Greenville. However, the programs in Greenville have been active for much longer than those in Knoxville and have established deeper connections with other resources in the community. Huntsville, like Greenville, has a much larger and more established innovation and startup community than Knoxville. The Cummings Research Park can be seen as a microcosm of the greater business community in Huntsville. It is interconnected and robust with resources for emerging technology and companies. From aerospace technology to genome sequencing, the research park, and the greater Huntsville community has the infrastructure to support startups and maintain a strong talent pipeline into the area.

Knoxville does have one key resource that differentiates it from the other three MSAs, Oak Ridge National Laboratory. The closest comparison would be between Redstone Arsenal and the Marshall Space Flight Center. However, Redstone Arsenal is largely closed to the public. While it has a large impact on the economy, as discussed previously, it does not directly contribute to the innovation hub as all of the work in the area is under government contracts with a focus on defense logistics. Marshall Space Flight Center offers a few opportunities for collaboration with companies, and the center encourages contracts with small business entrepreneurs. However, these are small in comparison to the resources available at ORNL. Marshall Space Flight Center has one clear focus: aerospace technology. In contrast, ORNL is able to cover a multitude of topics from clean energy to artificial intelligence. Through its connections with the University of Tennessee, ORNL encourages collaborative research with faculty and companies who can commercialize the technology coming out of the laboratory. TechStars can best be used to illustrate the importance of ORNL. One of the three investors in TechStars Knoxville is Thomas Zacharia, the laboratory director. His involvement in TechStars is

a clear indication that ORNL is invested in the local business community and has a willingness to partner with companies in the area to best utilize the technology they are developing. This is different from a government contract with Redstone Arsenal or Marshall Space Flight Center as companies working with ORNL are not under a government contract. This means that they are able to commercialize the technology with the intention of using the technology in their businesses. In contrast, companies under government contracts are using the technology to work for the government or in this case the Army. Rather than turning a profit by commercializing emerging technology, government contractors are paid to work on projects specifically for a government entity. This is less conducive to new innovation and collaboration, giving Knoxville a unique advantage.

One more specific comparison can be seen in the automotive industry. Knoxville competes with both Ann Arbor and Greenville in the electric vehicle and mobility industries. Ann Arbor leads the way in the automotive and mobility space. As a part of the Midwest, they have a well-established industry that has transformed from manufacturing into research and development. Ann Arbor had resources like the American Center for Mobility, the National Vehicle and Fuel Emissions Laboratory, and the MCity partnership with the University of Michigan. Each of these assets encourages continued innovation and entrepreneurial activity in the advanced automotive field from research on electric vehicles to crash safety measures. These resources not only create a thriving startup culture but also attract major companies such as General Motors. Knoxville, in comparison, does not have the same level of resources. The University of Tennessee Research Park at Cherokee Farm has started to invest in electric vehicle research. The park has seen some success by securing a partnership with Volkswagen as a major tenant in the park. However, companies in Knoxville do not have the same infrastructure as



companies in Ann Arbor. The amount of laboratory space and test track space in one area is unique to Ann Arbor and is not replicated in any of the MSAs represented here. More similarly to Knoxville, Greenville has one major hub for automotive research: CU-ICAR. The center is similar to the Research Park in Knoxville as it leverages the work being done at Clemson University to try to create a talent pipeline. However, CU-ICAR is significantly more established than Knoxville's automotive hub. By addressing seven different issue areas and working with over twenty companies on site, Greenville is able to leverage the work being done at the center to keep many industry leaders, such as Bosch and BMW in the area. In contrast to all three, Huntsville does not consider automotive research one of its focuses, and therefore cannot be effectively compared.

The automotive industry is just one example of the ways in which Knoxville competes with these three metropolitan areas. Across a multitude of industries, all three often compete for foreign companies trying to locate in the United States. Foreign direct investment and international firms represent an opportunity for high-quality jobs, particularly in advanced technology fields. Figure 6 illustrates the impact of foreign companies on income levels in the community by comparing the median wage of the area with the median wage of foreign-owned companies in the same area. Across all MSAs, there is a substantial increase in median wage for foreign-owned companies. Ann Arbor has the largest increase in wages with a 59.3% increase for foreign-owned companies. In Knoxville, wages at foreign-owned companies have a 31.6% increase in the median wage. As such, cities look to attract foreign-owned businesses and provide high-quality, higher-paying jobs while attracting talent to the region.

## Median Wage vs Median Wage of Foreign-owned companies by MSA

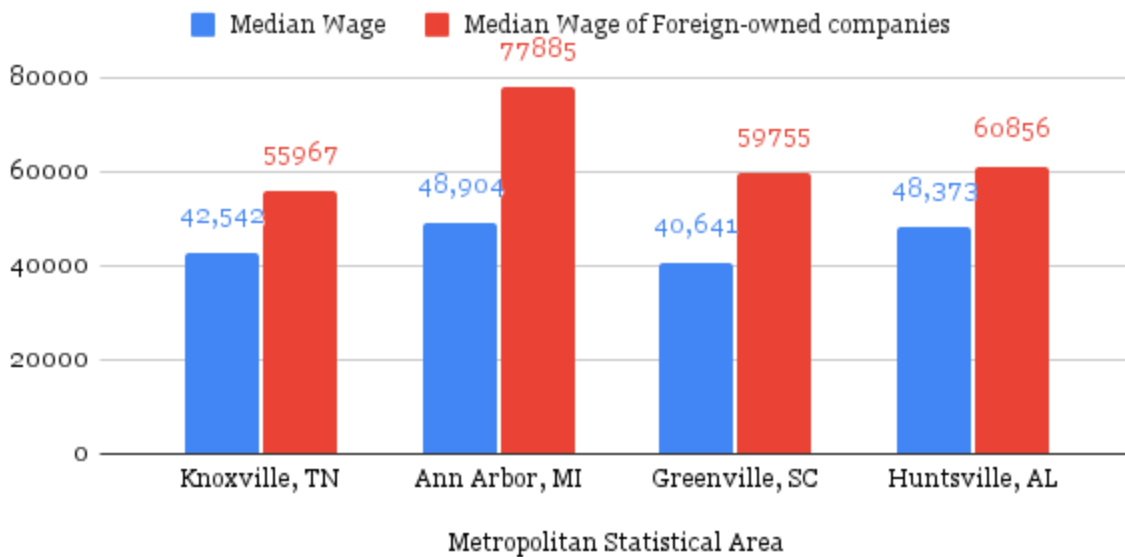


Figure 6: FDI Data for States, MSAs, and Counties, International Trade Administration

Knoxville has had thirty-two foreign projects located to the area in the past twelve years. In contrast, Ann Arbor currently has seventy-six foreign-owned companies with a permanent location within the area. Greenville has an estimated 230 international firms with over 76 projects located in the area between 2010 and 2018 (International Companies). Greenville is home to a number of major companies including Samsung, Mitsubishi, and Michelin. Huntsville is currently home to fifty-six foreign-owned companies with a major, permanent presence (2021 Foreign-based Companies). Most recently, Toyota and Mazda have invested \$1.6 billion in Huntsville to build a new manufacturing plant (The Global Valley). Comparing broadly across all four cities, Knoxville has consistently fallen behind in foreign direct investment. However, when comparing employment rates, Knoxville comes in second behind only Greenville, as seen in Figure 7. Greenville logically has the highest number of employees as they have the most foreign-owned companies and the highest population. However, Knoxville follows with an

estimated 12,840 employees, a number that has increased with the new projects coming into the area. Knoxville's annual employment is over 4,000 more jobs than the next closest, Huntsville. Some of this variation is due to the type of presence and the types of jobs available in the region. As stated, Huntsville recently received a large amount of funding for a new manufacturing plant for Toyota and Mazda. A manufacturing plant is likely to employ more individuals at a lower wage than a research and development team working in a lab. This follows as Knoxville and Greenville have the lowest median wages for foreign-owned companies, seen above in Figure 6, while also employing more individuals than Ann Arbor and Huntsville.

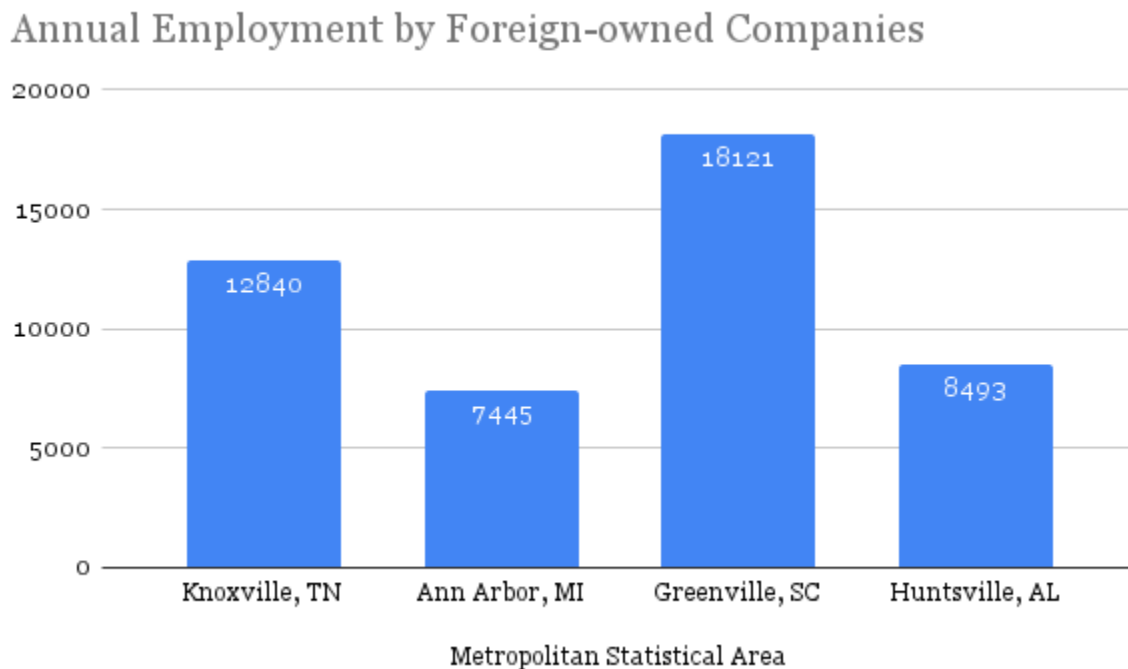


Figure 7: FDI Data for States, MSAs, and Counties, International Trade Administration

As Knoxville continues to compete with Ann Arbor, Greenville, and Huntsville, it is clear that they have many of the same types of resources. Each area has its strengths, but all have the necessary resources at the local level to attract quality companies and grow startups. Knoxville may not have the complex web that Ann Arbor, Huntsville, and Greenville have built across

resources, but Knoxville has access to more technology and high-level research than the other areas. Furthermore, it was well established that many of the comparable assets in other areas were established well before their counterparts in Knoxville. With more time to grow and establish a role in the community, Knoxville's resources can become that of any of the other regions.

### **State Programs and Funding Opportunities**

While the assets found within an area drive the industries and attract innovation to the area, the local area alone is not the only factor to consider. The economic development in each area is influenced by the policy in place at the state level. From safety regulations to tax incentives, there are a multitude of factors that various companies compare across states when considering locations. However, to best understand trends across industries, the focus for comparison will be on available funding for innovation and advanced technology industries. While tax incentives and credits, for example, can play a major role, the variation among tax incentives is a result of the different tax structures within each state. As such, this could be a separate question outside of the scope of this discussion. With that being said, the availability of funds for innovation, research and development, and entrepreneurs varies from state to state as well. While this, too, is tied directly to state allocation of funds and taxes, it still offers an interesting point of comparison. The differences in funds in each state illustrate the importance each state currently places on attracting innovative new businesses and can help explain why one company may choose one city over a similar city in a different state.

### ***Michigan***

The Michigan Economic Development Corporation has some of the most in-depth, and extensive early-stage funding programs in the region. There was a push from the

state level to create a broad Entrepreneurial and Innovation initiative and subsequent programs specifically for early-stage funding. Such early funding opportunities date back over twenty years beginning with the initial Venture Michigan Fund that was established in 2003 under the Early Stage Venture Investment Act. The goals of the fund are to create new jobs, create new businesses, and introduce new industries to the region. This program is different from most others as it is not funded by the state. Instead, it is funded by outside investors that are provided “up to \$450 million of tax voucher certificates” (Venture Michigan Fund). The initial goals were to diversify the industries in the region by funding Michigan-based startups. It is considered a very successful program by laying the groundwork for the continued emphasis on early-stage funding for emerging industries. A later program to mention is the Michigan Economic Opportunity Fund. It provides microloans of up to \$50,000 to women, veterans, and other entrepreneurs (Early Stage Funding). This program has seen significant success, but these are very small loans compared to the costs of commercializing technology. However, these have been incredibly successful for non-technology ventures.

Another available program is the First Capital Fund which provides opportunities for up to \$150,000 to businesses in the earliest stages of commercialization to keep these emerging businesses in Michigan and make them eligible to receive larger funding later. This is a unique program as it fills a very specific niche. Ann Arbor, and other cities, have strong accelerators, but to turn these into an entrepreneurial ecosystem, companies have to have the initial funding to stay in Ann Arbor. After initial funding, these same businesses are eligible for programs like Michigan Rise and the Pre-Seed Fund III. Michigan Rise is a subsidiary of Michigan State University, so it is not a direct state program. However, Michigan Rise receives the vast majority of its funding from the state. In partnership with the Michigan Economic Development

Corporation, the Pre-Seed Fund III invests in industries such as advanced mobility, alternative energy, and information technology to help startups commercialize the research being done across the state in these industries (Michigan Rise Pre-Seed Investment Fund). Michigan Rise

In each of these programs, there is a clear emphasis on the importance of startups and the research coming out of the universities in Michigan. There is clear recognition that innovation from the University of Michigan is central to the continued economic development success of Ann Arbor, and that view is further reflected by the state. This is illustrated by the Ann Arbor-Ypsilanti SmartZone. The SmartZone is a designation from the state intended to support the area by “[providing] capital needed for the facilitation of the commercialization of research products being developed at the University of Michigan and Eastern Michigan University and the development of private high technology enterprises that, but for this organization, would be deferred, or located outside of the SmartZone area” (City of Ann Arbor). These smart zones, available across the state, emphasize the importance of startups and work to ensure that this technology stays within the state.

### ***South Carolina***

South Carolina provides very few opportunities for extensive early-stage funding. However, they have an extensive network of credits for existing businesses. As an example, there is a credit for manufacturing and high-technology businesses to receive a refund of up to \$1,000 per full-time employee for retraining costs annually (Business Incentives, 2023, p. 22). This is directed at existing businesses shifting to higher technology manufacturing that requires new skills. Startups and emerging businesses are not eligible for such funds.

The few available grants and funds available are provided by the South Carolina Research Authority. SCRA has a number of programs like the project development fund and the

acceleration grant that provide small grants, between \$25,000 and \$50,000, to emerging startups (Acceleration Grant Eligibility and Criteria). One notable program is the Acceleration Grant program. This program is designed to help companies commercialize emerging technology to be eligible for tax incentives and funding from other sources. Furthermore, SCRA supports startups receiving federal funding through a matching program to encourage projects to stay in the state. Lastly, the SCRA supports some of the research coming out of public universities to begin commercializing technology before they are able to apply for larger grants and incentives. Each of these programs are aimed at very early-stage funding by providing microloans for short-term development. However, there are few state incentives to continue to invest in these companies to ensure they stay in South Carolina.

### ***Alabama***

Alabama has made a name for itself in recent years by shifting towards innovation and technology and away from the traditional manufacturing and rural industries associated with the state. This has occurred on both the state and local levels as public-private partnerships across the state have helped to recruit and fund new industries, particularly in STEM fields. The largest of these programs is Alabama Launchpad. ALP is a subsidiary organization of the Economic Development Partnership of Alabama. The program has supported 100 startups, as of 2020, with early-stage funding from pre-seed funding to venture funding (Alabama Launchpad Annual Report, 2021). This is one of the few state incentives, as most funding programs are found at the local level rather than the state level.

The state as a whole has supported many of these efforts through the Alabama Innovation Corporation. Innovate Alabama has been instrumental in pushing for policy changes and connecting venture capital firms to startups. It provides entrepreneurs with resources and

supplemental funding with the goal of keeping these companies in the state. Innovate Alabama has a focus not only on the commercialization of technology but also on technology transfer, particularly from federal institutions in the state. This program is particularly important for the state as it leverages resources from Marshall Space Flight Center and Redstone Arsenal, the two largest federal institutions in the state. The Small Business Technology Transfer Research program is one of the largest in the region, offering between \$25,000 and \$250,000 to Phase I companies and up to \$1.5 million for Phase II companies working on prototypes (Alabama Innovation Commission Report, 2021, p. 54). To be eligible for this funding, companies have to work on commercializing technology from one of Alabama's key industries, such as aerospace technology and automotive manufacturing. Alabama has also recognized the need to solidify a talent pipeline from the universities in the region to support their new industries. Innovate Alabama administers the Retain Alabama Program to introduce college graduates to the resources and advanced job opportunities in the state. While this is not a funding resource, it illustrates Alabama's integrated approach to retaining startups and attracting new businesses. Businesses need talent as well as funding to be successful, so encouraging a talent pipeline from the state level is an incredibly important step for continued success.

To further demonstrate Alabama's continued support for innovation, Governor Kay Ivey announced the creation of the Small Business Grant Program in 2022. This program is part of Innovate Alabama and provides up to \$25,000 in additional funds to small businesses receiving federal grants. With the creation of this program, Alabama was recognized as one of "20 states that have implemented robust supplemental grants for both Phase I and Phase II SBIR/STTR winners" according to the US Small Business Administration (Governor Ivey Announces Innovate Alabama's Launch of Small Business Grant Program). This continued commitment is



encouraging for the state as the available programs continue to grow, further allowing local programs to flourish.

### *Tennessee*

Tennessee offers a variety of grants and incentives. However, most of these programs are focused on well-established businesses opening new locations rather than new businesses and startups. Historically, these incentives and grants are determined based on the number of new jobs a business is going to create. While this is effective for attracting big-box manufacturing and other lower-skilled manufacturing jobs, it does not necessarily benefit the smaller companies that may be creating fewer jobs with higher pay and a more skilled workforce. The largest of these programs is the Fasttrack Program including infrastructure, training assistance, and economic development. In the Fasttrack Infrastructure program, local governments are given grants for “specific infrastructure projects benefiting one or more companies committed to creating new jobs and/or making new capital investments.” Across all Fasttrack programs, funding is determined largely by the “weighted average wages of new full-time jobs” and the “location of the project” (Incentives and Grants). However, looking at Figure 8, until 2022, the average grant per new job was much higher in rural areas, consistent with a push from the state to attract new businesses to rural communities and economic opportunity zones. There was a shift, beginning in 2021 to increase the average grants in urban areas. This shift occurred in the aftermath of the COVID-19 pandemic as many businesses needed support to recover from the lost jobs during the pandemic. The broader reason for looking at Figure 8, is to understand that most of the money in the incentives is going to rural or low-income communities. This is vital for the state as a whole, but these programs have less of an impact in Knoxville.

### Average FastTrack Grant per New Job in Urban and Rural Counties

This table illustrates the average FastTrack grant per job in urban and rural counties of the state.\*\*

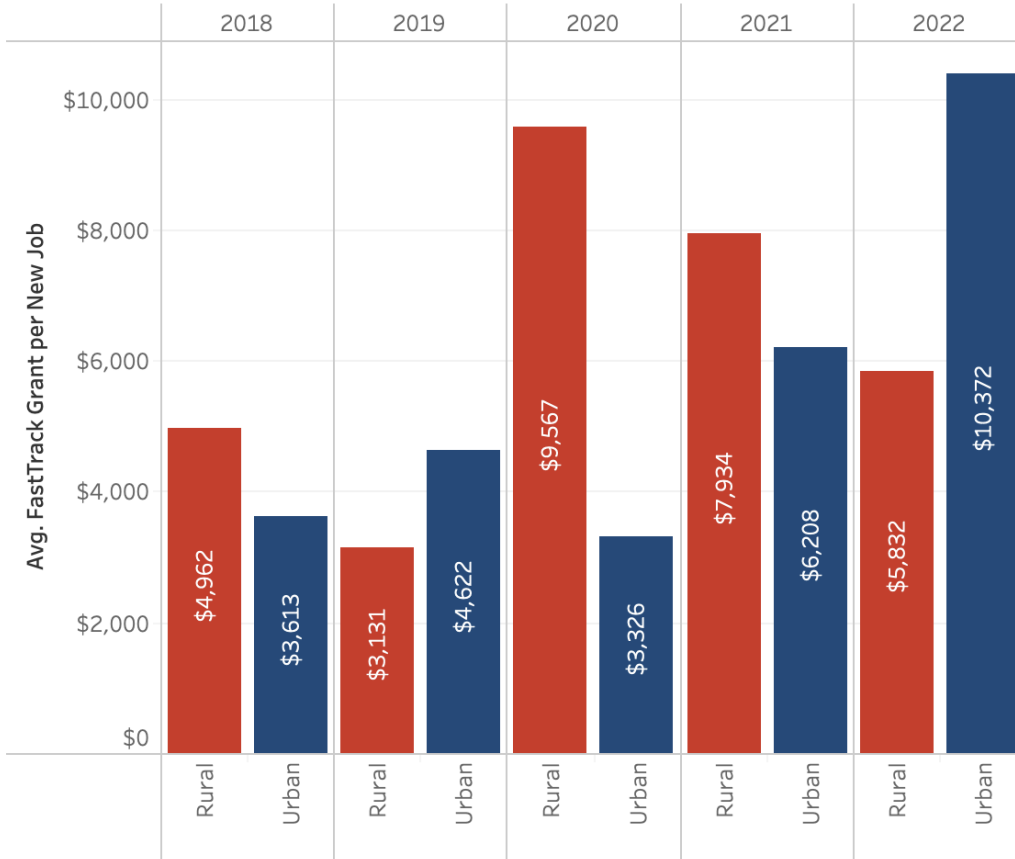


Figure 8: Tennessee Department of Economic and Community Development, 2022

Until 2022, Tennessee did not offer grants of any kind to startups that did not already have funding and employees. As such, startups like those being developed at accelerators in Knoxville were ineligible for any kind of grant funding as they are often not in a position to hire employees or open a manufacturing facility. However, in 2022, Tennessee began to shift this policy with the introduction of InvestTN through the LaunchTN program. LaunchTN has been the driving force behind the entrepreneurial community across the state, but they lacked the state funding to provide grants. Up until this point, LaunchTN worked to create a network of private investors and venture capital firms to support startups across the state. Beginning in 2023,

however, the newly launched InvestTN program will receive \$70 million from the state as a part of the State Small Business Credit Initiative (Launch Tennessee, 2023). These funds, unlike other state programs, are to be used for equity investments. LaunchTN and the Department of Economic and Community Development recognized the lack of funding for startups despite a push from the local level to recruit and keep the innovation coming out of Tennessee in the state long term. The CEO of LaunchTN, Lindsey Cox, explained in an early press release that “access to investment capital has been a challenge in Tennessee, so these funds will fill an immediate demand and support growth in startups that are primed to reach their potential” (Morrison, 2023). This is a promising program for Tennessee, and an initial first step towards innovation funding across the state.

## **Discussion**

### ***Primary Hypothesis***

The primary hypothesis stated that the Knoxville Metropolitan Statistical Area is underperforming in support for early-stage businesses while overperforming in access to technology and foreign direct investment. The hypothesis as a whole was incorrect, but some elements were accurate. The first part of the hypothesis concerning support for early-stage businesses was found to be consistent with the available information. While Knoxville has some fledgling startup accelerators and a small entrepreneurial community, it is not yet a widespread ecosystem. The resources available are strong as TechStars and SPARK innovation are working to make collaboration and connections with the business community more accessible, but these programs are still in their beginning stages. In order to better compete with Ann Arbor, Greenville, or Huntsville, Knoxville must continue to build upon these organizations and help them grow. One accelerator or program on its own will not change the business climate.

However, buy-in from local businesses and key assets to push for entrepreneurship and increased support will help accelerate the growth of new industries in the region. The partnerships between the universities and startup accelerators have been incredibly successful in Ann Arbor as the University of Michigan is incredibly integrated into the business community. In contrast, The University of Tennessee has long been separate from the greater Knoxville business community. These programs that bridge the gaps between student ideas, faculty research, and the local business community will be instrumental in beginning to integrate the available resources from the University to create a more diverse business climate. Huntsville, unlike Knoxville and Ann Arbor, does not have a major research university. However, the impact of the Cummings Research Park seems to act in a similar manner by integrating so many industries and elements of business in one location to provide support and resources to a multitude of industries. Even without a university to be the connecting link, it is possible to grow an innovation hub using solely buy-in from the business community and time to develop. In both of these examples, Ann Arbor and Greenville, there is a clear theme that Knoxville has the necessary pieces, but there is still the need for buy-in and integration, both of which take time. Ann Arbor and Huntsville may have a head-start, but they are not so far ahead that Knoxville cannot still become the innovation hub it hopes to be.

The second assumption was that Knoxville was overperforming in access to technology for research and development. This statement is somewhat true. Knoxville is the only of the three with a major National Lab that researches a wide range of topics. This is a major advantage as businesses have the ability to collaborate in a hands-on environment with access to highly skilled experts in their fields. However, Huntsville has some similarities through Redstone Arsenal and Marshall Space Flight Center. Much of the work done at Redstone is classified and therefore

does not provide businesses with access to technology. Marshall Space Flight Center, on the other hand, has programs to facilitate the transfer of technology to small businesses and startups. They have a more recent focus on startups as a means for collaborative research that will push industries forward for both government and commercial purposes. Of these two major assets, Oak Ridge has a higher capacity and a larger draw for a wider variety of businesses. The Marshall Flight Center has a much more specific mission with focused research and technology. In contrast, Oak Ridge has a variety of topic areas from artificial intelligence to clean energy. In this respect, Knoxville is in a better position to compete than Greenville, Huntsville, and Ann Arbor.

When looking at foreign direct investment, Greenville has the largest contingency of foreign firms and projects followed by Ann Arbor and Huntsville, while Knoxville falls far behind. However, by number of jobs, Knoxville is second only to Greenville. This is an important distinction to make when considering the impact foreign companies can have on the local economy. Many foreign projects pay significantly better than domestic companies, making them highly sought after. However, there is a difference between recruiting manufacturing and research and development projects. Manufacturing may result in more individual jobs, but it is not as highly specialized or skilled as research and development. This can be seen by Knoxville's higher number of individuals employed by foreign companies but lower number of actual projects. In comparison, Huntsville and Ann Arbor have more companies employing fewer people in more skilled jobs. Greenville, like Knoxville, has a high level of employment. However, Greenville has over 230 foreign companies indicating a mixture between research and development and manufacturing. Therefore, while the hypothesis was not incorrect as Knoxville does have high levels of foreign direct investment and employment by foreign firms, it is

misleading. Knoxville, and Tennessee as a whole, may be competitive in foreign direct investment, but it is not in the industries or types of jobs that Knoxville is trying to recruit. The talent pipeline and key industries of Knoxville do not align with large manufacturing projects, so Knoxville must push to shift this investment from manufacturing to research and development in order to stay competitive.

### ***Secondary Hypothesis***

The secondary hypothesis was correct in stating that policies on the state level are a hindrance to the growth and development of new industries in Knoxville. When looking at both Alabama and Michigan, there is a clear sustained effort toward supporting entrepreneurship and emerging industries. In Michigan, these efforts have been around for over twenty years building an incredibly successful track record. As such, the initial program and many subsequent programs both directly from the state and from private-public partnerships have been created. There is a clear emphasis on the University of Michigan and retaining the talent and technology from the University, and other state schools. Over the past twenty years, Michigan and Ann Arbor have benefitted from these programs, leading to a headstart on many similar areas that did not have the same funding opportunities at the time. Alabama added funding opportunities later than Michigan through a series of public-private partnerships. While much of Alabama's funding is still found at the local level or through private venture capital efforts, there is still a push from the state government to retain innovation in the state. Over the past five years, these efforts have increased significantly, indicating a very strong shift at the state level toward innovation. These policies align with Huntsville's strategic plan, much like Ann Arbor and Michigan.

Both Greenville and Knoxville lack this alignment at the state level. Greenville has little to no incentive programs for new businesses. While South Carolina has one startup accelerator

and federal incentive matching program, they lack the robust early state funding of Michigan and Alabama. In effect, they have a similar challenge as Knoxville as the state policies are not supportive of the local goals. Tennessee has historically lacked early-stage funding. Much like South Carolina and Greenville, Knoxville has had very different goals that do not align with the policies in place at the state level. However, this has begun to shift. In 2023, the launch of InvestTN, as a subsidiary of LaunchTN, represents the first push from the state level to attract and retain innovation startups in the state. At the launch of the program, it was recognized that this was the first of its kind in Tennessee and addresses one of the major challenges Tennessee faces in recruiting new industries. This shift also represents a potential shift towards policies that are complementary to the strategic goals of economic development in Knoxville. However, while this is an important milestone, InvestTN alone is not enough. This is one fledgling program compared to the multitude of Michigan's programs that have had twenty years to grow into what they are today. In comparison to Alabama, Tennessee's program is still seven to ten years behind. If Tennessee continues to develop programs and policies that complement local development objectives and assets, it is possible for Tennessee to close the gap with Alabama, and eventually Michigan.

## **Conclusion**

Knoxville is unique among these metropolitan statistical areas as it is home to both a large research university with quality innovation and a national laboratory with the potential for commercialization. These institutions and their programs for collaboration and acceleration should be driving economic development in the area. However, there must be support from the broader community. This support is where Knoxville is still behind similar MSAs. Although the growth in recent years has been evident, there is still work that must be done on both the state

and local levels to bring in support from both local businesses and political actors. Knoxville, and Tennessee, are headed in that direction with the approval of funding opportunities, the initial integration of Knoxville's resources, and growing local support for startup programs. Knoxville has the necessary assets and practices in place to grow into an innovation hub, but it takes time. Compared to other areas, Knoxville is behind because innovation has not been a focus of the business community until much more recently. Therefore, the next steps would be to look more closely at what policies at the local and state level can help to increase the speed at which Knoxville closes the gap with similar areas and further integrates all of the available resources.



## References

- About American Center for Mobility*. (n.d.). American Center for Mobility.  
<https://acmwillowrun.org/about-us/#mission>
- About the National Vehicle and Fuel Emissions Laboratory (NVFEL) | US EPA*. (2023, March 9). United States Environmental Protection Agency.  
<https://www.epa.gov/aboutepa/about-national-vehicle-and-fuel-emissions-laboratory-nvfel>
- Acceleration Grant Eligibility and Criteria. (n.d.). In *South Carolina Research Authority*.  
[https://www.scra.org/wp-content/uploads/2018/06/Acceleration-Grant\\_06.2022.pdf](https://www.scra.org/wp-content/uploads/2018/06/Acceleration-Grant_06.2022.pdf)
- Alabama Launchpad Annual Report. (2021). In *Alabama Launch Pad*.  
<https://alabamalaunchpad.com/wp-content/uploads/2021/02/ALP-2020-Annual-Report-FINAL-.pdf>
- Alabama Innovation Commission Report*. (2021). Innovate Alabama.  
<https://innovatealabama.org/wp-content/uploads/2021/12/commission-report.pdf>
- Ann Arbor SPARK. (2023, February 1). *Top Regional Employers | Washtenaw and Livingston Counties*.  
<https://annarborusa.org/spark-services/business-expansion/regional-demographics/top-regional-employers/>
- Ann Arbor/Ypsilanti SmartZone*. (n.d.). City of Ann Arbor.  
<https://www.a2gov.org/departments/finance-admin-services/smart-zone/Pages/Home.aspx>
- Blackburn, C. (2023). UTRF to Launch Venture Program, Accelerator Fund for UT Startups. *Knoxville Chamber*.  
<https://www.knoxvillechamber.com/utrff-to-launch-venture-program-accelerator-fund-for-ut-startups/>
- Brenna McDermott, Knoxville News Sentinel. (2021, October 4). Why the Techstars accelerator alone won't make Knoxville-Oak Ridge an innovation hub. *Knoxville News Sentinel*.  
<https://www.knoxnews.com/story/money/2021/10/04/techstars-accelerator-could-impact-knoxville-oak-ridge-corridor/8347996002/>
- Business Incentives*. (2023). South Carolina Department of Commerce.  
[https://www.scommerce.com/sites/default/files/2023-01/Jan2023\\_SCCommerce\\_BusinessIncentives\\_Web.pdf](https://www.scommerce.com/sites/default/files/2023-01/Jan2023_SCCommerce_BusinessIncentives_Web.pdf)
- Cummings Research Park. (2016). CRP Master Plan. In *Cummings Research Park*.  
<https://cummingsresearchpark.com/park-of-the-future/master-plan/>
- Early Stage Funding | MEDC*. (n.d.). Michigan Economic Development Corporation (MEDC).  
<https://www.michiganbusiness.org/services/entrepreneurial-opportunity/early-stage-funding/>
- Economic Overview Knoxville, TN MSA. (2021). In *Knoxville Chamber*. JobsEQ.  
<https://www.knoxvillechamber.com/wp-content/uploads/2021/11/Economic-Overview-Knoxville-TN-MSA-Q2-2021.pdf>
- Facts & Figures*. (2023, April). University of Michigan. <https://umich.edu/facts-figures/>

- FDI Data for States, MSAs, and Counties.* (2020). [Dataset]. International Trade Administration.  
<https://www.trade.gov/data-visualization/fdi-data-states-msas-and-counties>
- Governor Ivey Announces Innovate Alabama's Launch of Small Business Grant Program.* (2022, July 12). [Press release].  
<https://governor.alabama.gov/newsroom/2022/07/governor-ivey-announces-innovate-alabamas-launch-of-small-business-grant-program/>
- HudsonAlpha Generated over \$4 Billion for Alabama's Economy.* (2023, April 18). HudsonAlpha.  
<https://www.hudsonalpha.org/hudsonalpha-generated-over-4-billion-for-alabamas-economy/#:~:text=HudsonAlpha%20increased%20its%20economic%20impact,said%20Alabama%20Governor%20Kay%20Ivey.>
- Huntsville Madison County Chamber. (2021). *2021 Leading Employers.*  
<https://hsvchamber.org/wp-content/uploads/2021/04/Leading-Employers-April-2021.pdf>
- Incentives and Grants.* (n.d.). Tennessee Department of Economic and Community Development. <https://tnced.com/advantages/incentives-grants/>
- International Companies.* (n.d.). Greenville Area Development Corporation.  
<https://www.greenvilleeconomicdevelopment.com/business-climate/international/#:~:text=Foreign%20companies%20located%20in%20Greenville,Pierburg%2C%20Nutra%2C%20and%20Michelin.>
- International Transportation Innovation Center. (2023, April 18). *South Carolina's World-class Automotive Test Track.* <https://itic-sc.com/about/#what-we-do>
- Knoxville Area Facts & Figures. (2009). In *Knox Planning.* Knoxville-Knox County Planning.  
<https://archive.knoxplanning.org/locldata/facts-figures/2022%20Facts%20and%20Figures.pdf>
- Knoxville, TN Economy at a Glance.* (n.d.). U.S. Bureau of Labor Statistics.  
[https://www.bls.gov/eag/eag.tn\\_knoxville\\_msa.htm](https://www.bls.gov/eag/eag.tn_knoxville_msa.htm)
- Key Data.* (2021). Greenville Area Development Corporation.  
<https://www.greenvilleeconomicdevelopment.com/key-data-education/>
- Launch Tennessee. (2023, March 21). *Investors - Launch Tennessee.*  
<https://launchtn.org/investors/>
- Major Employers.* (2022, June). Greenville Area Development Corporation.  
<https://www.greenvilleeconomicdevelopment.com/business-climate/existing-business-industry/major-employers/>
- Marshall Space Flight Center Economic Impact Report. (2017). In *National Aeronautics and Space Administration.* National Aeronautics and Space Administration, George C. Marshall Space Flight Center.  
[https://www.nasa.gov/sites/default/files/atoms/files/economic\\_impact\\_mobile\\_508\\_2017.pdf](https://www.nasa.gov/sites/default/files/atoms/files/economic_impact_mobile_508_2017.pdf)
- Martin Slagter, (2021, July 19). Ann Arbor is once again the country's most educated city, report says. *Mlive.*

- <https://www.mlive.com/news/ann-arbor/2021/07/ann-arbor-is-once-again-the-countrys-most-educated-city-report-says.html>
- Mcity & University of Michigan. (2023, March 7). *Our Vision*. Mcity.  
<https://mcity.umich.edu/our-vision/>
- Michigan Rise Pre-Seed Investment Fund*. (n.d.). Michigan Rise Pre-Seed Investment Fund.  
<https://www.michiganrise.com/>
- Morrison, C. (2023, February 23). LaunchTN leadership hitting the road to share information on new fund. *Launch Tennessee*.  
<https://launchtn.org/2023/02/27/launchtn-roadshow-investtn/>
- NEXT Greenville. (2022). *NEXT 2021 Impact Report*.  
<https://nextsc.org/wp-content/uploads/2022/12/2021-NEXT-Impact-Report-Graphics-2.pdf>
- Office of Management and Budget. (2010, June 28) *2010 Standards for Delineating Metropolitan Statistical Areas*. Executive Office of the President.  
<https://www.govinfo.gov/content/pkg/FR-2010-06-28/pdf/2010-15605.pdf>
- Quick Facts*. (n.d.). CU-ICAR: Clemson University International Center for Automotive Research. <https://cuicar.com/about/quick-facts/>
- Spark Innovation Center*. (n.d.). The University of Tennessee Research Park at Cherokee Farm.  
<https://www.tnresearchpark.org/spark/>
- Talent Redefined: A Path to Prosperity Strategy*. (2021). Knoxville Chamber.  
<https://www.knoxvillechamber.com/wp-content/uploads/2021/05/2021-Talent-Retention-Attraction-Strategy.pdf>
- Tennessee Department of Labor and Workforce Development. (2022). *Tennessee's Economy Report in Sections*.  
<https://www.tn.gov/workforce/general-resources/major-publications0/major-publications-redirect/public-reports-redirect/tennessees-economy/sections.html>
- The Best Places to Live in the U.S., Ranked*. (2023). U.S. News.  
<https://realestate.usnews.com/places/rankings/best-places-to-live>
- The Economic Impact of Redstone Arsenal: Research and Technical Assistance Project. (2012). In *Huntsville-Madison County Chamber*. Nathalie P. Voorheen Center.  
[http://hsvchamber.org/wp-content/uploads/2017/09/redstone\\_economic\\_impact\\_analysis\\_may.pdf](http://hsvchamber.org/wp-content/uploads/2017/09/redstone_economic_impact_analysis_may.pdf)
- The Global Value*. (n.d.). Tennessee Valley Authority.  
<https://www.tva.com/economic-development/the-global-valley>
- The Story of HudsonAlpha*. (n.d.). <https://www.hudsonalpha.org/the-story-of-hudsonalpha/>
- The University of Tennessee and Oak Ridge National Laboratory - Research*. (2022, October 14). The University of Tennessee System. <https://research.tennessee.edu/ornl/>
- United States Census Bureau QuickFacts. (n.d.). *U.S. Census Bureau QuickFacts: Huntsville city, Alabama*. Census Bureau QuickFacts.  
<https://www.census.gov/quickfacts/huntsvillecityalabama>

- University of Tennessee, Knoxville. (2023, March 30). *Numbers - University of Tennessee, Knoxville*. <https://www.utk.edu/about/numbers>
- Venture Michigan Fund. (2019, January 17). Venture Michigan Fund. <https://www.venturemichiganfund.com/the-program/>
- Winden. (2012). *Creating knowledge locations in cities : innovation and integration challenges*. Routledge.
- Workforce Development*. (n.d.). The University of Tennessee-Oak Ridge Innovation Institute. <https://utorii.com/workforce-development/>
- Youtie, & Shapira, P. (2008). Building an innovation hub: A case study of the transformation of university roles in regional technological and economic development. *Research Policy*, 37(8), 1188–1204. <https://doi.org/10.1016/j.respol.2008.04.012>
- 2021 Foreign-based Companies. (n.d.). In *Huntsville Madison County Chamber*. Retrieved December 2020, from <https://hsvchamber.org/wp-content/uploads/2020/12/2021-Foreign-Based-Companies.pdf>