

Growth and Diversification Plan (2021)

GO VIRGINIA REGION 2

Prepared by the Virginia Tech Center for Economic and Community
Engagement
NOVEMBER 2021

ACKNOWLEDGEMENTS

This document is submitted to the state GO Virginia Board by the Region 2 Council. Prepared in accordance with state Growth and Diversification plan amendment guidelines, this plan updates and revises the original August 2017 Regional Economic Growth and Diversification Plan.

This plan would not be possible without the committed service of leaders from business, education, government and non-profits who have participated in the council and supported the work here in this region. Further thanks go to the leaders of our nine regional economic development, planning, and workforce organizations; Valley’s Innovation Council; TEconomy LLC; Economic Modeling Specialists Inc (EMSI); and other national, state and local sources. Their research and data provided a strong starting point for this plan and fresh insights during the fact-finding process. Lastly, we wish to thank Council members and staff for the energy and insights they brought to the process.

The information collected is synthesized in this document. This data assisted in the identification of Region 2’s target industry clusters and contributed to the formation of this region’s four strategic areas:

- Innovation Cluster Scale-Up
- Entrepreneurship and Business Development
- Talent Development, Attraction and Retention
- Collaborative Sites and Infrastructure Development

With this foundation, the GOVA Region 2 Council engaged stakeholders across the region. Working groups for each strategic area met in-person and online to develop and prioritize strategies that will be used to fund GO Virginia Region 2 projects for the coming five years. Each working group was led by two council members and facilitated by one staff member. Working group members met twice as a group and engaged individually with council members and staff. Finally, in October 2021, the draft plan was shared online and through three regional public sessions to gain even more input and feedback from residents, businesses, governments, and other organizations. A full list of working group members and participants in the development of this document is in Appendix C.

Raymond Smoot
Chair

Eddie Amos
Vice-Chair

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	i
TABLE OF CONTENTS.....	ii
LIST OF FIGURES AND TABLES.....	iii
EXECUTIVE SUMMARY	vi
SECTION 1: REGIONAL DEMOGRAPHICS AND GROWTH DATA.....	1
Demographics	1
Economic Growth.....	4
Firm Growth, Employment and Primary Industries.....	6
SECTION 2: REGIONAL ECONOMIC DRIVERS AND CLUSTERS	9
Transportation and Autonomy Cluster	15
Materials and Machinery Cluster.....	18
Life Sciences & Healthcare Cluster.....	19
Information Technology and Emerging Tech.....	22
Shared Demand Occupations.....	25
Peer Region Comparison.....	26
SECTION 3: REGIONAL PRIORITIES	30
Innovation Cluster Scale-Up.....	33
Entrepreneurship and Business Development	42
Talent Development, Attraction and Retention	49
Collaborative Sites and Infrastructure Development	54
SECTION 4: APPLICATION PROCESS AND ASSESSMENT CRITERIA	61
SECTION 5: IMPLEMENTATION AND SUSTAINABILITY	66
CLOSING	70
APPENDIX A: INDUSTRY CLUSTER DEFINITIONS	71
APPENDIX B: REGION 2 MEMBERSHIP	76
APPENDIX C: PEER REGION DATA	79

LIST OF FIGURES AND TABLES

Table 1: Population Growth	1
Figure 1: 2014 In-region Commuting Patterns	2
Figure 2: 2018 In-region Commuting Patterns	2
Figure 3: Region II 2001, 2011, and 2021 Graduates by Degree and Percent Change in Graduates	3
Table 2: Real GRP and Percent Change (2015-2020)	4
Table 3: Gross Regional Product (GRP) by 2-Digit NAICS Industry Sector	4
Figure 4: Region 2 Annual Change in Personal Capita Income	5
Table 4: Households Paying More Than 30% for Housing	5
Figure 5: Regional Average Wage	6
Figure 6: New Business Formation Rate in Traded Industries, 2010-2020.....	7
Table 5: Promising 2-Digit NAICS Industry Sectors in GOVA Region 2.....	8
Figure 7: Region 2 Target Clusters- GRP, LQ, and Shift-Share	10
Figure 8: Region 2 Employment Change, All Industries, 2015-2021.....	11
Table 6: Region 2 Industry Cluster Performance Trends, 2015-2021	11
Table 7: Comparative Industry Cluster Trends, 2015-2021	12
Table 8: Region 2 Industry Cluster Performance Trends, 2021-2026.....	13
Table 9: Comparative Industry Trends, 2021-2026	13
Table 10: Region 2 Industry Cluster Sales and Demand	14
Table 11: Region 2 Transportation and Autonomy Cluster Performance Trends	16
Table 12: Region 2 Key Transportation and Autonomy Cluster Occupations.....	17
Table 13: Region 2 Materials and Machinery Manufacturing Cluster Trends	19
Table 14: Region 2 Life Sciences & Healthcare Cluster Performance Trends.....	20
Table 15: Region 2 Key Life Sciences & Healthcare Occupations	21
Table 16: Region 2 IT and Emerging Technology Cluster Performance Trends.....	23
Table 17: Region 2 Key IT and Emerging Tech Occupations	23
Table 18: Region 2 Key Shared Demand Occupations	25

Figure 9: Job Change in Transportation and Autonomy Cluster, 2015 to 2026	26
Figure 10: Job Change in Materials and Machinery Cluster, 2015 to 2026	27
Figure 11: Job Change in IT and Emerging Technology Cluster, 2015-2026	27
Figure 12: Job Change in Life Sciences and Healthcare Cluster, 2015-2026.....	28
Table 19: Region 2 Strengths, Opportunities, Challenges	29
Table 20: Region 2 Industry Cluster Components and Average Wages.....	34
Figure 13: Target Industry Cluster Employment Growth (2015-2021)	34
Table 21: Innovation Cluster Scale-Up Strategies.....	36
Figure 14: New Business Formation by Region and State (2020).....	42
Figure 15: Startups by Traded Industries, 2019 and 2020.....	42
Figure 16: Concentration of New Business Formation	45
Table 22: Entrepreneurship and Business Development Strategies.....	47
Table 23: Region 2 Talent Development, Attraction and Retention Assets, Strengths, and Challenges...	49
Table 24: Talent Development, Attraction and Retention Strategies	51
Table 25: Collaborative Sites and Infrastructure Development Strategies	58
Table 26: Transportation and Autonomy Cluster Definitions.....	70
Table 27: Materials and Machinery Manufacturing Cluster Definitions	71
Table 28: Life Sciences & Healthcare Cluster Definitions	72
Table 29: IT and Emerging Tech Cluster Definitions	73
Figure 17: Comparative Median Household Income Data	80
Figure 18: Comparative Median Household Incomes by the COL	81
Figure 19: Number of Firms in Various Sizes Within Peer Economies.....	82
Figure 20: Diversity within Peer Economies	83
Figure 21: Home Ownership Rates in Peer Economies.....	84
Figure 22: Median Property Values in Peer Economies	85
Figure 23: Percent of Households that are Housing-Burdened	86
Figure 24: Civilian Labor Force Participation Rate within Peer Economies	87
Figure 25: Unemployment Rate Changes within Peer Economies	88
Table 30: Small Business/Entrepreneurship Support Resources	89

Figure 26: Absolute Distribution of Firms in Various Sizes within Peer Economies	90
Figure 27: Relative Distribution of Firms in Various Sizes within Peer Economies.....	90
Table 31: Job Change in Transportation and Autonomy Cluster	91
Table 32: Job Change in Materials and Machinery Cluster	92
Table 33: Job Change in IT and Emerging Tech Cluster	92
Table 34: Job Change in Life Science and Healthcare Cluster	93
Figure 28: Real GDP by MSA	93
Figure 29: Percent Change in Real GDP by MSA.....	94
Figure 30: Real GDP Per Capita within Peer Economies	95
Figure 31: Cumulative Percent Change in Real GDP Per Capita within Peer Economies.....	96
Table 35: Assorted Characteristics of Peer Groups	97

EXECUTIVE SUMMARY

GO Virginia’s objectives, as set by the state, are simple and provide a clear path for action. The program seeks to grow jobs that pay higher than the regional average wage, primarily through investment that is new to Virginia. This requires a focus on industries with high growth potential, featuring in-demand occupations with higher wages.

This Growth and Diversification plan provides a roadmap for utilizing GO Virginia funding for projects across this region, which includes the Lynchburg, New River Valley, and Roanoke-Alleghany sub-regions. Each of these areas has a strong history of local cooperation, and some experience with interregional collaboration, primarily between the New River and Roanoke Valleys. Together, they all share many economic similarities: traditional industry strengths in manufacturing, transportation, and agriculture; emerging technology sectors; mixed urban and rural characteristics; and higher education and healthcare as economic and employment drivers.

This plan documents the socio-economic trajectory of this region, particularly the concentration of different industries across this footprint, their job growth rates compared to the nation, their contributions to gross regional product, the number of higher-than-average wage jobs available in these industries, and assets unique to the region that drive opportunity. The analysis of that data identifies four target “clusters”—or geographic concentrations of businesses with common markets, suppliers, technologies, and workforce needs. These four interrelated clusters offer the greatest potential for sustainable, scalable, future growth in the region. The table below lists the four target clusters, their average wages, and key industries within the clusters.

GOVA Region 2 Target Industry Clusters

GOVA Industry Clusters (Average wage = \$27/hour or \$55K annually)			
Transportation and Autonomy (\$34/hr or \$70K)	Materials and Machinery Manufacturing (\$34/hr or \$70K)	Life Sciences and Healthcare (\$31/hr or \$65K)	IT and Emerging Tech (\$43/hr or \$91K)
<ul style="list-style-type: none"> • Heavy Duty Trucks • Motor Vehicle Parts • Automation 	<ul style="list-style-type: none"> • Plastics • Rubber • Iron Foundries • Industry Machinery and Tools 	<ul style="list-style-type: none"> • Biopharma & Medical Devices • Residential Care • Eldercare • Medical Diagnostics & Support Services 	<ul style="list-style-type: none"> • IT & Cybersecurity • Electrical Manufacturing • Engineering Services

Together these clusters provide more than 50,790 jobs, or approximately 15% of the total employment in the region as of 2021. Like many regions of the U.S., this region was hard-hit by the COVID-19

Pandemic. With that and the slow recovery from the last recession, comparative growth to the nation in these target clusters has been low. However, together, they contribute \$5.1 billion in economic activity, or 16% of the region's gross regional product in 2020. These clusters contributed proportionally more to the region's GRP in 2020 compared to the original plan in 2017. With the exception of the materials and machinery manufacturing cluster, each target industry cluster is expected to see growth in the next five years. The life sciences cluster is expected to lead the region, with 5.7% employment growth forecast.

To grow economic opportunity in these clusters, the plan identifies core strategies in four focus areas.

1. **Innovation Cluster Scale-Up:** Based on observations that were taken over the past five years, the Council created a focus area specifically addressing technical and business support to accelerate the promotion and development of innovative clusters (both soft and hard infrastructure)
2. **Entrepreneurship and Business Development:** To address the need for entrepreneurial activity and business growth in the region, Region 2 identified a focus on promoting access to capital, mentorship, and training programs. Over the past five years, 7 projects (\$1.1 million) have been funded to achieve the goal of growing more startup and existing firms that create and sustain higher wage jobs.
3. **Talent Development, Attraction and Retention:** One significant focus area is to address the need for talent attraction, retention, and development within the priority industry clusters, particularly as it pertains to higher than median-wage jobs. Over the past five years, 11 projects (\$1.4 million in funding) have been created to support the growth, attraction and retention of top talent. (Note: This plan uses the term "talent" in reference to workforce, partly since workforce is often associated with training programs and worker services whereas talent refers to a broader spectrum of approaches concerning attraction and retention of highly skilled [talented] people.)
4. **Collaborative Sites and Infrastructure Development:** Region 2's Council recognizes that one focus area in this region should include the development and growth of sites and the infrastructure used to support those properties, particularly existing underutilized sites and buildings, appropriate for the needs of growing priority industry clusters. In the past five years, 7 projects (\$1.4 million in funding) have been supported to increase the number of collaboratively developed sites and buildings on the market, improve their market positioning, and meaningfully encourage sites and buildings projects to leverage special assets.

Such projects must connect to these strategies, promote higher paying jobs in the priority clusters, include substantive matching funds, and most importantly demonstrate an innovative and forward-looking approach that doesn't simply represent business as usual.

SECTION 1: REGIONAL DEMOGRAPHICS AND GROWTH DATA

Region 2 of GO Virginia spans across three metropolitan statistical areas (MSAs) and regional commissions on the western half of the state. The region is comprised of the Lynchburg, New River Valley, and Roanoke-Alleghany MSAs. In total, Region 2 contains thirteen counties and five independent cities. The region's population of 781,531 made up 9.1% of Virginia's 2020 total population.

The region's industries provided approximately 6.4% of the state's gross domestic product (GDP) in 2020. Historically, manufacturing, trade, transportation, and utilities industries have played a significant role in the region's economic activity. While manufacturing and trade continue to play an important role, education and health sectors are growing. The region experienced a 91.7% growth (2015-2020) in annual postsecondary graduates, growth driven by the region's higher education institutions. The region's growth in higher education and diversification in economic activities suggests the region is primed to take advantage of increases in investment outlined in GO Virginia.

Demographics

From 2015-2020, the region's population had a growth rate of 0.78% (Table 1), a slower rate than state (2.67%) and national (2.73%) rates. Similar to national trends, Region 2's senior population increased. This growth may be due to attracting retired folks to the area, as well as retaining senior populations once out of the workforce. Another distinct characteristic of this region in 2020 was the large college-age population (20-24 years old), which represented about 9% of the region's total population compared to just 7% for the populations of Virginia and the U.S. While the population of early- to mid-career residents (25-40 years old) in Region II increased 6% since 2015, the late-career population (40-59 years old) declined by 7%.¹

Table 1: Population Growth²

	Population (2015)	Population (2021)	Total Change	% Change (2015-2021)
Region 2	775,474	785,790	10,316	1.33%
Virginia	8,367,303	8,649,331	282,028	3.37%
United States	320,738,994	331,820,028	11,081,034	3.45%

Despite the population decline in mid- to late-career residents (ages 40 to 59 years old), a 2018 laborshed analysis reveals a significant number of out-of-region residents commuting into Region 2 for work. Since 2014, in-commuting increased 10 percentage points, from 74,894 to 109,026 workers commuting

¹ Economic Modeling Specialists Inc (EMSI). Datarun 2021.3. <https://login.economicmodeling.com>

² EMSI. Datarun 2021.3

into the region. Of the 328,951 workers in Region 2 in 2018, 67% both lived and worked in the region and 33% commuted into the region for work. Moreover, in-region commuting from the New River Valley and Lynchburg into the Roanoke Valley has also increased, as illustrated in Figures 1 and 2.³

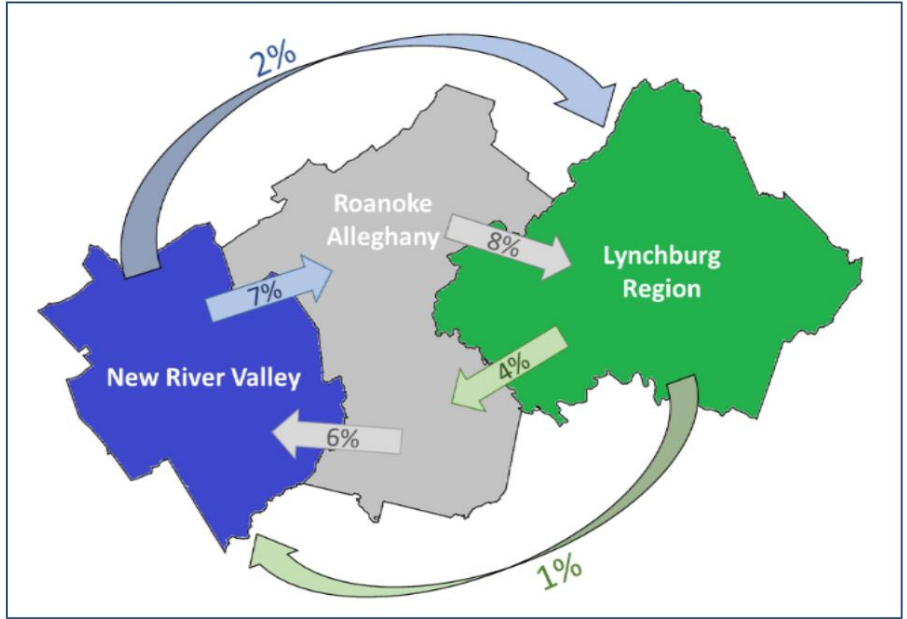


Figure 1: 2014 In-region Commuting Patterns

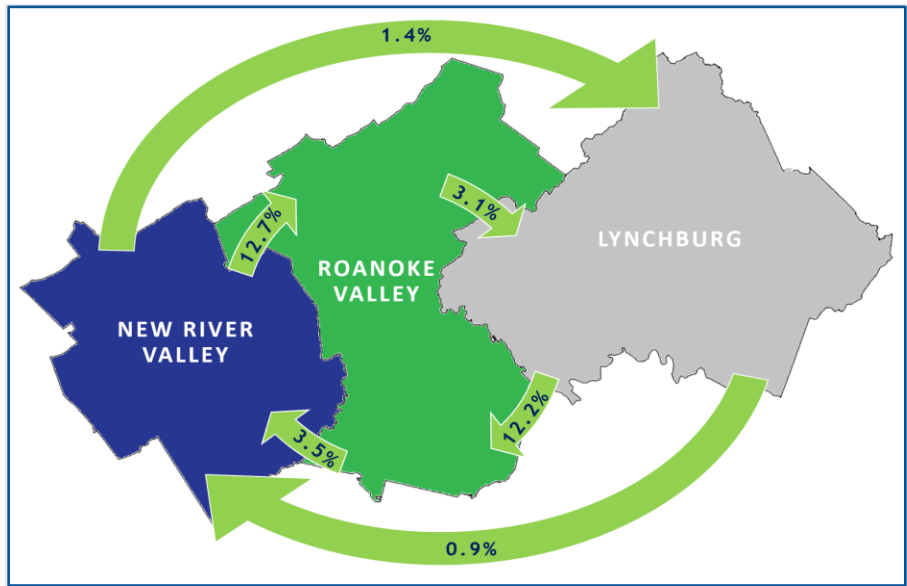


Figure 2: 2018 In-region Commuting Patterns

Meanwhile, growth in early and mid-career residents in the region may suggest that the region retained postsecondary graduates and/or attracted early to mid-career workers to the region. Indeed, the total

³ US Census Bureau (2014 and 2018). Longitudinal Employer-Household Dynamics OnTheMap. Retrieved from: <https://onthemap.ces.census.gov/>.

number of postsecondary graduates continues to increase, driven by the growth of the two public universities (Virginia Tech and Radford University); several private institutions (including Liberty University, Jefferson College of Health Sciences, Hollins University, Lynchburg College, Randolph College, Roanoke College, Ferrum College, and Sweet Briar College); and four community colleges (New River Community College, Virginia Western Community College, Dabney S. Lancaster Community College, and Central Virginia Community College). Over the past 5 years graduation rates increased by 9%, with 37,652 graduates earning at least an associate's degree, across the 3 Virginia MSAs in 2019. All degrees increased over this time including associates, certificates, bachelors, and professional and graduate degrees (Figure 3).⁴

This increase in post-secondary graduates was due in part to a surge in graduates during and after the recession, when individuals delayed entering the labor market, as well as intentional growth practiced by some of the region's largest higher education institutions. According to the State Council for Higher Education in Virginia (SCHEV), these numbers were also inclusive of online degree earners. For instance, the increase in Region 2's bachelor's degree earners over the past few years may reflect growth of online degree options, particularly for Liberty University, which would have little relevance for the regional goal of retaining post-graduates.⁴

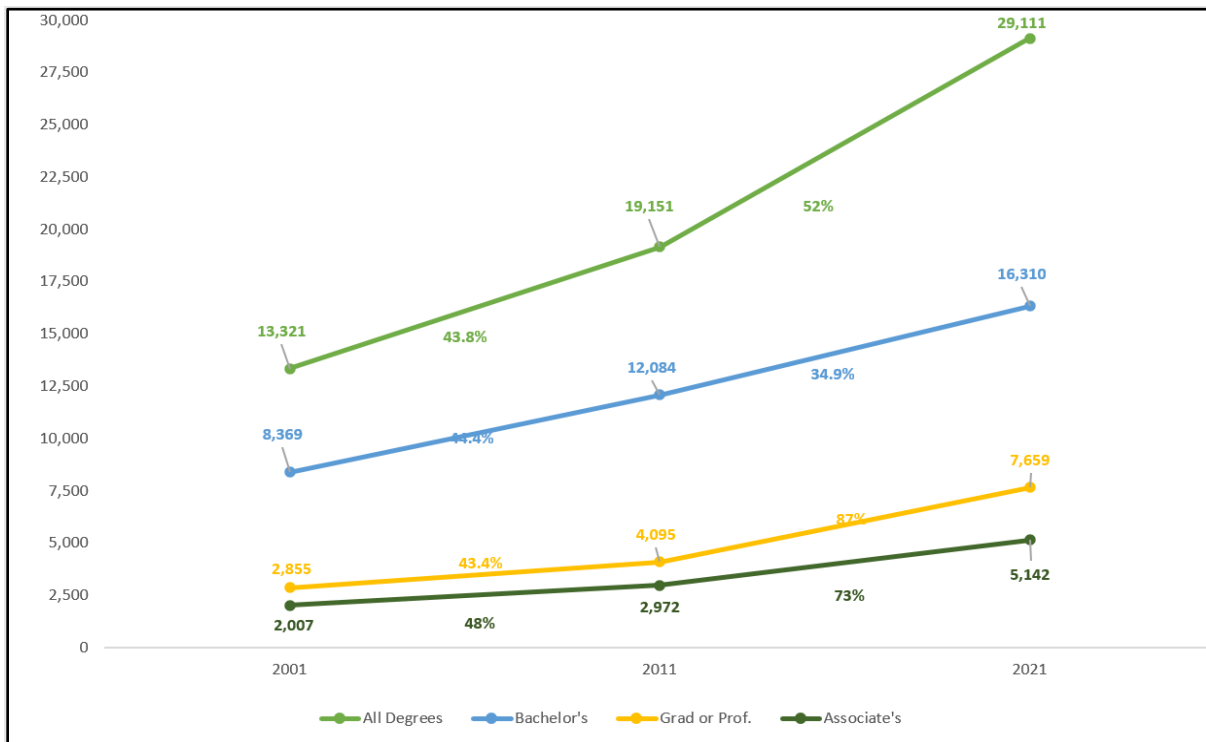


Figure 3: Region II 2001, 2011, and 2021 Graduates by Degree and Percent Change in Graduates

⁴ National Center for Education Statistics (2001, 2011 and 2021). Integrated Postsecondary Education Data System (IPEDS). Retrieved from: <https://nces.ed.gov/ipeds/use-the-data>.

Economic Growth

As seen with population growth, the region's total economic output has increased at a slower rate compared to the state and nation. The region displayed 0.6% growth in real gross regional product (GRP) from 2015-2020, compared to 6.2% growth in Virginia and 6.1% in the US (Table 3). Within the region, there have been differences in economic performance, with the Roanoke MSA being the largest in terms of real GRP but having a decline in real GRP.⁵ This slower growth rate is reflective of a national trend, where more rural regions have been slower to recover from both the Great Recession and the COVID-19 pandemic. Major industries contributing the gross regional product in Region 2 are manufacturing, government (including state education institutions), and healthcare and social assistance (See Table 3).

Table 2: Real GRP and Percent Change (2015-2020)⁵

	REAL GRP (billions in 2020 chained dollars)		% CHANGE IN REAL GRP
	2015	2020	2015-2020
Region II	31.5	31.7	0.6%
<i>Blacksburg-Christiansburg MSA</i>	5.9	6.0	0.3%
<i>Lynchburg MSA</i>	9.7	10.2	4.8%
<i>Roanoke MSA</i>	14.5	14.4	-0.8%
Virginia	467.5	496.6	6.2%
United States	17,890.3	18,986.8	6.1%

Table 3: Gross Regional Product (GRP) by 2-Digit NAICS Industry Sector⁵

2-Digit NAICS Sector	2020 GRP	% Regional GRP
Manufacturing	\$6,001,529,226	18.9%
Government	\$4,071,918,063	12.8%
Healthcare and Social Assistance	\$3,691,157,353	11.6%
Retail Trade	\$2,398,801,187	7.6%
Wholesale Trade	\$2,376,592,909	7.5%
Finance and Insurance	\$2,149,505,831	6.8%
Professional, Scientific, and Technical Services	\$1,963,909,050	6.2%
Construction	\$1,680,580,336	5.3%
Transportation and Warehousing	\$1,050,121,129	3.3%
Real Estate and Rental and Leasing	\$949,948,225	3%

⁵ EMSI. Datarun 2021.3

Similarly, the region’s population experienced relatively slow year-to-year growth of per capita personal income (Figure 4). Between 2015 and 2019, per capita income for the region increased 1.3% in real dollars compared to 2.9% for Virginia and 5.2% for the U.S. (2019 dollars). In 2019, per capita income for the region approximated \$43,863. Wealth varies within Region II. In 2019, only five localities had above the regional per capita personal income (Roanoke City, Salem City, Bedford, Botetourt and Roanoke Counties). Amherst, Appomattox, Craig, and Montgomery counties and Radford city had the lowest per capita personal incomes.⁶

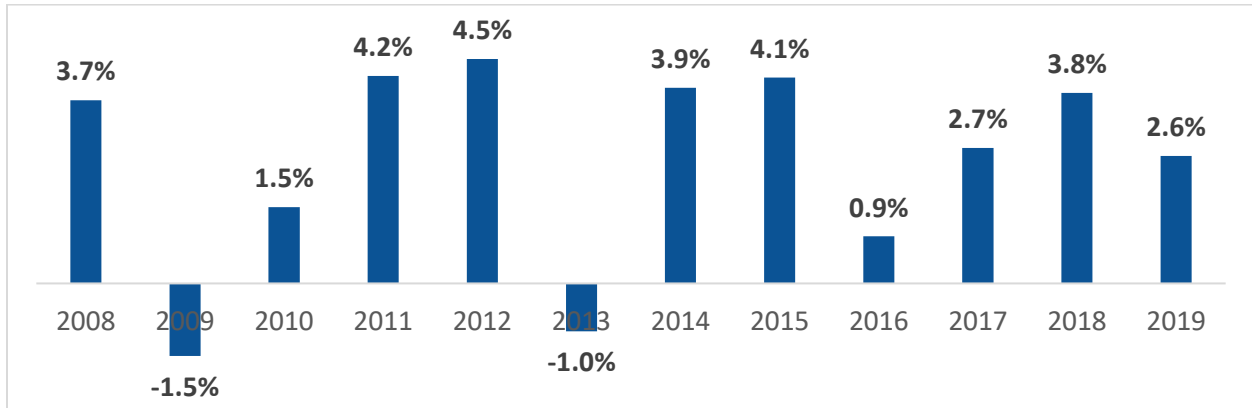


Figure 4: Region 2 Annual Change in Personal Capita Income⁶

GO Virginia emphasizes higher wages as a form of wealth-building. Figure 5 describes the region’s average wage. Another indicator of wealth relates to median household income and cost of housing. According to the Census’ American Community Survey, the median household income for the United States was \$65,712 in 2019, and Virginia’s was \$75,456 (nearly 15% higher). Region 2 had much lower median household incomes, ranging between \$56,000-\$60,500 across the three MSAs, indicating co, sts of living overall. However, Table 2 shows that overall housing burden remained relatively comparable for renters in Region 2 compared with the state.⁷

Table 4: Households Paying More Than 30% for Housing⁷

	Virginia		Blacksburg MSA		Lynchburg MSA		Roanoke MSA	
	Owners	Renters	Owners	Renters	Owners	Renters	Owners	Renters
All Incomes	412,739 (19.6%)	463,333 (42.9%)	4,926 (13.7%)	10,631 (40.6%)	10,596 (14.5%)	11,805 (39.6%)	12,694 (14.5%)	18,002 (46.3%)
Median Monthly Cost	\$1,799	\$1,254	\$1,499	\$915	\$1,167	\$857	\$1,364	\$956

⁶ Bureau of Economic Analysis (BEA). Interactive Tool: Personal Income, Population, Per Capita Personal Income (CAINC1 and SAINC1). Retrieved from <https://www.bea.gov>.

⁷ Census (2019). American Community Survey 5-year Estimates. <https://data.census.gov>.

Two leading causes of this regional housing burden on renters is lack of housing supply as well as low wages that prevent renters from saving for a down payment on a house. The relative importance of affordable housing for economic development is growing as firms grow and come to the region. Employers require more in-demand, skilled talent. To retain and attract that talent, affordable housing is a key consideration for where populations decide to live and/or work.

Figure 5: Regional Average Wage

One overarching goal of GO Virginia Region 2 is to increase the number of jobs with higher than average wages. The average wage for a worker in Region 2 was \$26.56 per hour at the time of this plan. This equates to an annual wage of \$55,430 for a full-time worker (2,087 hours). Average wages tended to be higher in the region's more urban areas. For example, the average wage for the cities of Lynchburg, Radford, Roanoke, and Salem and their surrounding counties was \$27.84 per hour (\$58,104 annually) at the time of this analysis. Meanwhile, average wages for the remaining 11 counties in the Region 2 footprint were \$23.75 per hour (\$49,576 annually).

Firm Growth, Employment and Primary Industries

The health of regional firms across traded industries⁸ is at the core of GO Virginia's goals to increase investment and high wage jobs. Firm health can be measured by the age make-up of firms, business formation and employment growth. Region 2 has proportionally more traded sector firms that are 11 years old or older than the state or nation. These older firms make up 92.1%, 87.3%, and 85.9% of total employment in the region, state, and nation respectively. Unlike the state and nation, however, these older firms have lost more jobs annually starting in 2013, indicating a need to better support job retention activities for these firms. Meanwhile, young firms ages five years or less contribute the most to job growth for the region, state and nation.⁹

The rate of new business formation in Region 2's traded sectors has remained within 2 percentage points of Virginia for all years but one since 2010 (See Figure 6). While the rate has been lower, it has remained relatively on trend. Although business formation slowed during the COVID-19 pandemic, entrepreneurs still created approximately 188 businesses in 2019 and 267 businesses in 2020. Traded industries that demonstrated particularly strong firm creation were Business Services; Transportation, Distribution and Logistics; Healthcare Services; and Engineering, R&D, Testing & Technical Services.¹⁰

⁸ Industries that export most of their product and therefore contribute new money to the regional economy. These industries play a key role in supporting and growing a region's economy.

⁹ TEconomy (2021). GO VA 2021 Phase 1 Entrepreneurial Trends Analysis; U.S. Census Bureau Quarterly Workforce Indicators dataset.

¹⁰ TEconomy (2021). GO VA 2021 Phase 1 Entrepreneurial Trends Analysis; Business Dynamics Research Consortium, Your-economy Time Series (YTS).

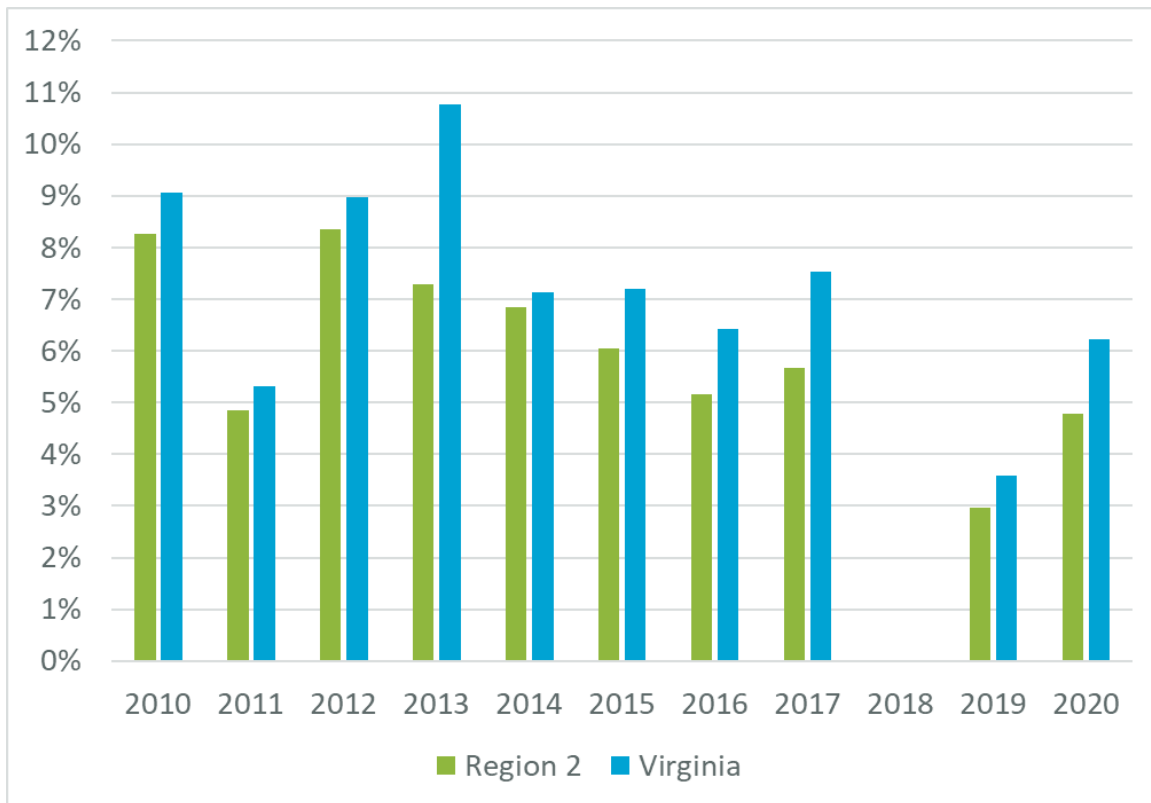


Figure 6: New Business Formation Rate in Traded Industries, 2010-2020¹¹

Region 2 has strengths and potential in four out of eleven of the state-defined industry clusters. According to a state-provided report by TEconomy LLC, these industry clusters are:

- **Business Services:** a mid-sized industry cluster that has shown job consistent. Note that in this region, industry codes for business services, engineering services and R&D often overlap. Business services include companies such as Aecom Design, Draper Aden and Associates, Star Tek, and Polymer Solutions.
- **Manufacturing:** a historically strong industry cluster with large, concentrated employment. Manufacturing includes firms like Moog, Yokohama Tire, Ply Gem, and Glad Manufacturing Co.
- **Aerospace:** this small, emerging cluster consists of businesses working in autonomous systems and cybersecurity; for instance, Aeroprobe, TORC Robotics, and Bae Systems. It has had distinctly higher rates of job growth than the national average.
- **Transportation, Logistics and Distribution:** another mid-sized industry cluster with consistent job growth and opportunities for greater employment concentration. This cluster includes businesses such as Lawrence Transportation Systems, Backcountry, Howells Motor Freight, Thompson Trucking, and three regional airports.

¹¹ TEconomy (2021). GO VA 2021 Phase 1 Entrepreneurial Trends Analysis; Business Dynamics Research Consortium, Your-economy Time Series (YTS). Note: 2018 excluded due to addition of a major source of firm data to underlying BDRC database that makes comparisons using 2018 not possible

Section 2 of this plan describes four target industry clusters for GOVA Region 2. While they have similarities with the state-wide TEconomy clusters, they are more tailored to the industry strengths of this specific region.

An examination of regional 2-digit NAICS industry sectors also shows ten industry sectors with distinct regional strengths (Table 5). Numbers highlighted in green represent:

- Positive jobs growth (2015-2020)
- Employment Specialization higher than the national average (Location Quotient)
- Greater jobs growth than the national average (Shift Share)
- Higher earnings than the regional average

Table 5: Promising 2-Digit NAICS Industry Sectors in GOVA Region 2

Description	2015 Jobs	2021 Jobs	2015 - 2021 % Change	2021 Location Quotient	Shift Share	Avg. Earnings Per Job
Construction	19,698	20,012	1.59%	0.95	(2,029)	\$57,899
Manufacturing	43,987	43,195	-1.80%	1.54	(325)	\$74,027
Wholesale Trade	11,277	11,001	-2.45%	0.84	197	\$73,990
Transportation and Warehousing	12,737	12,485	-1.98%	0.84	(3,235)	\$61,382
Finance and Insurance	11,239	10,733	-4.50%	0.70	(1,434)	\$84,481
Professional, Scientific, and Technical Services	17,152	17,313	0.94%	0.69	(1,706)	\$80,519
Management of Companies and Enterprises	6,015	6,150	2.24%	1.16	(292)	\$88,486
Educational Services	16,711	18,067	8.11%	1.93	727	\$35,095
Healthcare and Social Assistance	47,523	51,306	7.96%	1.07	(347)	\$62,452
Arts, Entertainment, and Recreation	3,761	4,489	19.36%	0.89	1,326	\$24,565

SECTION 2: REGIONAL ECONOMIC DRIVERS AND CLUSTERS

The term “industry clusters” refers to a geographic concentration of businesses that share common markets, suppliers, technologies, and workforce needs. Businesses within a cluster benefit from their proximity to shared resources including a skilled workforce, specialized suppliers, infrastructure, and a localized base of sophisticated knowledge about their industry. Each cluster has a high level of economic integration and interdependency.

Four revised industry clusters were identified for this 2021 growth and diversification plan: transportation and autonomy, materials and machinery manufacturing, IT and emerging tech, and life sciences and healthcare. The following criteria was used to identify these clusters:

- ▶ **Location quotient (LQ):** demonstrates the overall concentration of employment within a particular cluster, which serves as an indication of regional competitiveness. Industries with proportionally higher employment concentration in the region compared to the nation will have LQ values exceeding 1.0. Industries with particularly high employment concentrations will have LQ values in excess of 1.2.
- ▶ **Shift-Share/Competitive Employment Change:** Shift-share analysis compares regional employment growth to national employment growth. Most relevant to this plan, the competitive effect identifies industries that are growing faster than their national counterpart. Competitive effect values that exceed zero suggest that a regional industry is outperforming its national counterpart with respect to employment growth and that a portion of this growth is due to a factor present in the region. With some exception, negative competitive effect values suggest that a regional industry is not performing on par with national trends.
- ▶ **Gross Regional Product (GRP):** measures the final market value of all goods and services produced in a region. Industries and clusters that account for a higher portion of the region’s GRP tend to play an important role in driving investment, productivity, and employment growth.
- ▶ **Average Wages:** industries and clusters that paid workers higher-than-average average wages were prioritized in this analysis to ensure that GO Virginia funding is promoting the growth of higher-than-average wage jobs.
- ▶ **Ecosystem Assets:** Additional assets within the region are present, which would contribute to the growth of the cluster, even if these assets are not counted within the cluster. These assets include physical infrastructure, workforce and talent development programs, and research entities.

These clusters were revised from the original 2017 clusters to better narrow and identify specific industries for investment and to garner greater interest in cluster scale up activities through GOVA. With little exception, many of the industries that compose these clusters play an important role in driving regional investment and employment growth.

These four industry clusters continue to present opportunities to grow and diversify the region’s economy and for regional businesses to diversify their market base. Each cluster continues to make

significant contributions to the region’s GRP. In fact, these clusters contributed proportionally more to the region’s GRP in 2020 compared to 2017. Additionally, employment in three of the four clusters is more concentrated in Region 2 compared to the national average. Competitiveness was more varied; two clusters (life sciences and materials and machinery) are expected to outpace their national counterparts with respect to employment growth. Transportation and IT/Emerging Tech clusters, however, are expected to grow at a slower rate compared to national clusters.

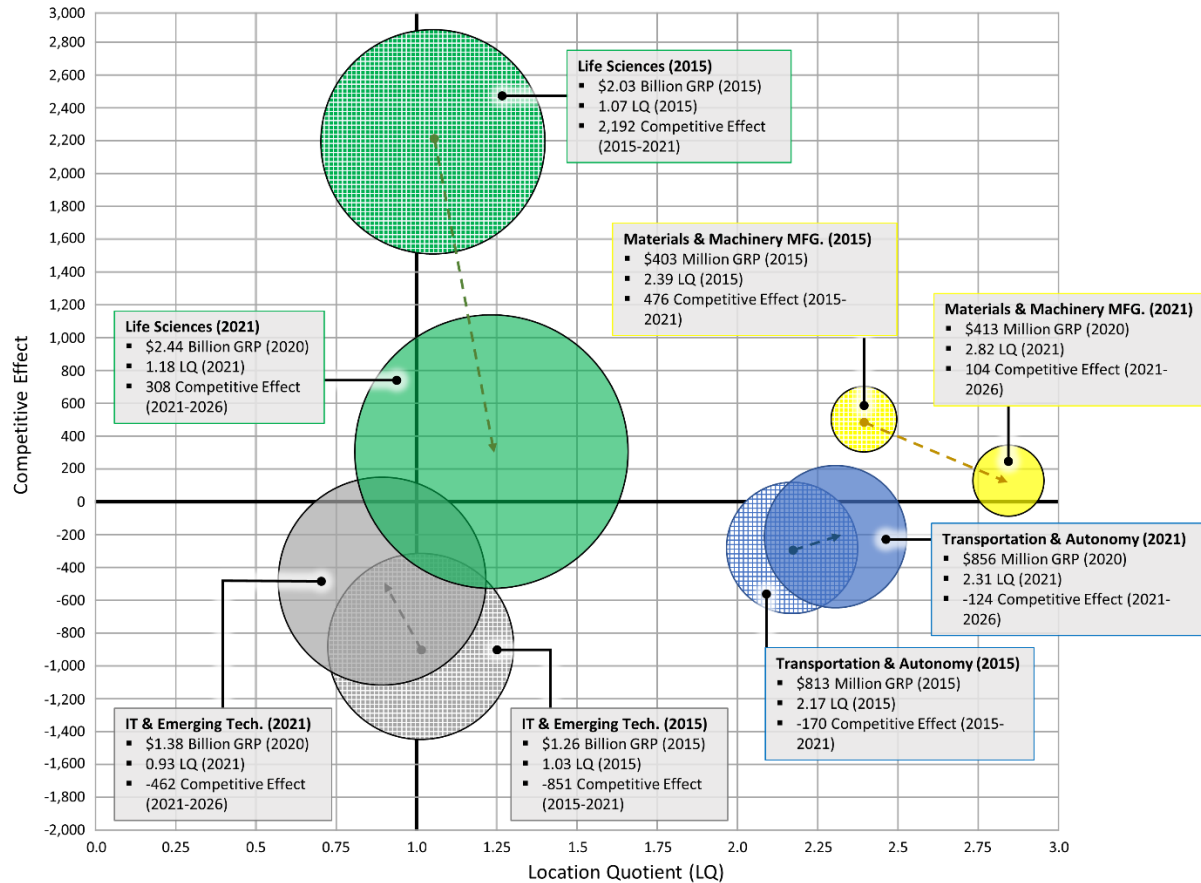


Figure 7: Region 2 Target Clusters- GRP, LQ, and Shift-Share¹²

As detailed in Section 1 of this document, total employment in Region 2 fell 3.1% from 371,960 jobs in 2015 to 360,597 jobs in 2021. Data suggest that much of the employment decline experienced during this period was the result of the Coronavirus Pandemic. For instance, total employment fell by 4.5% (16,761 jobs) from 2019-2020 alone. Non-cluster industries saw a 4.6% employment decline from 2015-2021 and 4.5% decline from 2019-2020. Industries belonging to the four target clusters were more shielded from these impacts. For instance, target cluster industries saw 7.8% employment growth from 2015-2021 and 4.3% decline from 2019-2020. Figure 8 illustrates employment change for Region 2, target cluster industries, and non-target cluster industries from 2015-2021.

¹² EMSI Developer 2021.3 Datarun

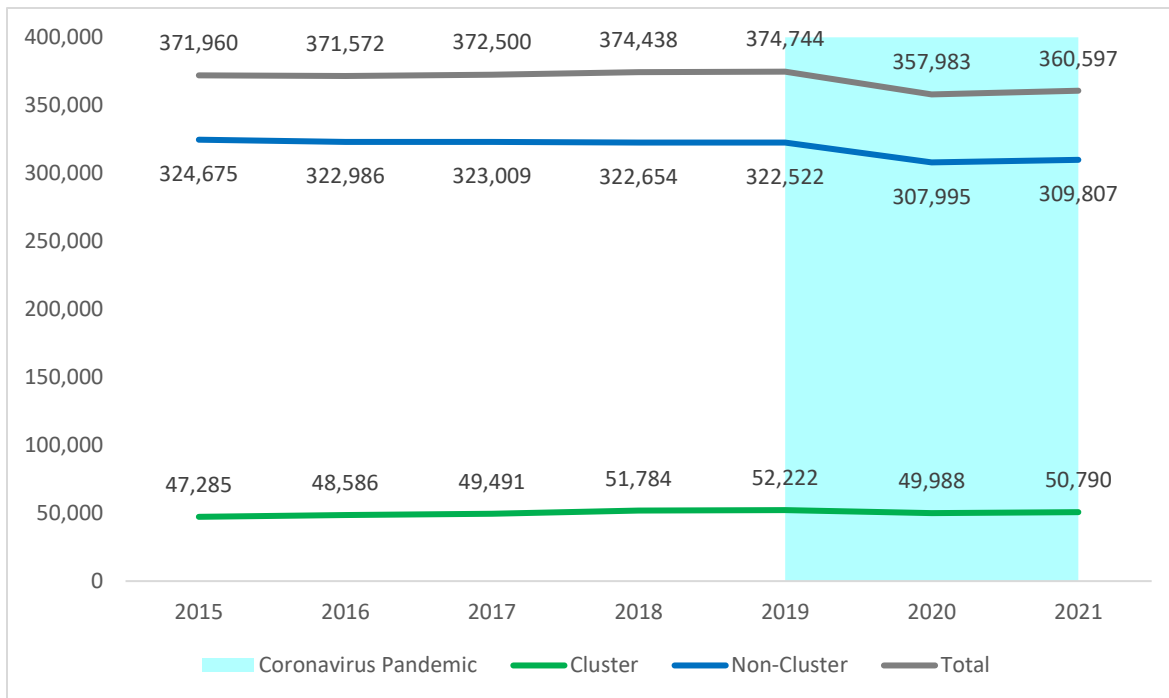


Figure 8: Region 2 Employment Change, All Industries, 2015-2021¹³

The following paragraphs detail performance trends for GO Virginia target industry clusters. Current employment (2021) is compared to 2015 employment figures. Each target cluster experienced employment growth over the past five years. Competitive employment change, however, was limited to the materials and machinery manufacturing and life sciences clusters. Table 6 details target cluster employment change over the past five-year period.

Table 6: Region 2 Industry Cluster Performance Trends, 2015-2021¹⁴

	2015		2021		2015-2021 JOB CHANGE		
	2015 JOBS	2015 LQ	2021 JOBS	2021 LQ	CHANGE	% CHANGE	COMPETITIVE EFFECT
Transportation and Autonomy	5,249	2.2	5,302	2.3	53	1.0%	(170)
Materials and Machinery	3,673	2.4	4,020	2.8	347	9.5%	476
IT and Emerging Tech	11,173	1.0	11,246	0.9	73	0.7%	(851)
Life Sciences and Healthcare	27,182	1.1	30,412	1.2	3,230	11.9%	2,192
TOTAL 4 CLUSTERS	47,285	1.2	50,790	1.2	3,505	7.4%	1,647
ALL INDUSTRIES	371,960	--	360,597	--	(11,363)	(3.1%)	(21,048)
4 CLUSTERS AS A % OF TOTAL ECONOMY	12.7%	--	14.1%	--	--	--	--

¹³ EMSI Developer 2021.3 Datarun

¹⁴ EMSI Developer 2021.3 Datarun

Table 7 compares regional cluster employment change to statewide and national cluster employment change for the past six-year period. Overall, Region 2 saw a higher rate of employment decline compared to state and nation during this period. The region’s materials and machinery manufacturing and life sciences clusters outperformed both the state and nation with respect to employment growth from 2015-2021.

Table 7: Comparative Industry Cluster Trends, 2015-2021¹⁵

	2015-2021 % JOB CHANGE		
	REGION 2	VIRGINIA	U.S.
TRANSPORTATION AND AUTONOMY	(0.5%)	8.3%	(1.1%)
MATERIALS AND MACHINERY	9.4%	(15.7%)	(3.8%)
LIFE SCIENCES	11.8%	7.8%	6.0%
IT & EMERGING TECH	1.7%	12.7%	18.8%
TOTAL ALL 4 CLUSTERS	7.8%	9.7%	8.7%
TOTAL ECONOMY	(3.1%)	1.5%	0.9%

Table 8 details projected employment change for each GO Virginia target industry cluster over the next five-year period. Except for materials and machinery manufacturing, which is projected to remain at its current job levels, each target industry cluster is expected to see growth. The life sciences cluster is expected to lead the region, with 5.7% employment growth forecast.¹⁶

Average wage data for each cluster can also be found on Table 8. Region 2 had an overall average wage of \$26.56 per hour in 2021. All four clusters had average wage values in excess of the regional average wage for 2021. The IT and emerging tech cluster led the region in average wages at \$43.42 per hour. Together, these four clusters had an average wage of \$34.39 per hour, which is almost \$7.83 higher than that of the region’s average hourly wage.¹⁷

¹⁵ Source: EMSI Developer 2021.3 Datarun

¹⁶ EMSI Developer 2021.3 Datarun. According to EMSI, “Industry projections are built from Emsi’s final industry data, which is based on the BLS’s Quarterly Census of Employment and Wages (QCEW) dataset... Projections are calculated for each 6-digit NAICS and county combination individually. For each county-industry combination, we begin with final Emsi industry data and produce three 10-year projection lines based on 5, 10, and 15 years of historical employment data, respectively... Next, we make adjustments to outside sources.” Retrieved from: <https://kb.emsidata.com/methodology/industry-projections-methodology/>.

¹⁷ EMSI Developer 2021.3 Datarun. Retrieved from: <http://www.economicmodeling.com>.

Table 8: Region 2 Industry Cluster Performance Trends, 2021-2026¹⁸

	2021 JOBS	PROJECTED JOB GROWTH		2020 GRP (MILLIONS)	2020 PAYROLLED BUSINESS LOCATIONS	2021 AVERAGE HOURLY WAGES
		(2021-2026)	2021 LQ			
TRANSPORTATION AND AUTONOMY	5,302	2.7%	2.3	\$856	31	\$33.75
MATERIALS AND MACHINERY MANUFACTURING	4,040	(0.1%)	2.8	\$413	50	\$33.67
LIFE SCIENCES	30,412	5.7%	1.2	\$2,435	471	\$31.26
IT & EMERGING TECH	11,246	2.8%	0.9	\$1,383	626	\$43.42
TOTAL 4 CLUSTERS	50,790	4.7%	1.2	\$5,088	1,178	\$34.39
ALL INDUSTRIES	360,597	2.3%	--	\$31,718	22,154	\$26.56
4 CLUSTERS AS % OF TOTAL ECONOMY	14.1%	--	--	16.0%	5.3%	--

Table 9 compares projected employment change in Region 2 to the state and nation. Overall, the region’s economy is expected to grow at a slower rate compared to the state and nation. The region’s life sciences cluster is expected to see employment growth greater than of the state and nation. The regional materials and machinery manufacturing cluster will withstand declines to the state and national clusters. The other two clusters trail behind the state and nation. Table 9 also compares average wages to the state and nation. Average wages were lower across the board compared to Virginia and the nation. This trend was observed across each target industry cluster and was especially pronounced considering the region’s IT and transportation clusters.

Table 9: Comparative Industry Trends, 2021-2026¹⁹

	2021-2026 % JOB CHANGE			2021 AVERAGE WAGES		
	REGION 2	VIRGINIA	U.S.	REGION 2	VIRGINIA	U.S.
TRANSPORTATION AND AUTONOMY	2.7%	6.7%	1.5%	\$33.75	\$48.23	\$50.76
MATERIALS AND MACHINERY	(0.1%)	(4.4%)	(2.5%)	\$33.67	\$34.07	\$36.19
LIFE SCIENCES AND HEALTHCARE	5.7%	4.1%	4.6%	\$31.26	\$33.04	\$36.95
IT AND EMERGING TECH	2.8%	7.3%	10.0%	\$43.42	\$67.60	\$70.65
TOTAL ALL 4 CLUSTERS	4.7%	5.6%	5.8%	\$34.39	\$50.76	\$47.51
TOTAL ECONOMY	2.3%	3.2%	3.2%	\$26.56	\$36.20	\$35.53

¹⁸ Source: EMSI Developer 2021.3 Datarun

¹⁹ Source: EMSI Developer 2021.3 Datarun

As detailed in Table 10, each cluster exports at least 49% of its products outside the region. The region’s Transportation and Materials-Machinery clusters exported more than 90% of their products in 2020. Life sciences and IT, both of which contain a number of local services-based industries, exported less products, but still have the potential to become significant traded-sector clusters. Table 10 also details the extent to which local demand is satisfied by target industry clusters. The Transportation, Materials-Machinery, and IT cluster met less than a third of local demand in 2020. Alternatively, the life sciences cluster met 62% of local demand. Each industry has an opportunity to find more customers in-region and expand its share of local demand.

Table 10: Region 2 Industry Cluster Sales and Demand (2020)²⁰

	TOTAL SALES (MILLIONS)	% IN-REGION SALES	% EXPORTED SALES	TOTAL DEMAND (MILLIONS)	% DEMAND MET IN REGION	% DEMAND MET BY IMPORTS
TRANSPORTATION AND AUTONOMY	\$4,225	7%	93%	\$967	29%	71%
MATERIALS AND MACHINERY	\$1,132	8%	92%	\$387	24%	76%
LIFE SCIENCES AND HEALTHCARE	\$4,424	51%	49%	\$3,618	62%	38%
IT AND EMERGING TECH	\$2,308	41%	59%	\$2,910	32%	68%

The 2017 and 2019 Growth and Diversification plans included a workforce gap analysis. This analysis was based on quantitative and qualitative data collected throughout these planning processes. Region 2 completed a similar analysis for the 2021 plan; job postings, annual openings, and regional completions data as well as input from stakeholders was gathered to identify workforce gaps. Workforce demand exists across different occupation types within these four clusters, depending on the level of education and skill sets. In general, demand for occupations includes:

- ▶ **Entry-Level Occupations:** Demand for entry level occupations gradually increased from 2017-2019, however, the Coronavirus Pandemic significantly reduced demand for these occupations between 2020-2021. These occupations tend to pay lower wages, which reduces employer’s ability to attract and retain talent. Recent wage increases amid a period of higher-than-average unemployment benefits have limited the supply of entry level workers in Region 2. Additionally, employers and workforce professionals noted that jobseekers and entry-level employees oftentimes lacked basic hard soft skills necessary for employment.
- ▶ **Middle-Skill Occupations:** These jobs typically require a unique skillset acquired through a 1-2-year certification or associate’s degree program. Specifically, these jobs tend to require some sort of industry credential, license, or apprenticeship/long-term on-the-job training. Technicians, machinists, welders, Licensed Practical Nurses, computer support specialists, and carpenters are all examples of middle-skill occupations. Region 2 has an older-than-average middle-skill workforce; a growing portion of these workers are approaching, at, or above retirement age. Meanwhile, there is not an adequate supply of workers to replace retiring workers and fill

²⁰ Source: EMSI Developer 2021.3 Datarun

newly-created middle-skill positions. Stakeholders suggest that younger people are not interested in pursuing regionally available careers. These occupations have become stigmatized despite higher-than-average wages and job security. Moreover, many parents and students believe a four-year degree is necessary for a livable wage. These trends constrict the region's pipeline for middle-skill talent. Additionally, community college personnel shared that enrollments for middle-skill degree programs are falling despite high levels of unemployment. Previously, high unemployment drove community college enrollment.

- ▶ **Mid-Level Managerial Positions and Higher:** Each target cluster contains occupations that require a bachelor's degree or higher, although some have higher demand than others. Region 2 has a higher-than-average number of bachelor's, master's, and doctoral or professional degree graduates. The region continues to face challenges in retaining these graduates, however. Stakeholders felt that the region's pipeline for these positions was fractured; there is a lack of communication and collaboration between industry and postsecondary education. As a result, graduates were unaware of available opportunities in Region 2. Moreover, stakeholders mentioned that graduates that did remain in Region 2 tended to out-migrate within a few years due to a lack of career advancement opportunities and lower-than-average salaries.

Transportation and Autonomy Cluster

Manufacturing continues to play a leading role in the region's economy, particularly commercial transportation manufacturing. With a significantly higher employment concentration (LQ) and contribution to GRP, cluster strengths include:

- ▶ **Heavy Duty Truck Manufacturing:** Region 2 has particular industry strengths in heavy duty truck manufacturing. Compared to other regions of the U.S., employment in this industry is 43 times more concentrated. Region 2 is home to Volvo Trucks USA, which produces all Volvo trucks sold in North America, as well as Mack Trucks, a subsidiary of Volvo.
- ▶ **Motor Vehicle Parts Manufacturing:** Manufacturers of motor vehicle parts vary across the region. Most notably, Metalsa Structural Products and Eldor Powertrain have continued to grow in Botetourt County. The region also contains a manufacturing branch of Yokohama Tires, which was the world's eighth largest tire manufacturer by global sales at the time of this report.
- ▶ **Automation:** Automated vehicles, both land and air, are of growing interest to transportation manufacturers. With its wealth of research and infrastructure assets, this region has grown companies such as TORC Robotics and Aeroprobe to provide innovative technologies for automation. Region 2 is also home to Wing, the first company in the U.S. to receive clearance from the FAA to deliver commercial goods via drone.

Supporting these private sector businesses are regional assets such as the Virginia Tech Transportation Institute and the Mid-Atlantic Aviation Partnership, two nationally-recognized research entities for the transportation industry. Dabney-Lancaster Community College and partners in Alleghany-Covington have also grown programming centered on developing an autonomy workforce particularly for drones.

The transportation and autonomy cluster saw mild employment growth since the first iteration of the Growth and Diversification Plan (1.0% change between 2015 and 2021). Most of that growth was in the

autonomy industry. Growth is expected to increase to 2.7% through 2026, however the growth is not as fast national growth. Nevertheless, this cluster has and will see continued specialization and employment concentration greater than the nation. Regional specialization continues to increase despite slow growth. By integrating innovative tech like autonomy systems and electric motors (seen in the Emerging Tech cluster), this commercial vehicle manufacturing cluster could see substantial growth and national competitiveness.

Table 11 details employment change for each transportation and autonomy subcluster. The autonomy subcluster will continue to see significant and competitive growth, bolstering the slow growth of the heavy duty trucks industry and the declining motor vehicle parts subcluster.

Table 11: Region 2 Transportation and Autonomy Cluster Performance Trends²¹

	2021 JOBS		2021 LQ	2026 LQ	2015-2021 CHANGE		2021-2026 CHANGE	
					% CHANGE	COMP. EFFECT	% CHANGE	COMP. EFFECT
TRANSPORTATION AND AUTONOMY	5,302		2.3	2.4	1.0%	(170)	2.7%	(124)
Heavy Duty Trucks	3,216	60.7%	42.8	41.3	25.0%	254	3.4%	(150)
Motor Vehicle Parts	1,550	29.2%	1.5	1.4	(40.5%)	(884)	(6.1%)	(108)
Autonomy	537	10.1%	0.4	0.6	652.6%	461	24.0%	134

Table 12 provides a list of the region’s top transportation and autonomy cluster occupations by employment. Occupations that pay higher-than-average wages for the region are shaded green. Occupational demand is largely determined by average annual openings, which measures the number of new and replacement jobs within an occupation. With little exception, occupations that pay lower-than-average wages required only a high school degree and on-the-job training. These occupations tend to have a high rate of turnover (30-60%), however. Additionally, employers face challenges in recruiting reliable and competent workers for these occupations.

Higher-paying occupations tend to require some mix of possessing a postsecondary degree, industry-recognized credential, experience, and/or moderate to long-term on-the-job training. This can range from a one-year nondegree program to a bachelor’s or master’s degree. These occupations are mostly middle-skill and managerial positions. As mentioned above, the fractured nature of the region’s talent pipeline limits the supply of workers with the qualifications to fill these positions. As such, regional employers face challenges in recruiting workers to fill these higher-wage positions across the board. Turnover in these positions is much lower, however, not greater than 25%.

Top job postings for this year included: machine operators, production operators, maintenance mechanics, and electronics technicians.

Most in-demand skills according to postings were auditing, manufacturing processes, electronics, electrical engineers, mechanics, and lean manufacturing.

²¹ Source: EMSI Developer 2021.3 Datarun

Table 12: Region 2 Transportation and Autonomy Cluster Occupations²²

DESCRIPTION	TRANSPORTATION AND AUTONOMY CLUSTER				ALL INDUSTRY	
	2021 Jobs	% Change (2015 - 2021)	2026 Jobs	% Change (2021 - 2026)	Avg. Hourly Earnings	Avg. Annual Openings (2021-2026)
Maintenance and Repair Workers, General	3,680	2.0%	3,799	3.2%	\$19.35	375
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	2,649	-17.0%	2,822	6.5%	\$33.75	294
First-Line Supervisors of Production and Operating Workers	2,423	21.0%	2,496	3.0%	\$30.77	272
Inspectors, Testers, Sorters, Samplers, and Weighers	1,840	12.7%	1,737	-5.6%	\$22.63	249
Electricians	1,648	20.3%	1,847	12.1%	\$24.64	245
Industrial Machinery Mechanics	1,836	59.7%	1,969	7.3%	\$25.95	220
Shipping, Receiving, and Inventory Clerks	1,742	-13.1%	1,697	-2.6%	\$16.55	203
Welders, Cutters, Solderers, and Brazers	1,434	6.1%	1,449	1.1%	\$20.93	193
Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	1,235	0.6%	1,300	5.3%	\$17.29	186
Machinists	1,304	-21.0%	1,361	4.4%	\$24.58	156
Industrial Engineers	1,113	38.0%	1,179	6.0%	\$44.72	109
Buyers and Purchasing Agents	1,032	11.8%	1,010	-2.2%	\$30.88	108

²² Source: EMSI Developer 2021.3 Datarun

DESCRIPTION	TRANSPORTATION AND AUTONOMY CLUSTER				ALL INDUSTRY	
	2021 Jobs	% Change (2015 - 2021)	2026 Jobs	% Change (2021 - 2026)	Avg. Hourly Earnings	Avg. Annual Openings (2021-2026)
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	655	19.2%	670	2.3%	\$21.21	87
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	514	21.8%	536	4.1%	\$17.67	82
Mechanical Engineers	605	-16.4%	633	4.7%	\$43.81	50

*Occupations that provide higher-than-average wages for the region are shaded green.

Materials and Machinery Cluster

The region’s materials and machinery cluster includes many of the materials manufacturers (plastics, rubber, metals) that go into industrial and commercial products and packaging. They range from custom manufacturers to manufacturers of specific packaging and industrial machinery products. Subclusters for this cluster include:

- ▶ **Plastics and Rubber Manufacturing:** Region 2 has a large assortment of manufacturers specializing in different materials. GLAD Manufacturing Company in Amherst County represents one of the largest and well-known manufacturer of plastic trash bags and food storage. ESS Technologies in Blacksburg creates custom packaging for pharmaceuticals, medical devices, cosmetics and other consumer goods. Another example is P1 Technologies in the City of Roanoke, which specializes in plastic injection molding, 3D printing, in-house tooling, and other techniques to provide custom manufacturing for business customers.
- ▶ **Metalworking and Machining:** Several businesses in Region 2 specialize in metallurgy, metal casting and additive manufacturing. These include Federal-Mogul Corporation and MELD Manufacturing Corporation in the New River Valley, as well as Dominion Metallurgical Inc, Precision Steel Manufacturing, and Nomar Castings in the Roanoke Valley. Moreover, this area contains industries vested in the development of machine tools for other manufacturers. Notable employers include Steel Dynamics Inc. located in Roanoke Virginia and Framatome, located in Lynchburg Virginia.

Among other assets, supporting these industry leaders are workforce programs in the community colleges, for instance, Virginia Western’s machining curriculum and Fab Lab. Virginia Tech offers material science and engineering programs and research as well as food science research and technical assistance for packaging.

The materials and machinery cluster is the region’s most specialized cluster in terms of employment concentration, with 2.8 times more jobs than similar regions in 2021. The cluster also saw a 9.5%

increase in jobs from 2015-2021, growth proportionally greater than national growth. This cluster is projected to maintain its competitiveness with the nation.

Table 13 details employment change for both materials and machinery subclusters. Plastics and Rubber manufacturing, from plastics products to rubber and plastics hoses and belting, have seen considerable growth. While metalworking and machinery, particularly industrial machinery and commercial and service industry machinery manufacturing, is losing employment, the subcluster remains strong compared to the nation.

Table 13: Region 2 Materials and Machinery Manufacturing Cluster Trends²³

	2021 JOBS		2021 LQ	2026 LQ	2015-2021 CHANGE		2021-2026 CHANGE	
					% CHANGE	COMP. EFFECT	% CHANGE	COMP. EFFECT
MATERIALS AND MACHINERY	4,020		2.8	2.9	9.5%	476	(0.1%)	104
Plastics and Rubber	2,850	70.9%	3.0	3.2	15.3%	423	0.2%	119
Metalworking and Machinery	1,170	29.1%	2.4	2.4	(2.5%)	53	(0.8%)	(-15)

The materials and machinery cluster has similar staffing patterns and demand to the transportation and autonomy cluster. Please see Table 12 above for the top in-demand occupations.

Life Sciences & Healthcare Cluster

The region's life sciences and healthcare cluster is multifaceted. The life sciences component of this cluster broadly captures industries vested in medical research and the production of healthcare products, including pharmaceuticals, surgical equipment, etc. Healthcare refers to industries vested in the provision of residential care and vital healthcare support industries. The region's life sciences and healthcare cluster is anchored by a number of medical programs and research institutions, multiple hospital and healthcare networks, and a patchwork of manufacturers. Region 2 has particular strengths in the following areas:

- ▶ **Biopharmaceuticals and Medical Devices Manufacturing:** This subcluster contains industries vested in the research, development, and production of pharmaceuticals and medical devices. Region 2 has particular strengths in optical instrument and lens manufacturing, due to the presence of Bausch and Lomb in Lynchburg, Virginia.
- ▶ **Residential Care:** This subcluster broadly contains hospitals and residential care facilities. Carillion, Centra and Lewis Gale anchor this subcluster. It is important to note that this subcluster largely contains local service-based industries. In other words, this subcluster is expected to only meet local demand. Region 2 is unique in that its healthcare clusters meet both local and out-of-market demand. These facilities serve many in the region as well as those in

²³ Source: EMSI Developer 2021.3 Datarun

Southern and Southwest Virginia, and further. As such, this subcluster has a higher-than-average employment concentration.

- ▶ **Elderly Care:** With the aging baby boomer generation, elderly care is taking on a very different character. Retirement communities and elderly care facilities are drawing people from outside of the immediate region. The assets of this region, including the atmosphere and livability of the region as well as the gerontological research and human capital assets, indicate potential for this region to attract and retain this population, transforming this industry group into a traded cluster of sorts. Included in this subcluster are retirement communities like Richfield in Salem, Brandon Oaks in Roanoke, Westminster-Canterbury in Lynchburg, and English Meadows in Blacksburg.
- ▶ **Diagnostic Support Services:** Finally, this subcluster contains diagnostic laboratories and imaging centers.

Additionally, the region boasts many assets that support the life sciences industries. The Virginia Tech Carilion School of Medicine, Edward Via Virginia College of Osteopathic Medicine, and other universities and colleges offer medical training and pre-med degrees to thousands of students annually. The Fralin Biomedical Research Institute conducts transformative medical and life sciences research as well as supports the training and development of individual scientists and entrepreneurs in the field.

The life sciences and healthcare cluster is the largest target industry cluster in Region 2 with respect to employment. Additionally, this cluster led its peers in contribution to the region’s GRP in 2020. The life sciences and healthcare cluster saw a nearly 20% increase in employment from 2015-2021. Shift-share analysis suggests that growth in this cluster was highly competitive during this period.

Table 14 details key indicators for each life sciences and healthcare subcluster. The residential care subcluster accounted for the bulk of cluster employment in 2021 (57.4%). Each life sciences and healthcare subcluster experienced growth from 2015-2021, although competitiveness was limited to the residential care subcluster. Nevertheless, each subcluster is expected to see competitive growth over the five-year period.

Table 14: Region 2 Life Sciences & Healthcare Cluster Performance Trends²⁴

	2021 JOBS		2021 LQ	2026 LQ	2015-2021 CHANGE		2021-2026 CHANGE	
					% CHANGE	COMP. EFFECT	% CHANGE	COMP. EFFECT
LIFE SCIENCES AND HEALTHCARE	30,412		1.2	1.2	11.9%	2,192	5.7%	308
Biopharmaceutical and Medical Devices	1,513	5.0%	0.5	0.5	8.9%	(35)	7.8%	50
Residential Care	17,462	57.4%	1.4	1.4	20.9%	2,257	5.5%	221
Elderly Care	10,696	35.2%	1.2	1.2	0.6%	(85)	5.7%	24
Diagnostic Support	741	2.4%	0.8	0.9	3.8%	(33)	7.9%	1

²⁴ Source: EMSI Developer 2021.3 Datarun

Table 15 lists the top life sciences and healthcare occupations by employment. The vast majority of these occupations are specific to healthcare, as the biopharmaceutical and support subclusters account for less than 10% of cluster employment. More than half of these occupations paid higher-than-average wages, although these occupations required an associate’s degree at the very minimum. Additionally, many lower-paying healthcare occupations required some sort of degree or certification. A number of healthcare occupations are expected to be in high demand. Workforce stakeholders, however, felt that the region’s talent pipeline could not keep pace with cluster growth. Healthcare and training providers have collaborated to address workforce gaps, however, the degree-requirement for many of these healthcare occupations poses a significant barrier to jobseekers.

Table 15: Region 2 Key Life Sciences & Healthcare Occupations²⁵

DESCRIPTION	LIFE SCIENCES & HEALTHCARE CLUSTER				ALL INDUSTRY	
	2021 Jobs	% Change (2015 - 2021)	2026 Jobs	% Change (2021 - 2026)	Avg. Hourly Earnings	Avg. Annual Openings (2021-2026)
Nursing Assistants	5,012	2.1%	5,195	3.7%	\$13.29	601
Registered Nurses	8,149	6.3%	8,464	3.9%	\$32.12	521
Medical Assistants	1,830	60.4%	2,022	10.5%	\$16.07	252
Licensed Practical and Licensed Vocational Nurses	2,487	-2.7%	2,604	4.7%	\$21.40	212
Substance Abuse, Behavioral Disorder, and Mental Health Counselors	1,334	10.2%	1,483	11.1%	\$21.92	176
Pharmacy Technicians	1,243	27.3%	1,223	-1.6%	\$15.93	121
Medical and Health Services Managers	953	22.6%	1,099	15.3%	\$51.94	98
Medical Dosimetrists, Medical Records Specialists, and Health Technologists and Technicians, All Other	853	15.9%	892	4.6%	\$21.69	81
Pharmacists	830	15.6%	806	-3.0%	\$59.08	51
Phlebotomists	360	-13.9%	393	9.0%	\$16.91	49
Clinical Laboratory Technologists and Technicians	589	-21.1%	625	6.0%	\$24.51	47

²⁵ Source: EMSI Developer 2021.3 Datarun

DESCRIPTION	LIFE SCIENCES & HEALTHCARE CLUSTER				ALL INDUSTRY	
	2021 Jobs	% Change (2015 - 2021)	2026 Jobs	% Change (2021 - 2026)	Avg. Hourly Earnings	Avg. Annual Openings (2021-2026)
Physicians, All Other; and Ophthalmologists, Except Pediatric	944	-6.4%	992	5.1%	\$117.42	46
Radiologic Technologists and Technicians	594	-3.0%	617	3.8%	\$27.15	38
Physical Therapists	569	8.4%	587	3.2%	\$45.38	37
Respiratory Therapists	437	22.4%	479	9.7%	\$27.48	32

*Occupations that provide higher-than-average wages for the region are shaded green.

Information Technology and Emerging Tech

This cluster includes existing and emerging industries that ultimately support the other prominent driver industries and clusters in the region through technology development. Subclusters include:

- ▶ **Cyber Security and Information Technology:** This subcluster provides vital computer and systems support services to virtually every industry. This subcluster has grown alongside the development of technology in general. As such, there is an ever-increasing global demand for IT skills, including coding, network design, engineering, and administration, malware prevention, security analysis, and more. One very successful regional example is 1901 Group.
- ▶ **Computer and Electrical Manufacturing:** Industries contained in this subcluster produce computer terminals, generators, transformers, and fiber optic cable. Similar to other areas of regional manufacturing strength, many of this group’s outputs are critical to downstream, industrial and commercial product industries. Large employers include MOOG and Inmotion US located in Blacksburg.
- ▶ **Engineering Services:** This is the largest single employing industry in this cluster, with numerous businesses engaged in engineering consultation work for design and development of machines, materials, instruments, structures, processes, and systems. Regional businesses include Aecom Design in Roanoke, and Novatech and Daedelus Engineering in Lynchburg.

Assets in this region that contribute to the growth of this cluster are numerous, with Virginia Tech and other higher education institutions producing research and graduates that advance industry technology. Many of the companies emerging from this cluster have roots in the region’s higher education institutions.

The IT and emerging tech cluster saw almost stagnant employment growth from 2015-2021; approximately 70 jobs were added with a growth rate of 0.7%. Meanwhile, the statewide and national IT and emerging tech clusters saw 12.7% and 18.8% employment growth during the same period,

respectively. This trend is expected to continue with a growth rate of 2.8% over the next five years, while the national growth rate is expected to be 10.0%. This modest growth compared to the state and nation indicates opportunities and potential for greater investment and expansion in this cluster.

Table 16 details performance trends for each IT and emerging tech subcluster. IT and cybersecurity includes industries such as computer systems design services, computer facilities management, and programming services. This subcluster accounts for half of cluster employment and for the only growth in the cluster. Yet, its proportional employment is only 60% compared to the U.S., meaning there should be significant unmet regional demand and potential for additional growth in this subcluster.

Computer and electrical manufacturing, and engineering services are two historically strong subclusters. They both have high location quotients, indicating regional specialization and strength in these areas. However, these clusters have and are expected to lose employment, illustrating a need for businesses in these related industries to grow their market shares and become more competitive.

Table 16: Region 2 IT and Emerging Tech Cluster Performance Trends²⁶

	2021 JOBS		2021 LQ	2026 LQ	2015-2021 CHANGE		2021-2026 CHANGE	
					% CHANGE	COMP. EFFECT	% CHANGE	COMP. EFFECT
IT AND EMERGING TECH	11,246		0.9	1.0	(0.7%)	(851)	2.8%	(462)
IT and Cybersecurity	5,512	49.0%	0.6	0.6	11.4%	(276)	9.5%	(185)
Computer and Electrical	2,746	24.4%	8.1	8.1	(12.3%)	(219)	(0.2%)	(50)
Engineering Services	2,988	26.6%	1.2	1.2	(3.4%)	(355)	(5.1%)	(228)

Table 17 lists the top IT and emerging tech occupations by employment. Occupations shaded in green paid higher-than-average wages for the region. This list contains a broad spectrum of occupations related to the industries that comprise the IT and emerging technology cluster. For example, project managers, electrical assemblers, and software developers were among the largest occupations by employment within this cluster. Only three of the fifteen occupations listed in Table 18 paid under the region’s average wage. Similar to the life sciences and healthcare cluster, however, higher-paying occupations tended to require an associate’s or bachelor’s degree.

²⁶ Source: EMSI Developer 2021.3 Datarun

Table 17: Region 2 IT and Emerging Tech Occupations²⁷

DESCRIPTION	IT & EMERGING TECH CLUSTER				ALL INDUSTRY	
	2021 Jobs	% Change (2015 - 2021)	2026 Jobs	% Change (2021 - 2026)	Avg. Hourly Earnings	Avg. Annual Openings (2021-2026)
Project Management Specialists and Business Operations Specialists, All Other	1,954	26.7%	2,093	7.1%	\$36.01	224
Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	1,235	0.6%	1,300	5.3%	\$17.29	186
Machinists	1,304	-21.0%	1,361	4.4%	\$24.58	156
Software Developers and Software Quality Assurance Analysts and Testers	1,568	5.6%	1,780	13.5%	\$48.52	142
Management Analysts	1,198	-12.5%	1,280	6.9%	\$53.89	125
Market Research Analysts and Marketing Specialists	1,010	12.8%	1,137	12.7%	\$29.91	118
Industrial Engineers	1,113	38.0%	1,179	6.0%	\$44.72	109
Computer User Support Specialists	1,155	-1.6%	1,230	6.5%	\$24.75	104
Computer Systems Analysts	842	6.8%	876	4.0%	\$47.35	72
Computer and Information Systems Managers	586	35.1%	630	7.6%	\$64.01	57
Network and Computer Systems Administrators	762	-15.4%	783	2.8%	\$37.65	56
Mechanical Engineers	605	-16.4%	633	4.7%	\$43.81	50

²⁷ Source: EMSI Developer 2021.3 Datarun

DESCRIPTION	IT & EMERGING TECH CLUSTER				ALL INDUSTRY	
	2021 Jobs	% Change (2015 - 2021)	2026 Jobs	% Change (2021 - 2026)	Avg. Hourly Earnings	Avg. Annual Openings (2021-2026)
Information Security Analysts	397	93.9%	443	11.6%	\$45.46	48
Electrical Engineers	512	-24.3%	525	2.6%	\$47.75	47
Civil Engineers	500	-10.1%	512	2.3%	\$38.98	46
Computer Network Support Specialists	421	1.3%	433	2.9%	\$30.27	40
Computer Programmers	457	11.0%	430	-5.8%	\$38.92	39
Electrical and Electronic Engineering Technologists and Technicians	279	-37.7%	290	4.0%	\$28.09	35
Web Developers and Digital Interface Designers	320	30.7%	337	5.4%	\$32.14	31
Architectural and Engineering Managers	306	-2.6%	316	3.1%	\$72.57	26

*Occupations that provide higher-than-average wages for the region are shaded green.

Shared Demand Occupations

Demand for vital support and operational positions is shared across virtually all industries. Table 19 lists the top shared-demand occupations by employment in Region 2. Demand for these occupations, in many cases, is shared across each of the target industry clusters. Two-thirds of these occupations were lower-paying support occupations, such as office clerks, bookkeepers, material movers, etc. These occupations tend to require only a high school diploma. The remainder of these occupations were more specialized support roles, including accountants and project managers. These occupations tend to require some sort of postsecondary degree and/or industry-specific experience- this is especially the case for higher-paying shared demand occupations.

Table 18: Region 2 Key Shared Demand Occupations²⁸

DESCRIPTION	SHARED DEMAND OCCUPATIONS				ALL INDUSTRY	
	2021 Jobs	% Change (2015 - 2021)	2026 Jobs	% Change (2021 - 2026)	Avg. Hourly Earnings	Avg. Annual Openings (2021-2026)
Office Clerks, General	7,504	-14.7%	7,453	-0.7%	\$15.23	921
Laborers and Freight, Stock, and Material Movers, Hand	6,096	5.1%	6,167	1.2%	\$15.01	903
Customer Service Representatives	6,190	1.8%	6,258	1.1%	\$15.80	844
Miscellaneous Assemblers and Fabricators	5,783	-10.3%	5,537	-4.3%	\$18.45	707
Bookkeeping, Accounting, and Auditing Clerks	3,772	-12.8%	3,698	-2.0%	\$18.50	434
General and Operations Managers	4,145	5.9%	4,354	5.1%	\$50.83	370
Accountants and Auditors	2,606	2.7%	2,669	2.4%	\$35.39	251
Inspectors, Testers, Sorters, Samplers, and Weighers	1,840	12.7%	1,737	-5.6%	\$22.63	249
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	1,330	-3.8%	1,424	7.1%	\$31.50	174

*Occupations that provide higher-than-average wages for the region are shaded green.

Peer Region Comparison

In considering long-term growth and impact, Region 2 has developed a set of peer regions. The process began with the identification of 28 possible metropolitan regions (MSAs) with comparable higher education institutions to account for research, human capital and possible spinout tech companies. Factors that were taken into consideration for each of the 28 MSAs were:

- Population Density and Growth
- Urban to Rural Ratio (Designate Places with 50,000 or more residents)
- Comparable industry sectors
- Per Capita Income
- Median Household Income

²⁸ Source: EMSI Developer 2021.3 Datarun

- Gross Regional Product per Capita
- Composition of population in terms of age and education attainment (within 1-5% difference compared to Region 2 among different categories e.g. those with Bachelors)

These factors led to the selection of eight proposed peer regions. For this plan, we focus on three comparable peer regions:

- Birmingham-Hoover MSA
- Chattanooga, TN-GA MSA
- Champaign-Urbana MSA.

Below, we highlight select information regarding clusters of interest below. These statistics illustrate that Region 2’s economic growth has been comparable to its peer regions. Readers are invited to refer to Appendix C for additional content, as well as the data underlying the charts that follow.

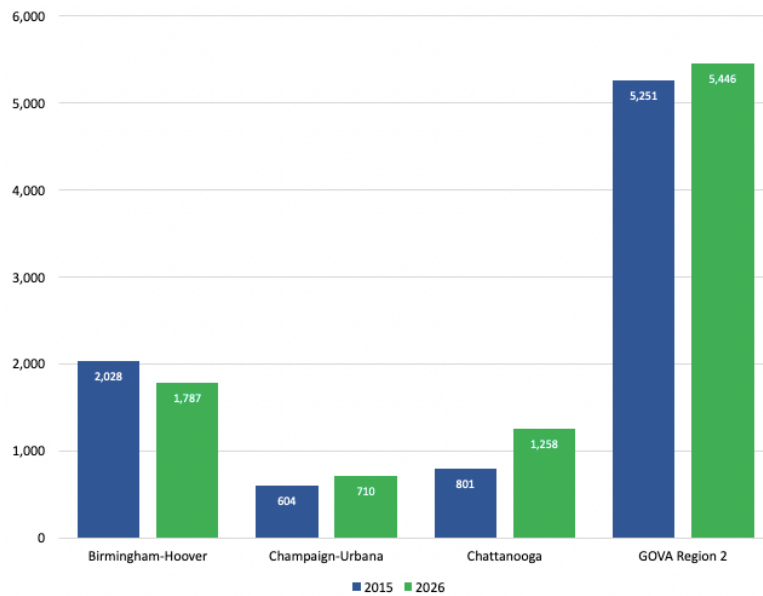


Figure 9: Job Change in Transportation and Autonomy Cluster, 2015 to 2026²⁹

We note that GOVA Region 2 sees projected growth in the Transportation and Autonomy cluster, though not to the degree predicted in the Chattanooga TN-GA MSA. However, given that the other two MSAs see marked decline in jobs in this industry, GOVA Region 2’s outlook is optimistic.

²⁹ EMSI Industry Table Data, GOVA Region 2 Transportation and Autonomy Cluster. EMSI.

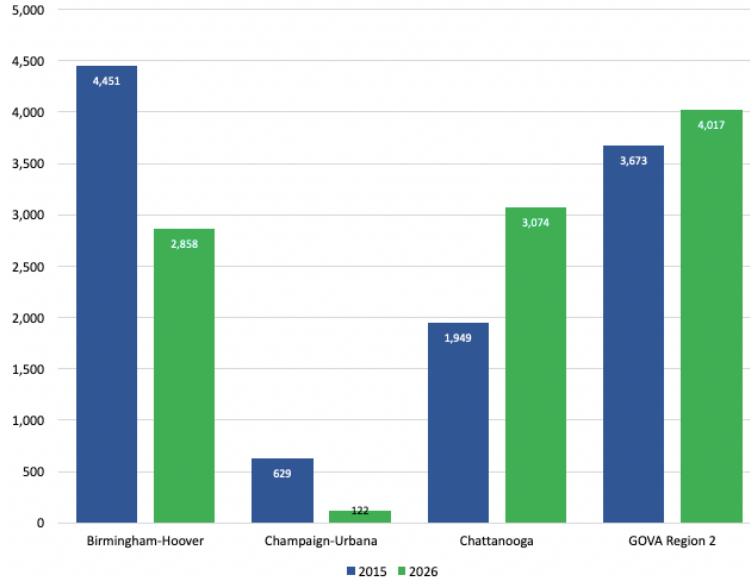


Figure 10: Job Change in Materials and Machinery Cluster, 2015 to 2026³⁰

We note that GOVA Region 2 sees projected growth in the Materials and Machinery cluster, though not to the degree predicted in the Chattanooga TN-GA MSA. However, given that the other two MSAs see incredibly dramatic predicted declines, GOVA Region 2's outlook is optimistic, to say the least.

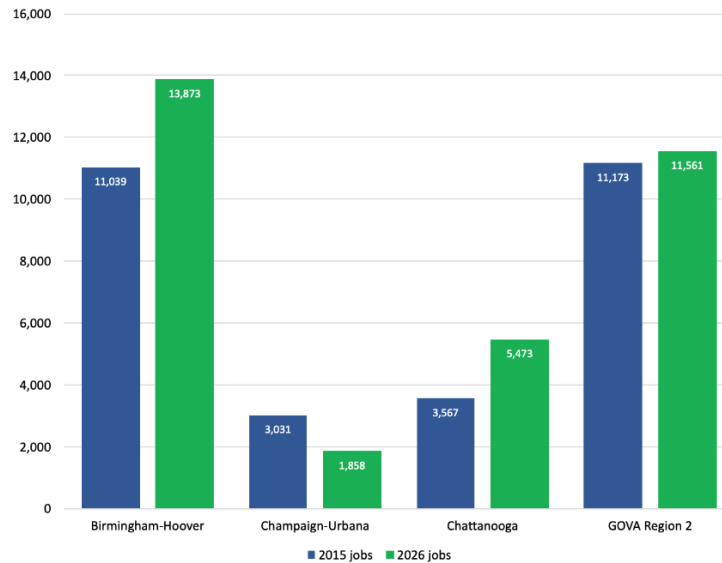


Figure 11: Job Change in IT and Emerging Technology Cluster, 2015 to 2026³¹

Though GOVA Region 2 does, in fact see projected growth in the number of IT and Emerging Technology jobs, the relative growth is not as dramatic as that predicted in the Birmingham-Hoover and

³⁰ EMSI Industry Table Data, GOVA Region 2 Materials and Machinery Cluster. EMSI.

³¹ EMSI Industry Table Data, GOVA Region 2 IT and Emerging Technology Job Cluster. EMSI.

Chattanooga MSAs. Continued focus should ensure that forward progress is made and GOVA Region 2 does not see declines manifest, as is predicted to occur in the Champaign-Urbana MSA.

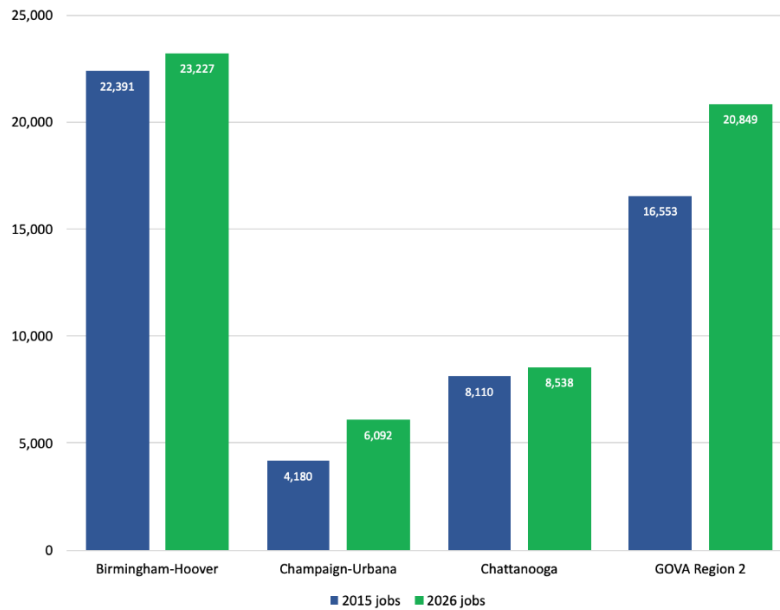


Figure 12: Job Change in Life Sciences and Healthcare Cluster, 2015-2026³²

GOVA Region 2 sees dramatic predicted Life Sciences and Healthcare cluster job change, with projected growth of approximately 25% from 2015 to 2026. Champaign-Urbana sees notable relative growth, though we remark that GOVA Region 2’s larger absolute size renders its relative change more impressive. GOVA Region 2’s projected growth should be supported by the various small business development strategies detailed for the future and should be supported by efforts to attract human capital to the area.

³² EMSI Industry Table Data, GOVA Region 2 Life Sciences and Healthcare Job Cluster. EMSI.

SECTION 3: REGIONAL PRIORITIES

Region 2’s three sub-regions have similar assets and concerns, as demonstrated by a review of existing strategic plans for each of the three areas as well as discussions with area representatives. The existing strategic plans reviewed for this plan include Comprehensive Economic Development Strategies, Workforce Development Strategic Plans, and published and in-process strategic plans of each of the three Economic Development Marketing Organizations. During this review process, the Virginia Tech Center for Economic and Community Engagement also met with organization representatives from each of the three sub-regions to discuss the changes that have occurred among key assets, activities and challenges over the past five years and the priorities that have been identified for the future. These organizations included:

- **New River Valley MSA:** The New River Valley Regional Commission, the New River Mount Rogers Workforce Development Board, and Onward NRV, formerly known as the New River Valley Economic Development Alliance
- **Roanoke-Alleghany MSA:** The Roanoke Valley-Alleghany Regional Commission, the Virginia’s Blue Ridge Works! Workforce Development Board, and the Roanoke Regional Partnership
- **Lynchburg MSA:** The Central Virginia Planning District Commission, the Central Virginia Workforce Development Board, and Lynchburg Regional Business Alliance.

Each organization performs in-depth community engagement during their strategic planning processes and daily activities, which allows for a comprehensive perspective of each area’s economy. Based on an analysis of these strategic plans, a list of key characteristics that are similar across Region 2 is provided below.

Table 19: Region 2 Strengths, Opportunities, Challenges

Region 2 Common Characteristics	
Demographics	<p>STRENGTHS: Increases in racial and ethnic diversity</p> <p>CHALLENGES: Region 2 continues to experience an aging population with increasing loss of younger residents due to brain drain. Like many US regions, Region 2 also faces substance abuse challenges, discouraged residents/workers, and a retiring population that contains valuable workplace skills and knowledge.</p>
Education	<p>STRENGTHS: The community college system; many 4-year higher education institutions; strong K-12 system among many counties in the region; high graduation rates</p> <p>OPPORTUNITIES: Create stronger partnerships between businesses and schools; leverage the integrated community college system more; promote experiential learning (internships/apprenticeships); Improve CTE alignment with job demand and college program availability</p>

Region 2 Common Characteristics (continued)	
Education	<p>CHALLENGES: Stigma against middle-skill (non-bachelor degree) jobs; workforce lacks soft skills, lack of mentor support in K-12 for traded sector careers; lack of experiential learning</p>
Talent and Workforce	<p>STRENGTHS: Strong education system (K-postsecondary); Skilled/knowledgeable workers, strong job growth; low unemployment</p> <p>OPPORTUNITIES: Retain students and young professionals by raising awareness of regional employment opportunities and quality of life assets; grow public awareness of skilled trade occupations; share data and market opportunities; increase awareness of career development and career pathways in the region</p> <p>CHALLENGES: Many low-wage jobs; brain drain; pipeline challenges; cost/time to upskill; lack of interest in training/enrollment; limited retention of college graduates; lack of soft skills; lack of communication between stakeholders, increase in remote work options</p>
Infrastructure	<p>STRENGTHS: Water, sewer, gas; increasing availability of broadband</p> <p>OPPORTUNITIES: Redevelop and repurpose underutilized property; expanding recreational, cultural and quality of life assets; expanding broadband, water, sewer and gas, investing in “flex-space”; soft cost investments to jump start development/interest, sector strengthening site investment; updated inventory of sites and buildings</p> <p>CHALLENGES: Aging infrastructure and building stock; limited rural broadband access; rural-urban divide; funding</p>
Transportation	<p>STRENGTHS: I-81 interstate system; regional airports; Amtrak; major railroads</p> <p>OPPORTUNITIES: Improve regional air service; facilitate access to interstate system for attracting and growing businesses</p> <p>CHALLENGES: Lack of public transportation especially in rural areas; regional airport challenges; congestion on I-81; aging and increased use of roadways</p>
Entrepreneurship and Business Environment	<p>STRENGTHS: Low cost of doing business; collaborative business community; good resources for businesses.</p> <p>OPPORTUNITIES: Continue promotion of entrepreneurial growth and venture capital funding; improve business engagement with resource entities; ensure greater broadband connectivity; create financial incentives for hiring dislocated workers.</p> <p>CHALLENGES: Competition with online retailers; corporate restructuring resulting in regional downsizing or restructuring; rental prices vs. developer prices; zoning;</p>
Marketing	<p>STRENGTHS: quality of life assets, tourism destinations, positive identity, sustainable growth opportunities</p> <p>OPPORTUNITIES: Leverage quality of life assets to attract and retain population, talent, and businesses; build collective regional brand and community leadership capacity; effectively promote what differentiates and characterizes the region; competitive advantages to targeted audiences.</p> <p>CHALLENGES: Lack of regional vision and collaboration among partners; no system of shared outcomes/metrics/collective impact</p>

Region 2 Common Characteristics (continued)	
Quality of Life and Culture	<p>STRENGTHS: Natural amenities and outdoor recreation; low cost of living; ability to retain family-oriented professionals; diversity in arts and culture; vibrant downtowns; low crime-rates</p> <p>OPPORTUNITIES: Build public engagement to exceed the minority voice; market to millennials; continue to develop and sustain placemaking assets; increased interest in mixed-use developments; build economic/outdoor narrative</p> <p>CHALLENGES: Unaffordable and/or deteriorating housing; low citizen engagement; lack of diverse/affordable housing; regional identity/brand; preservation of historic buildings and neighborhoods.</p>

Moreover, these three sub-regions within Region 2 have several well-aligned target industry goals. The Region 2 Council considered these target industries in developing its four priority clusters. In the future, many of these industries will rely on their ability to grow and adapt to the changing economy with the help of new technologies. These industry similarities include:

- Advanced Manufacturing
- Life sciences, biomedical, and healthcare
- Food and beverage processing and packaging
- Information technology (especially cybersecurity)
- Business and financial services

Additionally, during the Growth and Diversification planning process at least two regions remained invested in transportation manufacturing and warehousing, autonomous systems (including aerial and terrain), and energy. While there are many industries that continue to support the region’s strong cultural environment and overall quality of life, the driver industries listed above provide a critical employment base and align well with GO Virginia Region 2’s target industry clusters.

Over the past five years, the differences among the three sub-regions remained particularly true with respect to the more urban and rural parts of Region 2. For example, access to broadband remained one of the largest concerns for those in outlying rural counties, who struggle to acquire last mile services. Similarly, transportation infrastructure continues to be a greater need in rural regions. Most rural counties in Region 2 remain economically reliant on manufacturing, demonstrating the need for reliable transportation resources to ensure they meet the supply and demand of their businesses. The impact of the COVID-19 pandemic created unseen pressures on transportation infrastructure and broadband for the entire region. With increasing trends in remote work and commuter routes, these two assets remain imperative for economic resilience. Region 2’s urban hubs continue to focus on the development of the life sciences, healthcare, and IT industries. This difference in industry reliance also contributes to diverse workforce needs from middle-skilled jobs requiring industry certifications to jobs requiring higher level, research and development-oriented degrees. While the average hourly wage for all of Region 2 is \$27 per hour (\$55K annually), the region’s more rural counties have average hourly wages closer to \$24 per hour (\$50K annually).

Nevertheless, these similarities reveal areas that Region 2 might address with GOVA funding:

- **Innovation Cluster Scale-Up:** Based on observations that were taken over the past five years, the Council created a focus area specifically addressing technical and business support to accelerate the promotion and development of innovative clusters (both soft and hard infrastructure)
- **Entrepreneurship and Business Development:** To address the need for entrepreneurial activity and business growth in the region, Region 2 identified a focus on promoting access to capital, mentorship, and training programs. Over the past five years, 7 projects (\$1.1 million) have been funded to achieve the goal of growing more startup and existing firms that create and sustain higher wage jobs.
- **Talent Development, Attraction and Retention:** One significant focus area for Region 2's GO Virginia funds was to address the need for talent attraction, retention, and development within the priority industry clusters, particularly as it pertains to higher than median-wage jobs. Over the past five years, 11 projects (\$1.4 million in funding) have been created to support the growth, attraction and retention of top talent. (Note: This plan uses the term "talent" in reference to workforce, partly since workforce is often associated with training programs and worker services whereas talent refers to a broader spectrum of approaches concerning attraction and retention of highly skilled [talented] people.)
- **Collaborative Sites and Infrastructure Development:** Region 2's Council recognizes that one focus area in this region should include the development and growth of sites and the infrastructure used to support those properties, particularly existing underutilized sites and buildings, appropriate for the needs of growing priority industry clusters. In the past five years, 7 projects (\$1.4 million in funding) have been supported to increase the number of collaboratively developed sites and buildings on the market, improve their market positioning, and meaningfully encourage sites and buildings projects to leverage special assets.

The sections that follow provide an in-depth overview of each strategic focus area, along with a discussion of regional assets, potential strategies, and possible criteria for projects interested in GO Virginia funding.

Innovation Cluster Scale-Up

As described earlier in this document, industry clusters are groups and networks of geographically interdependent firms, knowledge-producing institutions (e.g. universities, research institutes, technology-providing firms), bridging institutions (e.g. providers of technical or consultancy services) and customers, linked in a production chain which cumulatively creates added value. The concept of the cluster goes beyond that of firm networking, as it captures all forms of knowledge sharing and value exchange.

While industry clusters include all kinds of firms, large and small, established and start-ups, service-oriented and goods-producing, there are typically some number of traded-sector firms at their center. Traded sector firms are important for GO Virginia because they sell their good outside the region

bringing “new” money into our communities. Given that connection to broader commerce they are typically key sources of new investment into the region.

The previous regional plan described the composition and dynamics of key clusters in Region 2. They were used effectively to focus applicants on the needs of those industries, especially within talent, sites, and entrepreneurship. The plan did not identify and prioritize explicit strategies for the strengthening and growing the clusters themselves. Even without guidance from the plan, some project activities aligned with the goal of growing target industry clusters. The state boards now identify this as one of their key areas alongside talent, sites, and entrepreneurship, under the term “cluster scale-out”. To better highlight and garner interest in clusters, this 2021 G&D plan narrowed the larger clusters from 2017 to focus on key private, traded sector industries. Investment in these revised industry clusters could fuel significant growth in the larger regional economy.

Cluster Development Principles for Scale-up and Scale-Out

There are core principles identified with successful cluster development efforts.³³ First and foremost, patience is required. Constructing a robust cluster ecosystem, building trust and collaboration among partners, takes some time and can’t be accomplished overnight.

It is also important to understand that these efforts should be industry-driven, shaped by validated market opportunities and the needs of multiple firms in a cluster. At the same time universities and colleges can and should fuel talent and technology needs of the cluster. Government funding, in some fashion, will also play an important catalytic role fueling cluster development at different stages of development.

Critical funding opportunities include those used for specific infrastructure, supporting education or training programs, or stimulating certain lines of research. These funding approaches serve multiple firms in a cluster, and frequently support multiple communities in an economic region. Such investments are best understood as collective bets that are unique opportunities for one or more clusters. These types of investments often require champions, advocates and leaders in the region who can envision, articulate and see the investment through to implementation.

There are a range of activities that might help to “scale-up” Region 2’s target clusters; for example, advancing emerging firms or moving established firms into new areas of opportunity. In either case, clusters that include to innovative, traded sector firms can scale-up through the provision of targeted business or technical support, the creation of cluster-specific hard and soft infrastructure, or other efforts to facilitate de-risking or problem solving for technology, talent, or other needs.

While cluster-specific interventions might be the norm, it’s also important to recognize the networked nature of participants in a cluster and the fuzzy edges of clusters where technological innovations are reshaping markets. These types of inventions contribute not only to scaling up but also scaling out. For example, our region is rich in knowledge creation assets and features vibrant firms developing emerging technologies. One of the most robust segments of this cluster in recent years has been autonomy. They

³³ <https://www.brookings.edu/blog/the-avenue/2021/09/01/a-new-federal-grant-should-make-regional-leaders-rethink-their-industry-clusters/>

are producing software, sensors and controls, that are reshaping products in the transportation and autonomy cluster.

Region 2 Clusters

As discussed earlier in this plan, we have narrowed the original 2017 target clusters and identified four target clusters across Region 2, which focus specifically on traded industries within larger industry clusters. They thrive in different communities, filling niches across geography and labor markets. They have all enjoyed some stability and even growth over the last six years (2015-2021), as seen in Table 7: life sciences and healthcare (19.1%), materials and machinery manufacturing (9.5%), transportation and autonomy (1.0%), and IT and emerging technology (0.7%).

Table 20: Region 2 Industry Cluster Components and Average Wages

GOVA Industry Clusters (Average wage = \$27/hour or \$55K annually)			
Transportation and Autonomy (\$34/hr or \$70K)	Materials and Machinery Manufacturing (\$34/hr or \$70K)	Life Sciences and Healthcare (\$38/hr or \$79K)	IT and Emerging Tech (\$43/hr or \$91K)
<ul style="list-style-type: none"> • Heavy Duty Trucks • Motor Vehicle Parts • Automation 	<ul style="list-style-type: none"> • Plastics • Rubber • Iron Foundries • Industry Machinery and Tools 	<ul style="list-style-type: none"> • Biopharma & Medical Devices • Residential Care • Medical Diagnostics & Support Services 	<ul style="list-style-type: none"> • IT & Cybersecurity • Electrical Manufacturing • Engineering Services

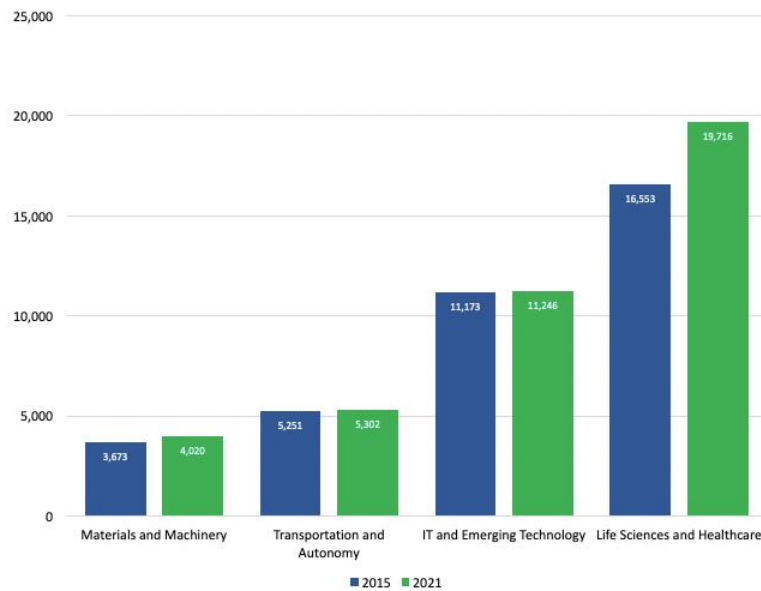


Figure 13: Target Industry Cluster Employment Growth (2015-2021)³⁴

³⁴ EMSI Industry Data, GOVA Region 2, 2015-2021. EMSI.

The transportation and autonomy cluster supports over 31 firms in the region with primary sub sectors in heavy duty trucks, motor vehicle parts manufacturing, and autonomy industries. One of the flagship manufacturing companies in the region is Volvo Trucks in Dublin mentioned earlier in the report. The 556-acre site is the company's largest site and has two million square feet of manufacturing space capable of producing over 150 trucks a day. Nearly 3,000 employees support the operations at the site, which has grown significantly since producing the first truck built in the U.S. in 1982.

Materials and machinery manufacturing supports more than 50 firms in the region such as Framatome Inc., which employs over 14,000 employees. With headquarters and operations in Lynchburg, Framatome is a significant player in the nuclear energy industry. However, Framatome also engages in research, development, and repair of machinery and components manufacturing. Their Solutions Complex on Mt. Athos Road hosts a multitude of activities falling into this industry cluster; for example, Framatome serves as a global leader as incore fabrication, designing and fabricating high technology systems such as fixed incore detectors.

The life sciences and healthcare cluster is anchored by the Carilion Clinic which employs over 13,000 staff (including 700 physicians) across seven hospital campuses, seven specialty medicine centers and 200 other ambulatory care and related facilities. Carilion traces its roots back to Roanoke Hospital opened in 1900 and has since grown tremendously in the region. The healthcare provider was critical in establishing two of the region's leading higher education institutions: Virginia Tech Carilion (VTC) and Radford University Carilion (RUC). VTC was established in 2008 and included the Fralin Biomedical Research Institute. The school graduates over 40 medical students each year. RUC provides evaluation and training to over 1,000 students with various degree offerings in nursing and other healthcare fields.

Other large patient facilities include the Veterans Administration Center in Salem, Lewis Gale Regional Health System with 2 hospitals in the NRV region and Centra Health based in Lynchburg.

There are over 600 graduates in the life sciences from the region's colleges. Other medical schools include the Edward Via Virginia College of Osteopathic Medicine and the Virginia-Maryland Regional College of Veterinary Medicine each enrolling over 700 students.

With over 65,000 jobs the emerging IT and tech industry is the largest cluster in the region. There are a wide range of companies from small startups to large firms such as GE, Optical Cable Corporation and Elbit System. For the last 5 years in the Roanoke region the growth in per capita patents filled has exceeded the national average growth by 3.5 times. There are 8 institutions in the region that provide a least a 4-year computer science or IT degree: American National University, Ferrum College, VMI, Roanoke College, Lynchburg College, Virginia Tech, and Washington & Lee. In the NRV area there were a total of nearly 900 IT/CS graduates in 2020.

Strategies

Weighing the current context for cluster in Region 2, a workgroup of private, public and non-profit leaders developed several strategies principles for GO Virginia to consider and laid out several challenges for future applicants looking to support cluster scale-up. Working group members agreed on the following principles:

- Proposed activities should have a clear focus on problem solving, de-risking, making connections. Success should be measured on how that activity helps companies with similar or interrelated issues solve problems.
- Proposed activities should look to standardize and scale up support mechanisms across the region.
- Proposed activities should clearly link and leverage the assets and services we already have, to support cluster growth in a repeatable predictable fashion.
- Proposed activities should contribute to building what one participant called “the corporate family,” bringing people together from industry in the cluster and supporting organizations to have conversations. This goes along with making sure people understand the cluster ecosystems in our region. Applicants need to shed light on similar issues or problems that companies are facing in the region and how they can work together to address them.

Building on these workgroup insights and a typology of interventions from Brookings,³⁵ the following strategies are offered for the region.

Table 21: Innovation Cluster Scale-Up Strategies

Broad Strategies	Specific Objectives	Examples
<p>IMPROVE INFORMATION AND NETWORKS</p> <p>Individual firms may not all connect with each across a regional cluster. Traditional analysis, for example through supply chains, may not reveal all opportunities for firms and other support organizations to share ideas. There also needs to be communication on knowledge for export opportunities and other development opportunities.</p>	<p>Build a sustainable, industry-driven, cluster organization to facilitate communication and collaboration, leading to growth and investment.</p>	<p>AUVSI: Ridge and Valley Chapter https://ausridgeandvalley.org/</p> <p>VA Bio-Connect https://www.vabio.org/why-virginia/virginia-bio-connect/</p> <p>Virginia Offshore Wind https://www.vaoffshorewind.org/</p>

³⁵ <https://www.brookings.edu/research/rethinking-cluster-initiatives>

Broad Strategies	Specific Objectives	Examples
<p>FOCUS TALENT DEVELOPMENT</p> <p>There are mismatches in the labor market with US employers reporting workforce shortages. Workforce development strategies are focusing on efforts for direct work ready experiences.</p>	<p>Deliver customized, hands-on training (credit and not-for credit), curricula development, etc. aligned with current and anticipated needs across the industry cluster.</p>	<p>Alleghany Highlands “Drone Zone” https://www.ahedc.com/targeted-sectors/drone-technology/</p> <p>Blockchain Ecosystem Catalyst https://www.valleysinnovation.org/blockchain/</p> <p>ELITE Internship Program https://tinyurl.com/3m9taak2</p>
<p>SUPPORT INFRASTRUCTURE AND PLACEMAKING</p> <p>Infrastructure may be preconditioned for a cluster. Firms in the area need places to conduct R&D activities and centralized centers can serve multiple companies and research entities. The physical presence of these R&D centers can incentivize firms to locate and remain in the area. A sense of place is important as it helps create an identity for the cluster and provides an image for what the cluster is achieving in the region</p>	<p>Develop industry-focused research test-beds and demonstration/prototype innovation facilities</p> <hr/> <p>Construct facilities and secure equipment, targeted to industry needs, for workforce training and supporting entrepreneurship programming</p> <hr/> <p>Develop community and identity around industry clusters</p>	<p>Innovation Quarter Winston Salem https://www.innovationquarter.com/</p> <p>Roanoke Innovation Corridor https://roanokeinnovates.com/</p> <p>VT Corporate Research Center, Wet Lab Study https://www.vtcrc.com/</p> <p>VTTI and MAAP https://www.vtti.vt.edu/ https://maap.ictas.vt.edu/</p>

Broad Strategies	Specific Objectives	Examples
<p>ENHANCE RESEARCH AND COMMERCIALIZATION</p> <p>Research activities that focus on solving an industry problem that can be commercialized are important for cluster development. Research should be tied into the priorities of the local firms so that the firms can grow the cluster with innovative products.</p>	<p>Support applied research, prototyping, tech assistance, and manufacturing extension accelerating product development and process improvements stimulating industry growth.</p>	<p>Additive Manufacturing Partnership Labs and Center for Energy Research and Education Industry Labs (LU) https://www.liberty.edu/engineering/cere/</p> <p>GENEDGE: Retooling Manufacturers for Strategic Industries https://genedge.org/about-us/programs/go-virginia</p> <p>Virginia Tech Center for High Performance Manufacturing https://www.ise.vt.edu/about/facilities/centers/chpm.html</p> <p>VCU Pharmaceutical and Chemical Engineering Commercialization https://egr.vcu.edu/departments/chemical/research/areas-of-research/</p>
	<p>Support the growth and viability of companies exploring “game-changing” technologies in such areas as Unmanned Autonomous Systems, additive manufacturing, and similar.</p>	
	<p>Better connect regional companies (including small to medium sized enterprises) with universities and research centers.</p>	
	<p>Formalize and sustain regional research networks and consortiums.</p>	
	<p>Expand incubator/accelerator activities that provide mentorship and resources for new ventures engaged in commercialization.</p>	
	<p>Incentivize universities and researchers to increase regionally-focused start-ups and commercialization opportunities.</p>	

Broad Strategies	Specific Objectives	Examples
<p>IMPROVE CAPITAL ACCESS</p> <p>There are often disparities for younger firms and firms in non-centralized geographic regions with access to capital. Funds are needed to help grow smaller firms and create an ecosystem where investments take place across the cluster.</p>	<p>Support for entrepreneurship, start-ups, and scale-ups including: education/training, investment resources, M&A resources, shared-resources (e.g. in the MDF/PIF)</p>	<p>Invest SWVA https://www.investswva.org/</p>
	<p>Connect regional companies to investors outside the region.</p>	<p>RAMP</p>
	<p>Increase investments and support for emerging and critical industries and innovative technologies.</p>	<p>https://ramprb.com/</p> <p>VTC Innovation Fund https://vtcinnovationfund.com/</p>
	<p>Encourage development of pre-seed and early-stage seed funding and support entrepreneurs in acquiring government and private funding</p>	

As adapted from a recent Brookings institution study there are five key interventions needed to support a robust cluster scale-up.

The first is to **improve the information and networks**. Tradition analysis and methods do not always capture all the available opportunities for idea sharing and communication. The Association for Unmanned Vehicle Systems International (AUVSI) Ridge and Valley chapter serves to “advance unmanned systems at the regional level, and to help drive publicity and awareness for the region as a resource for technical expertise.” This organization is an example of building a sustainable, industry-driven, cluster organization to facilitate communication and collaboration, leading to growth and investment. In the life sciences, the Virginia Biotechnology Association since its founding in 1992 has been enhancing public awareness of the newly emerging Virginia biotech industry and works to expand the knowledge and expertise within the field through seminars and forums.

The second intervention is a **focus on talent development**. Given the mismatches in the labor market where employers are unable to find qualified workers, Workforce development strategies are shifting focus to efforts for direct work ready experiences. The region must deliver customized, hands-on training (credit and not-for credit), curricula development, etc. aligned with current and anticipated needs across the industry cluster. In the Allegheny Highlands consisting of Allegheny County and the City of Covington the “Allegheny Highlands Drone Zone” program serves to bridge this gap by providing partnerships with Virginia Tech at the Virginia Center for Autonomous Systems (VaCAS) and classes in small unmanned aircraft and electrical control systems at the Dabney S. Lancaster Community College. Another example for talent pipeline development in the region is the Roanoke-Blacksburg

Technology Council's Experiential Learning in Tech Employment (ELITE) Internship program, which partners with local firms to offer internships for students enrolled in a software developer degree at a regional four-year university.

The third intervention is to **enhance research and commercialization**. Research activities that focus on solving an industry problem that can be commercialized are important for cluster development. Research should be tied into the priorities of the local firms so that the firms can grow the cluster with innovative products. Recently the Tiny Cargo Co. biotech startup through partnership with the Fralin Biomedical Research Institute at VTC was among five companies to receive a Washington, DC Health Innovation QuickFire Challenge award which provides the company with \$50,000 and the opportunity to reside at JLABS@Washington, DC and receive mentorship from experts at Johnson & Johnson. The company has licensed intellectual property to deliver heart medicine using exosomes through Virginia Tech's LICENSE: Center for Technology Commercialization.

The fourth intervention is to **support infrastructure and placemaking**. Infrastructure may be preconditioned for a cluster. Firms in the area need places to conduct R&D activities and centralized centers can serve multiple companies and research entities. The physical presence of these R&D centers can incentivize firms to locate and remain in the area. A sense of place is important as it helps create an identity for the cluster and provides an image for what the cluster is achieving in the region. Recently in 2019 the 1901 group which is a leading provider of innovative IT services and solutions broke ground on a 45,000 square foot Enterprise IT Operations Center within the Virginia Tech Corporate Research Center (VTCRC). This site supports the growth in cloud, cybersecurity and managed service businesses. The VTCRC has 36 buildings on over 230 acres housing over 220 companies, many of which are in the IT and tech sector.

The fifth intervention is to **improve capital access**. There are often disparities for younger firms and firms in non-centralized geographic regions with access to capital. Funds are needed to help grow smaller firms and create an ecosystem where investments take place across the cluster. It is important to have activities that connect regional companies to investors outside the region and support for entrepreneurship, start-ups, and scale-ups including: education/training, investment resources, M&A resources, shared-resources (e.g. in the MDF/PIF). Examples in the region include the Virginia Tech Carillion Innovation Fund, Invest SWVA and the Regional Accelerator and Mentoring Program (RAMP). In September of 2020 RAMP received an endorsement from the U.S. Economic Development Administration with a \$1 million grant to the Valleys Innovation Council which doubles RAMP's output.

Key Takeaways

In this strategic area, the key implementation charge is to support strategies that strengthen knowledge, collective capacity and soft and hard infrastructure of target industry clusters.

- Within the context of a given industry cluster, tailor the following strategies:
 - Improve information and networks;
 - Focus on talent development;
 - Support infrastructure and placemaking;
 - Enhance research and commercialization;
 - Improve capital access.
- In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area and describe how the proposed project will address one or more of the following principles:
 - Focus on problem solving, de-risking, making connections among companies in these clusters;
 - Standardize and scale up support mechanisms for target industry clusters across the region;
 - Clearly link and leverage the assets and services the region already has, to support cluster growth in a repeatable predictable fashion.
 - Encourage collaboration within industry clusters including building understanding of cluster ecosystems, exploring similar issues within clusters, and identifying and pursuing ways of working together.

Entrepreneurship and Business Development

Entrepreneurship and supporting the growth of Region 2’s entrepreneurial ecosystem(s) continue to be priorities for local and regional entities. Since GO Virginia began in 2017, new and existing groups in the region have made strides to better align and collaborate with their ecosystem partners. These include but are not limited to the Valleys Innovation Council or VIC (regional entrepreneurial ecosystem coordinator), the Roanoke-Blacksburg Tech Council, RAMP, the Advancement Foundation, and regional SBDCs. Regional efforts supported by GOVA funding have culminated in a growing support network for high growth startups across all target clusters. However, as the data and stakeholders have suggested, there is still room for improvement.

A regional analysis of entrepreneurial trends identifies “Higher Job Growth Compared to National Average”, “Positive Job Growth”, and “Location Quotients Above 1.2” as current strengths in Region 2.³⁶ Our region has a greater proportion of firms that are 11+ years in age than the rest of the state and U.S. As a result, the proportion of younger and middle-aged firms lag behind both VA and U.S. metrics.

³⁶ IBID

Regardless, young firm job growth has been consistent from 2010 through 2020 in Virginia and in our region; notably, our region and our state saw young firm job growth in 2020, while the U.S.'s growth for firms of this age stalled after 2019.

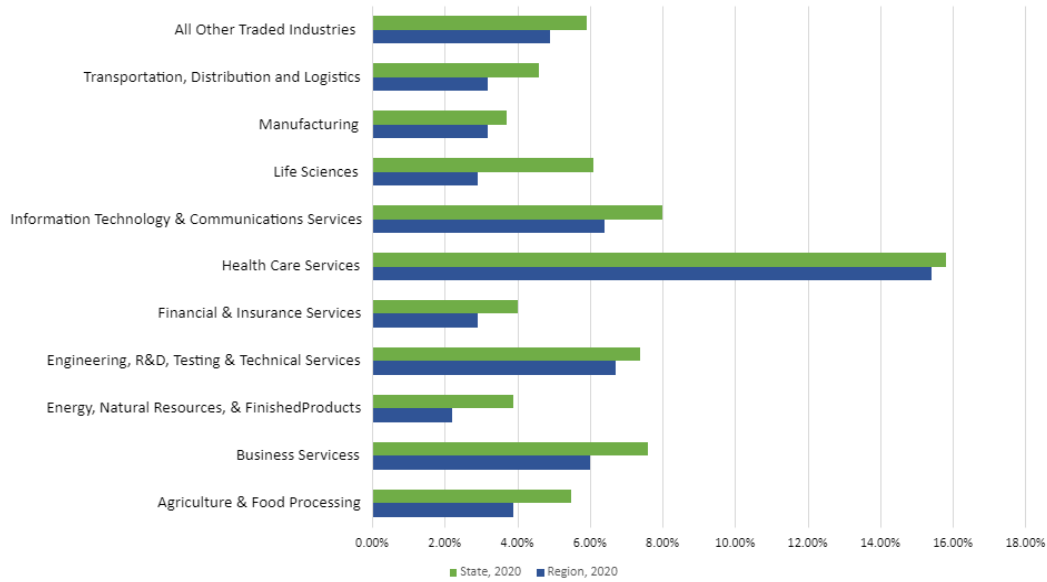


Figure 14: New Business Formation by Region and State (2020)³⁷

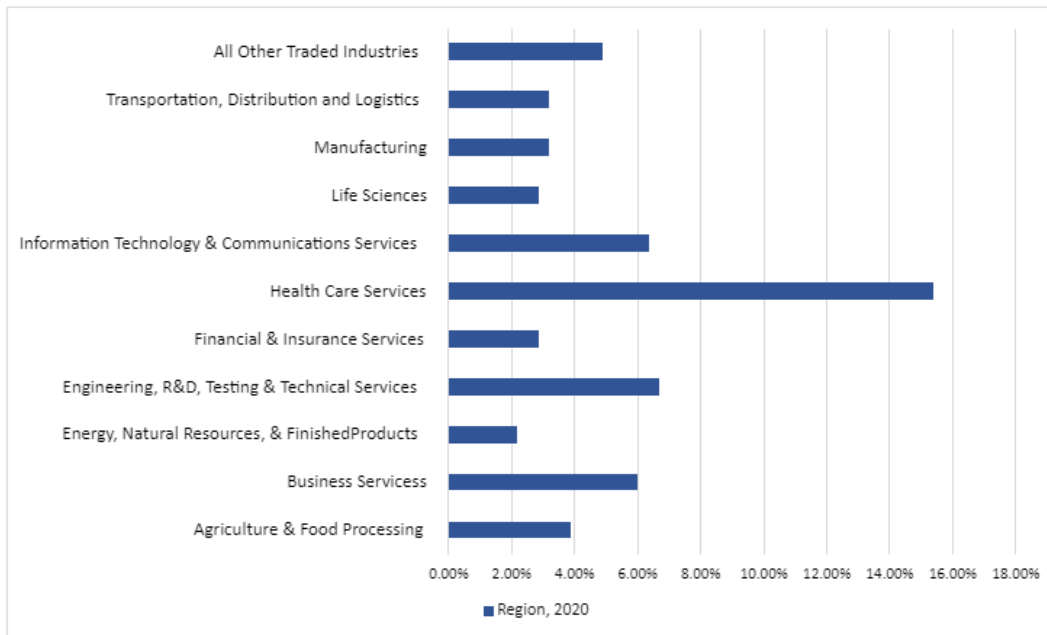


Figure 15: Startups by Traded Industries, 2019 and 2020³⁸

³⁷ : Teconomy Partners LLC. (2021, August 13). *Region 2: Roanoke/New River/ Lynchburg Update on Entrepreneurial Trends: Phase 1 Analysis of Startup Activity and Firm Dynamics.*

³⁸ Teconomy Partners LLC. (2021, August 13). *Region 2: Roanoke/New River/ Lynchburg Update on Entrepreneurial Trends: Phase 1 Analysis of Startup Activity and Firm Dynamics.*

In contrast, older firm job growth has been inconsistent in the region, most likely reacting to the ebbs and flows of manufacturing industry demand. The COVID-19 pandemic was particularly hard on older firms. In 2020, 11+ year old firms saw significant job losses in the region, state, and nation.

Region 2 also tracks somewhat steadily with the U.S. and the Commonwealth of Virginia with respect to new business formation. Rates of business formation in traded industries have remained generally positive, although rates are somewhat lower than Virginia as a whole.³⁹

Strengths and Successes

Region 2 has established the Valleys Innovation Council (VIC), a regional backbone organization to support and grow the region’s entrepreneurial ecosystem. This organization has taken leadership in developing sub-regional ecosystem groups and growing entrepreneurial resources. More recently, VIC has partnered with the Roanoke-Blacksburg Tech Council and the regional accelerator RAMP, to form a larger umbrella organization (VERGE) that will better facilitate collaboration among resource providers.

Our region offers a variety of opportunities through accelerators, SBDCs, chambers of commerce, co-working spaces and associations through which businesses may seek guidance. Examples of support organizations, as detailed by VIC, include the 757 Angels Network, American Business Women’s Association (ABWA) New River Valley, Virginia Tech’s Apex Systems Center for Innovation and Entrepreneurship (CIE), among others. These resources may be organized into the following categories: Ecosystem Support, Education Services, and Sources of Capital.⁴⁰

Region 2 has seen growth in formal and informal avenues for mentorship and entrepreneurial training since the 2017 G&D Plan. Many entities have established or expanded their services to other firm types and sub-regions. For instance, the Roanoke SBDC expanded its services to the New River Valley, ensuring that all three metropolitan areas in Region 2 have access to SBDC services.

Entrepreneurial resource providers have made strides to develop cross-regional collaboration with other Virginia resource providers such as Lighthouse Lab in Richmond. For instance, many of the coworking spaces in this region have agreements with other coworking spaces across the state, allowing members to travel and still have office space.

GOVA Region 2 has implemented a number of projects to support entrepreneurs and small businesses. These projects have all acquired matched funding, in some cases exceeding the original amount funded by GOVA. Showing partnership support through matched funding appears to be a strength of projects in the region.

Ongoing Needs and Challenges

Valley’s Innovation Council has outlined several programmatic and resource needs for entrepreneurs in the region, including:

³⁹ Teconomy Partners LLC. (2021, August 13). *Region 2: Roanoke/New River/ Lynchburg Update on Entrepreneurial Trends: Phase 1 Analysis of Startup Activity and Firm Dynamics*.

⁴⁰ Valleys Innovation Council. *Innovation Resources*. Valleys Innovation Council. <https://www.valleysinnovation.org/innovation-resources/>

- 1) **Pitch Plus (Technical Assistance):** Put in place support structures to help entrepreneurs access capital and have a culture that educates founders and builds connections between startups and sources of capital.
- 2) **Hub-and-Spoke Startup Studios with Co-working Space:** Give startups access to the necessary infrastructure, programming, and other resources needed to scale operations beyond what a formal accelerator program provides to a more limited number of companies.
- 3) **Pre-Seed Funding/Early-Stage Funding Sources:** Have a diverse portfolio of funding sources, with a preference for non-dilutive sources, available to support early-stage companies.
- 4) **Industry-Specific Accelerator Cohorts:** Develop domain specific accelerator cohorts (e.g., the recently launched RAMP Health and Life Science cohort) or partner with other Virginia accelerator programs involved with the Virginia Accelerator Network to address the needs of startups within the identified Region 2 advanced industry clusters. Domain focused startups within prioritized industry clusters would then have access to mentors and resources tailored to their industry segment to help them determine product/market fit and to successfully scale.
- 5) **Industry-specific Shared Workspaces:** Have sufficient inventory to house current and prospective companies in identified industry clusters such as life sciences and healthcare, transportation and autonomy, and IT in proximity to where they need to be located.

Entrepreneurship activity is heavily concentrated in three ‘hubs’ in the region: Blacksburg, Roanoke, and Lynchburg.⁴¹ However, working group commentary at the August 2021 GOVA Region 2 meeting expressed that the Lynchburg has had limited entrepreneurial activity with Roanoke and Blacksburg organizations. Since the original 2017 Growth and Diversification Plan, the majority of GOVA-related entrepreneurial activity has occurred with entities physically located in the City of Roanoke and Town of Blacksburg. Few of these GOVA projects have been led by Lynchburg-based entities.

If developing an entrepreneurial ecosystem based on a hub and spoke model—where communities surrounding Blacksburg, Roanoke, and Lynchburg are the spokes—working to foster more entrepreneurial activity and connectivity in regional spokes should be prioritized. Reaching out to these spokes will be instrumental for startup growth throughout the region; we note especially little activity in Appomattox County, Craig County, and Giles County, based on density mapping. Density may be key, as it facilitates peer networking and collaboration. Addressing the lack of startup density in certain spoke areas will work to grow larger county peer networks and lead to greater synergy throughout the region, overall.⁴²

⁴¹ IBID

⁴² IBID

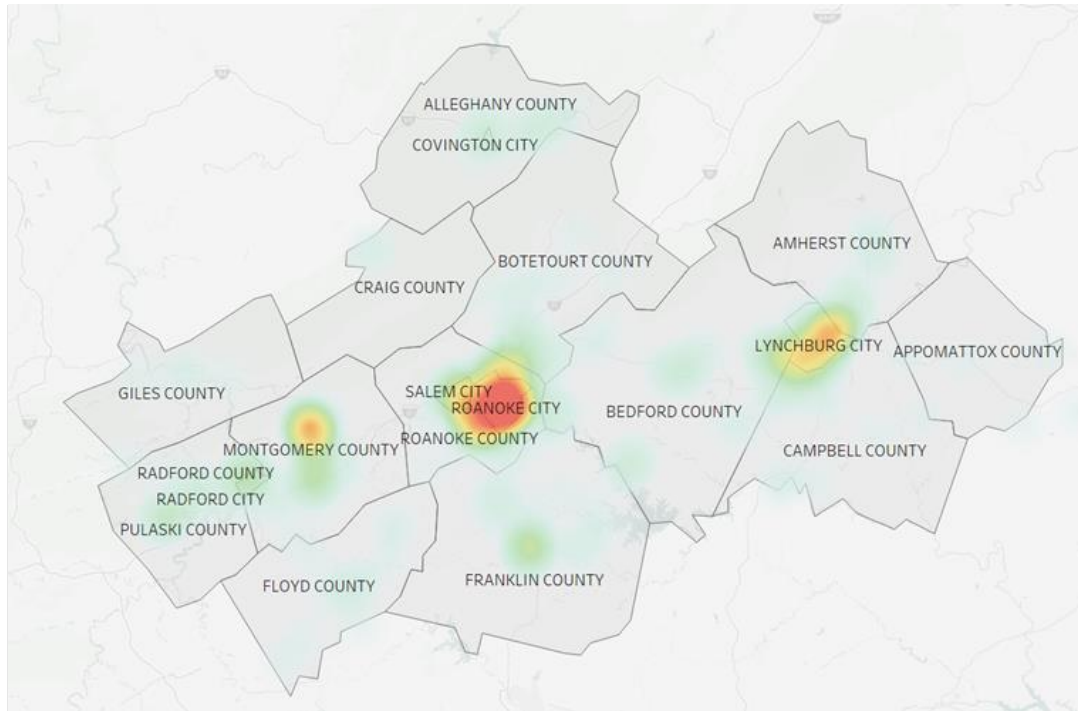


Figure 16: Concentration of New Business Formation⁴³

While it is the most critical component for entrepreneurial success, access to capital remains a challenge despite significant strides made in the region. Small businesses and entrepreneurs still struggle to acquire initial investments in their businesses. Angel funding, venture capital funding, and even traditional small business funding remain limited and/or inaccessible for businesses in this region.

Another challenge small businesses and entrepreneurs in the research and scientific-oriented fields is a lack of access to quality lab space. Wet labs, in particular, are necessary for growing the life sciences industry cluster. Lab space may be cost-prohibitive for these firms, and without availability in the area, there is inherently a limit on the growth of firms in these fields. Such a limit curbs supply of lab-space by sources of capital/would-be investors, which in turn further curbs growth in relevant fields. Working to address the lack of lab space may solve this ‘chicken or the egg’ type problem currently experienced in the region.⁴⁴

Small businesses and startups in more rural areas of the region face a lack of business-worthy broadband internet. Working with these firms to secure high-speed, reliable internet service will help bridge the geographic and technology gap among businesses in the region.⁴⁵

⁴³Image Source: Teconomy Partners LLC. (2021, August 13). *Region 2: Roanoke/New River/Lynchburg Update on Entrepreneurial Trends: Phase 1 Analysis of Startup Activity and Firm Dynamics*. Note from original Teconomy document: This map is based on geocoordinates of individual establishments, not an aggregation of establishment counts to a prescribed geography such as census tracts. The mapping software plots a visualization of startup spread by analyzing the clustering of coordinates in a multi-dimensional spatial context relative to each region. It is not possible to provide a numeric estimate of density (i.e. establishments per square mile) since calculation of spread is multi-dimensional and not fixed to a prescribed geographic boundary.

⁴⁴ Valleys innovation Council for the Region 2 Go Virginia Council. (2021, March). *Region 2 Entrepreneurial Ecosystem Strategic Investment Plan*.

⁴⁵ IBID

Awareness and transparency of entrepreneurial resources continue to be a challenge in the region, particularly for businesses operated by historically marginalized communities. Engaging those business owners and leverage the relationships of entrepreneurs who have successfully used regional resources is key to increasing awareness. This will not only address business needs, but also work to effect tangible equity impacts among regional entrepreneurs and businesses.⁴⁶

Strategies

To achieve the goal of growing more startup and existing firms that create and sustain higher wage jobs, one priority of Region 2 is to support GOVA initiatives that increase the number of startups and small businesses accessing capital investments. Below are strategies that address improving access to capital and supporting the development of capital-ready businesses.

Note that some entrepreneurial and business development needs may be addressed in other strategic areas of this G&D plan. For example, the need for technical and c-suite talent is covered in the Talent Development, Attraction and Retention strategic area. The need for better access to higher speed internet is addressed in the Collaborative Sites and Infrastructure Development strategic area of this plan. Increasing the commercialization of R&D products is a focus of the Innovation Cluster Scale-Up strategic area. This strategic area, Entrepreneurship and Business Development, focuses on the development of soft infrastructure and resources for start-up and existing small businesses.

⁴⁶ IBID

Table 22: Entrepreneurship and Business Development Strategies

2017 Strategies	Proposed 2021 Strategies	Opportunities
Increase presence of and access to capital investors	Build a diverse portfolio of funding sources, with a preference for non-dilutive sources, available to support early-stage companies	Activities to encourage development of pre-seed and early-stage seed funding
		Activities that connect regional companies to investors outside the region
		Activities that help formalize and professionally sustain regional network(s)
		Activities that provide training and technical assistant for capital acquisition
Expand and coordinate mentorship and training resources to increase the supply and flow of investible ventures	Expand and coordinate mentorship, training and other entrepreneurial resources to increase the supply and flow of investible ventures	Activities that give startups access to the necessary infrastructure, programming, and other resources needed to scale operations
		Activities that would encourage resource collaboration among resource providers
		Activities that support the development of and access to trusted business expertise (e.g. accounting).
		Activities the support the development of domain-specific cohorts of companies, providing them the space, resources and networking opportunities to ensure a stronger, regional industry cluster in the future.
Improve awareness of existing capital, mentorship & training resources.	Improve awareness of and relationships with entrepreneurial resources, particularly among BIPOC ventures and more rural, “spoke” counties hubs.	Activities that raise awareness and connect entrepreneurs and businesses to training, mentorship and funding resource
		Activities that support entrepreneurial ecosystem resource providers’ outreach to and relationship building with entrepreneurs and small business owners
		Activities that improve the exchange of ecosystem information within and outside of Region 2

Key Takeaways

In this strategic area, the key implementation charge is to support the development of young and growing firms in the region.

- Core strategies include:
 - Build a diverse portfolio of funding sources, with a preference for non-dilutive sources, available to support early-stage companies;
 - Expand and coordinate mentorship, training and other entrepreneurial resources to increase the supply and flow of investible ventures;
 - Improve awareness of and relationships with entrepreneurial resources, particularly among BIPOC ventures and more rural, “spoke” counties hubs.
- In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area and describe how their project will:
 - Increase the number of deals and investment in the region,
 - Create and sustain companies in the region, and
 - Promote startups or expanding businesses that support higher than average wage jobs.

Talent Development, Attraction and Retention

Talent production and the attraction and retention of skilled workers continues to be a critical challenge for all regions of Virginia. This is especially the case for GO Virginia Region 2, which tasked itself with improving the area’s talent landscape during the 2017 Growth and Diversification planning process. The region’s 19 postsecondary institutions continue to be its leading talent asset. At the time of this plan update, there were 159,737 undergraduate students enrolled at institutions in Region 2.⁴⁷ Additionally, there were 29,912 high school students and 22,681 middle school students enrolled across Region 2 in 2021.⁴⁸ Table 23 details talent assets present in Region 2.

⁴⁷ SCHEV 2021 Fall Headcount, this value excludes Virginia University-Lynchburg, Jefferson College, and Centra College of Nursing.

⁴⁸ Virginia Department of Education 2021 Fall Enrollment Headcount

Table 23: Region 2 Talent Development, Attraction and Retention Assets, Strengths, and Challenges.

ASSET TYPE	EXAMPLE STRENGTHS	CHALLENGES
Educational assets	K-12 school districts, four community colleges, 10 four-year universities and colleges, three technical and trade schools, and two medical schools.	Limited linkages between secondary and postsecondary education. And industry. Limited knowledge of individual programs/offerings across three sub regions.
Shared demand for occupations across industry clusters	Each target cluster shares demand for administrative, IT, middle-skill, and managerial occupations. Ample programming available for cross-industry occupations.	Lack of interest in filling vital in-demand occupations. Limited supply of skilled workers to fill openings/replacement jobs. Challenges in recruiting skilled workers to Region 2.
Large regional employers, and national and international employers	Large employers exist across Region 2, many of which are affiliated with national and international corporations.	Employers are not engaged with the talent pipeline. This contributes to a lack of awareness of employers' labor needs.
Workforce Development System	Three workforce development boards, robust community college system, industry-specific training programs.	Limited connectivity across different elements of the system. Employers are largely unaware/disinterested in the system.
Willingness to collaborate	Mentioned in each regional plan and highlighted during discussions with talent stakeholders.	Limited capacity and methods to meaningfully collaborate.

Despite a large pool of potential workers, regional businesses struggle to recruit and retain skilled workers across the board. Findings from the GOVA-funded “Stopping the Brain Drain” study suggest that majority of postsecondary graduates pursue employment opportunities outside of Region 2. Additionally, 18.4% of the region’s secondary completers planned to enter the labor force immediately following graduation in 2019. Input received throughout this planning process, however, suggests that these students are not leaving high school with career-relevant hard and soft skills. Finally, there is unmet demand for middle-skill occupations in Region 2. The misalignment between employers and employees present in Region 2 poses a challenge to growing the regional economy. The 2017 Growth and Diversification Plan identified the following talent-specific challenges, input from stakeholders suggests that Region 2 faces many of the same challenges in 2021:

- ▶ *Talent (skills/experience) gap:* There was nearly unanimous agreement among talent stakeholders that regional employers struggled to find skilled and competent employees to fill new and replacement jobs. Stakeholders shared that entry level workers did not have the hard and soft skills necessary for success. Additionally, the Coronavirus Pandemic has greatly constricted the supply of workers willing to fill lower-wage paying jobs. This gap was not limited to entry-level occupations; stakeholders noted challenges in connecting recent four-year graduates with regional firms. In many cases, regional employers sought workers with four or more years of industry-relevant work experience.

- ▶ *Interest gap*: there is unmet demand for many occupations in Region 2, especially those with a degree and/or experience requirement. There is a perceived lack of interest in obtaining the degrees, credentials, and skillsets necessary to fill these positions in Region 2 despite a relatively large number of training providers. Additionally, those that already possess in-demand skillsets may not be interested in remaining or relocating to Region 2. The interest gap was a leading challenge during the 2017 planning process and continues to pose a significant barrier to regional economic growth. A growing portion of the region’s middle-skill workers are at or approaching retirement age. To date, the region’s current pipeline for these occupations is insufficient to replace these workers.
- ▶ *Affordability gap*: degree programs are costly both in terms of tuition and opportunity cost (forsaking immediate wages in pursuit of a degree). Stakeholders pointed towards paid experiential learning opportunities (internships and apprenticeships) as a way to lower this barrier, although there was a limited supply of these opportunities available in Region 2.
- ▶ *Coordination gap*: there is not enough coordination between different elements of the talent pipeline (companies, educational institutions, workforce entities, etc.). Stakeholders felt that the region’s talent pipeline was highly fractured; entities vested in talent-production were overly siloed. Communication and collaboration with regional industry was identified as the region’s leading coordination gap.

The many governmental bodies (workforce development boards, planning district commissions, and regional economic development organizations) that share jurisdiction over Region 2 have common goals related to improving the talent landscape. Many these entities have developed strategies aimed at addressing the gaps detailed above, including fostering collaboration between the workforce system and industry, developing experiential learning opportunities, and marketing Region 2 to skilled workers living outside the area. Additionally, the GO Virginia program has been used to galvanize talent development in Region 2. Recent talent successes include:

- ▶ Career coaches at regional high schools have helped secondary students explore career paths, set goals, and make connections with training providers and employers.
- ▶ Community colleges have developed stackable credentialing programs that provide students with the skills they need to secure employment and pathways for continuing education alongside employment.
- ▶ The GOVA-funded Region 2 Talent Collaborative seeks to close the interest-gap detailed above. To date, this project has been used to host career expos for secondary students and match employer’s investments in upskilling their workers.
- ▶ The Ignite program developed by the United Way of Southwest Virginia provides secondary students with paid internships that teach critical workplace skills and prepare students for the workplace through hands-on experience.
- ▶ The “Stopping the Brain Drain” study investigated barriers to retaining postsecondary graduates in Region 2. This study also investigated challenges faced by employers in recruiting and retaining the skilled talent they need to be successful.

Region 2 engaged stakeholders to revisit the talent strategies developed during the 2017 Growth and Diversification Plan. Stakeholders felt that the strategies should largely remain the same, as many of the challenges these initial strategies addressed are still prevalent in the region. Table 24 lists the updated talent strategies:

Table 24: Talent Development, Attraction and Retention Strategies

Strategies	Opportunities	Metrics
<p>Strengthen the pipeline from K-12 to higher education to career for each target industry cluster.</p>	<p>Define clear career pathways for each of the four target industry clusters and support programs that address critical pathway training opportunities (i.e. apprenticeships, STEM-focused CTE, internships, etc.)</p>	<ul style="list-style-type: none"> • Number of region-specific career pathways developed; number of career counselors using career pathways to advise students. • Number of industry-aligned CTE programs created; number of students participating. • Number of high school graduates pursuing occupations or higher education that may lead to employment within target clusters.
	<p>Prioritize job training at the K-12 level; tailor training programs to provide regionally relevant, career-oriented skillsets. Continue career exploration activities for secondary students.</p>	
	<p>Address the interest gap through identifying in-demand occupations and creating targeted awareness and recruitment campaigns for each target cluster.</p>	
<p>Increase number of degree completions and instances of skillset development applicable to target industry clusters.</p>	<p>Delineate demand for degrees and demand for skillsets. Better understand which occupations require a degree and which occupations require skill development and/or training.</p>	<ul style="list-style-type: none"> • Increased awareness of programs and resources by target populations within Region 2. • Number enrolled in in-demand training programs; number of completers. • Number of industry-specific nondegree skill development programs created; number of participants and completers. • Number of soft-skill development programs/courses created; number of participants and completers.
	<p>Cross market and cross promote technical programs and certifications.</p>	
	<p>Increase the supply of experiential learning opportunities that allow students to earn an income and acquire credentials concurrently.</p>	
	<p>Consider alternative methods of training delivery to increase the supply of skilled workers (i.e. bootcamps, on-the-job training, etc.).</p>	
	<p>Prioritize soft-skill development alongside hard-skill development. Provide students and workers with skills for a successful career.</p>	

Strategies	Opportunities	Metrics
<p>Improve knowledge and promotion of complementary workforce and training programs.</p>	<p>Rectify fractured nature of the region’s talent pipeline by enhancing collaboration across the region’s talent production and attraction stakeholders: continue to improve communication; identify linkages and opportunities for collaboration; and assign responsibility.</p>	<ul style="list-style-type: none"> • Number of workforce service participants in programs. • Number of new partnerships created. • Number and diversity of participants in the workforce system. • Number of incumbent and dislocated workers participating in in-demand training/degree programs.
	<p>Expand regional focus of talent development beyond secondary and postsecondary students; harness workforce programs to develop talent amongst incumbent workers and dislocated workers. Target and prioritize workers dislocated as a result of the Coronavirus Pandemic.</p>	
<p>Enhance employer engagement activities that will encourage more aligned skill development, create opportunities for regional employment post-graduation, and promote the hiring of in-demand occupations.</p>	<p>Better integrate employers into the region’s talent development pipeline. Identify and apply innovative strategies aimed at fostering communication between employers and elements of the talent production/attraction system. Prioritize information sharing regarding workforce needs and in-demand job openings.</p>	<ul style="list-style-type: none"> • Number of employers meaningfully engaged in workforce development efforts. • Number of experiential learning, internship, and apprenticeship programs created; number of students/workers participating. • Increased awareness of regional talent development/attraction programs amongst employers and job seekers. • Number of universities engaged.
	<p>Engage employers in better understanding the needs of workers, including, but not limited to access to transportation and childcare.</p>	
	<p>Better leverage funding for program outreach to more effectively market regional talent development programs to employers and jobseekers.</p>	
	<p>Partner with employers to expand experiential learning, internship, and apprenticeship programs. Better communicate the shared value of these programs.</p>	

Key Takeaways

In this strategic area, the key implementation charge is to support strategies to grow, attract, and retain skilled talent by enhancing regional coordination and increasing the talent pipeline for critical higher wage occupations.

- Core strategies include:
 - Strengthen the pipeline from K-12 to higher education to career for each target sector;
 - Increase number of degree completions and instances of skillset development applicable to target industry clusters;
 - Improve knowledge and promotion of complementary workforce and training programs;
 - Enhance employer engagement activities that will encourage more aligned skill development, create opportunities for regional employment post-graduation, and promote the hiring of in-demand occupations.
- In addition to the broader criteria, applicants may be asked to:
 - Explain how their project supports one or more core strategies in this focus area
 - Align their activities with three or more of the success metrics listed in the focus area description; and
 - Describe how their project will address one or more of the gaps identified in the talent development and retention section (talent, interest, affordability, coordination).

Collaborative Sites and Infrastructure Development

Site and infrastructure development continues to be challenged with creating real estate places, spaces, and fundamental facilities and systems that support the sustainable functionality of different industries. GO Virginia policy guidance outlines that funding is not appropriate for direct site acquisition but may be used for site preparation and development and to better position and animate sites and built assets to spur economic growth. Additionally, funding for broadband development is to be used for “middle-mile” projects including, but not limited to, fiber and conduit, that extend telecommunications networks and focus on meeting the business needs of a community. Opportunities to facilitate specific approaches to collaborative, regionally significant development may be shaped by the needs of priority industry clusters or groups of related firms identified through the Growth and Diversification planning process.

The inception of GOVA Region 2’s Growth and Diversification plan revealed that its three sub-regions all share a common issue with the availability of market-ready sites and buildings. Over the past five years, funding has been used to advance the limited number of large sites, graded pads, and “shovel-ready” development sites. Sub-regions continue to discuss ways to leverage existing special assets like research centers or educational facilities, corporate anchors, and “quality of life” infrastructure. Additionally,

increased attention is given to specialized entrepreneurship centers, research-oriented parks or innovation districts, or other targeted development plans for their impact of producing products that come to market and ultimately determine business location and expansion.⁴⁹

Information

Questions about physical features like lot size and topography, grading and readiness to build, as well as the quality of existing structures or the availability of shell buildings remain a common inquiry. The accessibility to networked assets like communications infrastructure has grown in significant importance, especially over the last year. Furthermore, the state of transportation infrastructure and quality of labor, proximity to educational institutions and medical facilities, or large corporate anchors are a concern.

There has been a clear focus on bringing more information to bear on the site development process, especially identifying a supply of large industrial sites, characterizing their physical features, and their access to networked infrastructure or special assets. In 2019, VEDP used VBRSP funds to analyze and characterize 466 sites across the State to augment the Commonwealth's sites inventory, and to determine the types and amount of investment required to make these sites shovel-ready.⁵⁰ The VEDP Site Characterization process evaluated each property using a 5-level tiered system to show the degree of readiness for economic development. The sites readiness scoring system, along with a prioritization process guided by VEDP and aligned with each region's Growth and Diversification Plan, now serve as a guide to site investments by GO Virginia.

The previous plan outlined economic development organizations in Region 2 were preparing to create a richer picture of site and building characteristics through site assessment initiatives. Through GO Virginia funding the following projects have been completed or are in the process of being accomplished:

1. The Lynchburg Site Readiness advanced a portfolio of six existing commercial/industrial sites along the site readiness scale and clarified next steps for moving all sites to at least Tier III on the Virginia Business Site Readiness Scale (VBRSP).
2. Amherst LYH Region Site Readiness, through the Lynchburg Regional Business Alliance, has supported the advancement of 15 publicly owned sites to Tiers 3, 4, and 5. The project is currently in collaboration with municipalities in Region 2 including Amherst County and the town of Amherst.
3. The Central Virginia Training Center (Lynchburg Regional Business Alliance), working with the Lynchburg Regional Business Alliance, focused on creating a master redevelopment plan that included a zoning overlay district for the Central Virginia Training Center. By identifying redevelopment opportunities for the site, which is located in Madison Heights, Amherst County,

⁴⁹ Regional EDO reports accessed September 24, 2021. <https://roanoke.org/thrive-2027/> https://www.opportunitylynchburg.com/wp-content/uploads/2018/09/BO_guide_final_web.pdf <https://www.onwardnrv.org/wp-content/uploads/2020/09/Onward-NRV-Mission-and-Five-Year-Strategy.pdf>

⁵⁰ VA Growth and Opportunity Fund Regional Site Guidance accessed September 24, 2021. <https://www.centralvirginia.org/wp-content/uploads/2021/04/GO-Virginia-Sites-Guidance.pdf>

the region is able to generate jobs and housing that pertain to the region's in-demand sectors: manufacturing, technology, and healthcare.

4. The Flexible Laboratory Space Assessment is currently undergoing and will work to support both Roanoke and Blacksburg's life and health sciences ecosystem with flexible laboratory space, assessing the demand and projected growth in need for lab space in Region 2, making a working plan to serve the entire region, and creating an initial conceptual design with associated presentation materials to drive investor and market interest.

Economic development organizations can pursue multiple market opportunities based on site characteristics, but they face an information gap. "We've improved information about where the infrastructure stands, the metrics are there, but we don't know what we have and don't have," stated one participant in the working group developing this section of the plan. Most economic development organizations track some information about company prospects; however, consultants managing initial inquiries often provide limited information about their clients. Many leads are generated centrally from the state, which does not collect and characterize such inquiries, there is no context in which to assess the leads that reach the regions. Furthermore, there is no central database that economic development organization in Region 2 can query to understand how infrastructure and sites have improved in their region and use to set priorities for the future.

In general, communities have given increased attention to the development of broadband over the past year due to the impacts of the Coronavirus pandemic. In 2019, GO Virginia issued a policy update for the use of GOVA funds for investments in broadband. That policy outlined funds should not be used for broadband projects focused on providing residential broadband service to customers ("last mile"), rather in partnership with the private sector, middle mile broadband infrastructure projects will be funded, which extend telecommunications networks to the business community. The increasing need for broadband services has led to availability of multiple funding sources. Therefore, the role of GOVA advancing broadband initiatives in Region 2 needs to be handled delicately. To avoid a duplicative effort, there are opportunities to support broadband in concert with other funding sources, act as a catalyst for a plan or preparing a large project for another funding source.

Collaboration

Collaboration among localities is clearly a key to large sites, given limited land availability in many jurisdictions, and the costs for acquisition and development. The state provides a legal framework for joint site development and revenue sharing through the Regional Industrial Facilities Act (RIFA).⁵¹ Partners are asked to share costs up front with the promise of shared tax revenues at the end of the day. This model allows a relatively land-poor jurisdiction like Salem to share in the benefits of a large site in Roanoke County developed by the new Western Virginia Regional Industrial Facilities Authority.

It is important however to think about the long path of development and the many investments that partner jurisdictions may make along the way, such as utilities, site grading, shell buildings, and ultimately incentive packages. Performance agreements for economic development projects exist to

⁵¹ 8 Regional Industrial Facilities Act, accessed August 9, 2017. <http://law.lis.virginia.gov/authorities/virginia-regionalindustrial-facilities-act/>

govern shared investments, but targeted funding available on the condition of joint investments by localities, might provide an incentive to make meaningful commitments. For example, Go Virginia funded the Wood Haven Road Water and Sewer Infrastructure Enhancement project that works through the Western Virginia Regional Industrial Facility Authority (WVRIFA) to improve site readiness and marketability by making the water and sewer utility connections to the site ready for use. Prior to receiving funds, the site, jointly owned by the County of Roanoke and the Cities of Roanoke and Salem through the WVRIFA, was unable to be developed and did not attract businesses to the area. Through the project, the site will be propelled to a Tier 4 readiness standard through the Virginia Businesses Ready Sites Program. The project seeks to attract new businesses to the region through site preparedness. This project encouraged increasing downstream infrastructure capacity, a significant topic that many participants were interested in during workgroup sessions for the development this section of the plan. There are many sites within Region 2 communities that could benefit from water, gas, or sewer infrastructure growth and improvement. There is an opportunity to raise infrastructure caps to make sites more competitive, improve marketability, and keep up pace with the growth and development of the region.

Another form of collaboration has taken place around special assets. Much attention is paid in economic development to anchor institutions; for instance, higher education institutions' ability to spin innovative new companies from research or teaching facilities. Over the past five years, two GOVA funded projects have been developed with Liberty University collaborations.

1. The Center for Energy Research and Education (CERE) Industry Labs works with Liberty University and Framatome (AREVA Inc.) to create four industry labs including: Chemical/Material Lab, EMC Lab, Calibration Lab, and a Non-Destructive Testing Lab through site preparedness on a 28-acre lot in Bedford, VA. Through developing the land and establishing the labs, the region will be able to attract and build industry support for leading innovations and attract high-growth energy companies to the region.

2. The Additive Manufacturing Partnership Labs (AMPL) is a collaborative effort between Liberty University (LU), The Center for Advanced Engineering and Research (CAER), Central Virginia Community College (CVCC), the XLR8 STEM Academy, local partners BWX Technologies, FarField NDT, and Bedford County to support the collective goal of building the Additive Manufacturing (AM) base and educating the AM workforce. GO Virginia funding will purchase the AM equipment needed to establish the lab. LU will outfit the AM laboratory with: two Markforged Metal X 3D Printers, one Markforged X7 3D Printer, one Geomagic Capture Scanner, and smaller 3D printers in support of the STEM Academy. The 2,400 square-foot facility will include several AM systems capable of full consolidation of nylon, carbon fiber, polymeric, metallic, and ceramic material systems, as well as a prototyping laboratory which includes a host of characterization techniques.

Similarly, certain functions of large corporations, federal facilities, or even airports, are often considered generative assets to leverage for development. Ideas about what works to build on such assets focuses in many cases on how to facilitate and capture value from the unique points of connection and collision they represent. Bringing different economic actors together, almost always crossing jurisdictional or

even state or national boundaries, can generate new ideas and opportunities. These ideas need the right kind of spaces like accelerators and incubators, research parks, or specialized development districts or corridors in the open market. They may require partnerships between localities and universities, or other “anchor” entities, to assist with development or facilitation. In the case of Liberty University, not only could Region 2 capitalize on this anchor institution but it was used to spur sector strengthening assets that further support the regions’ target industries. There are other opportunities for particular research assets or sector assets that we have not taken advantage of yet or that we could really grow

Strategies and Criteria

Region 2’s Council recognizes that one focus area in this region should include the development and growth of sites and the infrastructure used to support those properties, particularly existing underutilized sites and buildings, appropriate for the needs of growing priority industry clusters. In the past five years, 7 projects (\$1.4 million in funding) have been supported to increase the number of collaboratively developed sites and buildings on the market, improve their market positioning, and meaningfully encourage sites and buildings projects to leverage special assets that increase the number of collaboratively developed sites and buildings on the market, improving their market positioning, and meaningfully engaging sites and buildings leveraging special assets. The goals of the GO Virginia program include growing higher than regional average wage jobs, primarily from new investment, and facilitating collaboration across jurisdictions.

The GO Virginia program’s limited availability of funding promotes careful consideration of project applicability. Strategies for leveraging special assets may tap resources like those listed above; but generally, they begin with commitments at the local or regional level or in partnership with the anchors. They are highly competitive, require substantial planning, and play out over extended timelines. Success metrics for projects could include bringing more information about both supply and demand to this market, delivering more data about site characteristics and industry needs to improve the success of development projects, or supplying assets that reinforce target industry development. Other measurements may include the number of sites appropriate for target clusters identified in this plan, market ready sites judged through the state assessment system, and dollars invested in collaborative projects.

Table 25: Collaborative Sites and Infrastructure Development Strategies

Strategies	Opportunities	Metrics
Improve information about site and building characteristics and market demand for sites and buildings	Local government or regional economic development agency funding	<ul style="list-style-type: none"> • More information available on site and building characteristics available to the market • More information available to economic developers on industry demand from priority industry clusters defined by this plan • More sites and buildings on the market appropriate for priority industry clusters defined by this plan • More ready-to-market sites as defined by the state tiered readiness grades • More industrial and commercial real estate availability • Increased capacity of downstream infrastructure around business developments • Increased/strengthened broadband access across Region 2 businesses • More joint local investments or anchor institution investments in site/buildings development or redevelopment measured by dollars committed to projects • Growth and development of sector strengthening assets that have progressed Region 2 target industries
	VEDP sites characterization and development grants	
Incentivize collaboration at all stages of joint site/building development or re-development	Virginia DHCD (e.g. Building Collaborative Communities, CDBG) grants	
	USDA Rural Development	
	US EDA Public works grants	
Develop and implement real estate strategies to leverage special assets	Local government or regional economic development agencies funding	
	Anchor institutions support	
Expand and improve downstream infrastructure capacity to better position sites for targeted investments	Local government or regional economic development agency funding	
	Virginia Resources Authority funding	
Cultivate sector strengthening assets that are prime motivators for advancing target industries	Local government or regional economic development agency funding	
	Anchor institutions support	
	VEDP sites characterization and development grants	
Partner to advance and support broadband initiatives and implementation throughout the region	US EDA Public works grants	
	Roanoke Valley Broadband Authority	

Key Takeaways

In this strategic area, the key implementation charge is to support strategies that increase the number of collaboratively developed prospect-ready sites on the market, improve their market positioning through infrastructure improvements, and meaningfully engaging sites and buildings by leveraging special assets.

- Core strategies include:
 - Improve information about site and building characteristics and market demand for sites and buildings
 - Incentivize collaboration at all stages of joint site/building development or re-development
 - Develop and implement real estate strategies to leverage special assets
 - Expand and improve downstream infrastructure capacity to better position sites for targeted investments
 - Cultivate sector strengthening assets that are prime motivators for advancing target industries
 - Partner to advance and support broadband initiatives and implementation throughout the region
- In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area and align their activities with three or more of the success metrics.

SECTION 4: APPLICATION PROCESS AND ASSESSMENT CRITERIA

This plan should guide the Region 2 Council in assessing projects and should support and guide applicants in designing and submitting fundable projects.

This section outlines the standard process for project screening, beginning with a first-stage, baseline, screening by Region 2 support organization staff. Staff and Council continue to encourage any interested party to discuss funding opportunities.

Potentially interested applicants are encouraged to submit a no more than 2-page letter of interest that could speak to some or all of these points:

- Includes the name and contact information of the expected primary applicant
- Identifies Region 2 jurisdictions to be impacted/involved
- Includes list of likely partners and collaborators
- Provides a brief narrative description of the project
- Identifies likely total costs including anticipated GO Virginia request and matching fund sources
- Includes a clear description of expected outcome or result - clearly describing how the project would spur growth of higher-wage jobs in one or more of Region 2's priority clusters AND respond to one or more of the identified strategies in the Region 2 Economic Growth and Diversification Plan

All those potentially interested are encouraged to submit a letter, even if brief and incomplete in order to begin the process of engaging with support staff personnel. Letters may be submitted that do not yet have some of these details in order to accelerate staff feedback and ensure that applicants are able to access and complete the full application in a timely manner. Interested applicants should review the Region 2 Growth & Diversification Plan prior to submitting their inquiry or application.

The letter of interest process supports possible applicants by eliciting feedback and guidance on the appropriateness of potential projects for GO Virginia funding. Letters of interest should be submitted electronically to support organization staff at the Virginia Tech Center for Economic and Community Engagement.

Eligible applicants:

Region 2 includes the counties of Alleghany, Amherst, Appomattox, Bedford, Botetourt, Campbell, Craig, Floyd, Franklin, Giles, Montgomery, Pulaski, and Roanoke; as well as the independent cities of Covington, Lynchburg, Radford, Roanoke, and Salem. Proposals require the collaboration of at least two localities. For more information on this or other requirements, applicants are encouraged to refer to the policy guidance documents from the state of Virginia available at <https://www.dhcd.virginia.gov/gova>.

Such local participation shall mean at least two or more counties and/or cities, a county and/or city and one or more political subdivisions or public body corporate and politic of that county and/or city along with such similar entity in another county and/or city, or two or more political subdivisions or public bodies corporate and politic from at least two different counties and/or cities. A town, with the county that surrounds it, may petition the Board for the ability to apply for a grant, if the parties can demonstrate that their collaboration is substantive and aligned with the goals of GO Virginia.

which may be any combination of counties, cities and towns and/or political subdivisions, public bodies corporate and politic, along with other public or private entities. Political subdivisions or public bodies corporate that represent the same county or city will not be counted as a separate locality. Public or private entities that may pursue and administer grant funding include, but are not limited to, other political subdivisions of the state, foundations, non-profit entities, colleges and universities, other educational entities, economic development organizations, workforce boards, local governments, regional council support organizations, and other stakeholders. A town, with the county that surrounds it, may petition the Board for the ability to apply for a grant, if the parties can demonstrate that their collaboration is substantive and aligned with the goals of GO Virginia.

Public or private entities that may pursue and administer grant funding include, but are not limited to, other political subdivisions of the state, foundations, non-profit entities, colleges and universities, other educational entities, economic development organizations, workforce boards, local governments, regional council support organizations, and other stakeholders. While a private company may apply, in cooperation with the collaborating localities and other stakeholders, to participate in or manage a project, grant funds are not to be used as economic development incentive payments or to promote the activities of a single entity. Instead, grant funds are to be used to support the implementation of requests aligned with plan priorities and that offer broad community benefits. Financial participation by the collaborating localities is required as part of any application for a grant allocation, and the minimum threshold for such participation is outlined in these guidelines. The roles of the various participants in applying for and administering a proposed project shall also be set forth in the grant application.

Project evaluation criteria:

- **Economic impact (35%):**
 - Project application outlines the expected return on investment of the proposed project and the timeline for achieving that return.
 - Project application demonstrates the proposed project's alignment with and how it will address the prioritized needs and opportunities of the growth and diversification plan.
 - Grant requests that have a larger impact with regard to the creation of higher paying jobs and economic diversification, based on a return on investment model, in a smaller economic region shall receive higher scores.
 - Project outlines both behavioral as well as anticipated tangible results that will come from the collaboration.

- **Regional collaboration (30%):**
 - The number and percentage of localities within the region that are participating in the proposed project and the portion of the region’s population represented by the participating localities.
 - Participation of localities or regions (including interstate collaborations) that are outside the applying region.
 - Cost efficiencies, repurposing of existing funds, leveraging of existing assets, or other evidence of collaboration that can be demonstrated as a result of the proposed project.
 - The amount of involvement in the project by businesses, colleges and universities, and other public and private entities within the region in the conceptualization of and the implementation of the project.
 - The amount, timing, and form of the proposed project match that outlines the depth of the commitment by the public and private funding partners to the effort.
 - Inventory existing grant requests or programs with similar goals to ensure the proposed project is not duplicative of, but additive to, other efforts to support economic diversification and the creation of higher paying jobs.
- **Project readiness (20%):**
 - Project application demonstrates that the project partners have the capability to successfully execute the project.
 - Project application demonstrates that the regional council has consulted with subject matter experts regarding the efficacy and viability of the proposal
 - Project application outlines how the project may be coordinated with existing efforts in the region.
 - Project application fully analyzes the barriers to successful implementation and other associated risks along with a plan to overcome them.
 - Project application reviews any prerequisite activities undertaken by the collaborating parties to increase efficiency with regard to program delivery and to ensure a deeper and consistent level of support for the project once launched.
 - Project application demonstrates the project partners, including the lead public or private administering entity, have sufficient financial management and personnel to ensure compliance with the grant agreement.
- **Project sustainability (15%):**
 - Plan for how a project will be sustained after grant funds are exhausted.
 - Demonstrated ability to meet the project performance metrics and to take remedial actions in the event those measures are not achieved.
 - Demonstrate leverage above the required amounts from any source. Based on program guidelines, prior decisions by the GO Virginia State Board, and the “GO Virginia Guidance and Metrics by Project Type” policy document, applications that include the following types of activities or fund uses are discouraged:
 - Healthcare and nursing training programs
 - K-12 Capital Requests

- State Salaries
- Scholarships
- Transportation Infrastructure
- Incentive packages for industry prospects
- Direct funding to start-ups
- Trade missions
- Quality of life or tourism as a primary focus

For Region 2, applicants can access materials at the website of the Region 2 support organization: <https://cece.vt.edu/GOVAR2.html> and contact a staff member. Applicants are encouraged to contact Region 2 support staff for direct guidance and to maintain communication through the preparation and submission of the application. Support staff are available to advise and coach applicants on project fit and to help shape a compelling and competitive application.

At this writing, there are three streams of GO Virginia funding which applicants may seek. The first are Enhanced Capacity Building (ECB) funding. These funds are typically less than \$100,000 and are intended to support studies, planning or capacity building activities that directly support a future GO Virginia per capita or statewide competitive funding request. In other words, the ECB request must describe and outline a clear “line of sight” between the ECB activities and the possible future GOVA per capita or statewide competitive funding request.

Per capita (or implementation) grants funds are typically between \$100,000 and \$500,000, though may be more in select instances. They are used for projects that have a clear Return on Investment or ROI. The anticipated return on investment of a proposed project resulting from the GO grants is one of the key measures to be used by the Board in making funding allocations. The nature of the GO Virginia initiative, however, is different from traditional economic development programs and incentives where results are more immediately visible through direct job creation and capital investment and the tax revenues such activities generate. These measures are important, but under GO Virginia, the proposed grant requests should also focus on long-term, sustainable change, economic diversification, and regional collaboration, so some measures of success are behavioral and thus, harder to measure.

Further, GO Virginia expects that the projects it funds will have broad community benefit that supports activities across local boundaries. In calculating the anticipated return on investment for proposed grant requests, applicants should outline the anticipated jobs and capital investment that could accrue from the project over a two-year period that aligns with the likely payout schedule of a grant, as well as over the longer term. Using those factors, the applicant should outline the anticipated state and local tax revenues that will result from the proposed activity. When determining the economic impact of a proposed grant request, the Board will give preference to those applications which can demonstrate that the GO Virginia portion of the grant is recouped within three years, however, projects that may have a smaller return in the initial phases, but a larger anticipated longer-term impact (considering the likelihood of future success) will received special consideration.

In addition to these objective factors, applicants should outline other measures of success, such as new collaborative agreements, revenue sharing, cost savings and efficiencies resulting from the project, or

other items that can be used by the Board to understand the financial viability of the project. Another variable that the Board will use in determining the return on investment is any information provided by the applicant about previous successes involving the applicant on similar initiatives.

By way of example, a grant request focused on a cluster scale-up activity which seeks \$100,000 from the Board may have as a goal the creation, within 3 years, of 50 new jobs earning \$50,000 per year. That would result in \$2.5 million of wages in year three. The average effective personal income tax rate in Virginia is approximately 4%, so that project would generate a \$100,000 return. Additional tax benefits (in the form of sales taxes, excise taxes, and property taxes) would show that the project is a net positive for the Commonwealth. That same project which yields 50 jobs earning \$40,000 per year would result in \$2.0 million of wages in year three – or an income tax yield of \$80,000. Sales taxes (which are realized assuming about 1/3 of wages are spent on items subject to the sales tax) yield another \$35,333.

It is understood that certain project types will have a longer timetable to achieve their expected return on investment. For example, projects focused on increasing the number of startup businesses or improving the entrepreneurial climate could take longer to show measurable results than those projects that scale up an existing company or can immediately commercialize research and development opportunities from our universities. Further, grant requests to solely support enhanced capacity building efforts may be able to demonstrate only limited returns prior to the end of the program. Consideration of the project type and duration will be used by the Board in making final grant decisions.

The final funding stream available to applicants are Statewide Competitive Funds. These projects are larger in size and scope, are multi-regional (crossing more than one GO Virginia region), and represent an economically significant opportunity for the state.

All GO Virginia Per Capita and Competitive grants must be matched (usually \$1:1) by non-state resources such as federal, private, non-profit, and local entities. The state may also request that those matching funds include a local government contribution (such as no less than 20% of the required \$1:1 match, or \$50,000 whichever is greater). Application budgets should reflect adequate funding through committed match and the requested funds to cover the full cost of the proposed project.

The goal of a local contribution requirement is to ensure localities are truly invested in the collaborative nature of the GO Virginia process as well as to ensure that proposed grant requests are of a substantial nature and meet the highest priorities identified in the regional growth and diversification plans. The local contribution may come from any combination of the participating localities (cities, counties, towns) and political subdivisions thereof (school systems, EDA, IDA, RIFA, etc.). The local contribution may take the form of cash, revenue sharing, dedication of locally owned or controlled assets to the proposed regional project, reallocation of existing funds, or in-kind contributions.

SECTION 5: IMPLEMENTATION AND SUSTAINABILITY

This plan recognizes that significant work has transpired in the region and around the Commonwealth since 2017. The Region 2 Council has established a strong record of accomplishment per its ability to identify, assess, and support worthwhile projects.

Nonetheless, the Council and support organization may find that more work will be needed to grow the regional project pipeline in the future, as many “ready-to-go” projects have already been funded. One challenge may be working more closely with organizations less familiar with GO Virginia or with less existing capacity to pursue funding. That may mean a more intentional strategy for outreach and project cultivation as well as a more intensive coaching process for potential applicants.

Implementing the Plan and Advancing Go Virginia Goals

The Council will continue to focus on strategies and activities that support the creation of higher wage jobs and generate new revenues from out-of-state sources. These include:

Promote innovative and strategic cluster scale-up for Region 2’s four target industry clusters

- Within the context of a given industry cluster, tailor the following strategies:
 - Improve information and networks;
 - Focus on talent development;
 - Support infrastructure and placemaking;
 - Enhance research and commercialization;
 - Improve capital access.
- In this focus area, the key implementation charge is to:
 - Support strategies that strengthen knowledge, collective capacity and soft and hard infrastructure of target industry clusters.
- In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area and describe how the proposed project will address one or more of the following principles:
 - Focus on problem solving, de-risking, making connections among companies in these clusters;
 - Standardize and scale up support mechanisms for target industry clusters across the region;
 - Clearly link and leverage the assets and services the region already has, to support cluster growth in a repeatable predictable fashion.
 - Encourage collaboration within industry clusters including building understanding of cluster ecosystems, exploring similar issues within clusters, and identifying and pursuing ways of working together.

Enhance Region 2's entrepreneurial ecosystem through increased access to quality capital, business mentorship, and other support resources

- Core strategies include:
 - Build a diverse portfolio of funding sources, with a preference for non-dilutive sources, available to support early-stage companies;
 - Expand and coordinate mentorship, training and other entrepreneurial resources to increase the supply and flow of investible ventures;
 - Improve awareness of and relationships with entrepreneurial resources, particularly among BIPOC ventures and more rural, "spoke" counties hubs.
- In this focus area, the key implementation charge is to:
 - Support the development of young and growing firms in the region
- In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area and describe how their project will:
 - Increase the number of deals and investment in the region,
 - Create and sustain companies in the region, and
 - Promote startups or expanding businesses that support higher than average wage jobs.

Develop, attract and retain skilled talent

- Core strategies include:
 - Strengthen the pipeline from K-12 to higher education to career for each target sector;
 - Increase number of degree completions and instances of skillset development applicable to target industry clusters;
 - Improve knowledge and promotion of complementary workforce and training programs;
 - Enhance employer engagement activities that will encourage more aligned skill development, create opportunities for regional employment post-graduation, and promote the hiring of in-demand occupations.
- In this focus area, the key implementation charge is to:
 - Support strategies to grow, attract, and retain skilled talent by enhancing regional coordination and increasing the talent pipeline for critical higher wage occupations.
- In addition to the broader criteria, applicants may be asked to:
 - Explain how their project supports one or more core strategies in this focus area
 - Align their activities with three or more of the success metrics listed in the focus area description; and
 - Describe how their project will address one or more of the gaps identified in the talent development and retention section (talent, interest, affordability, coordination).

Collaborate in development of sites and infrastructure

- Core strategies include:
 - Improve information about site and building characteristics and market demand for sites and buildings

- Incentivize collaboration at all stages of joint site/building development or re-development
- Develop and implement real estate strategies to leverage special assets
- Expand and improve downstream infrastructure capacity to better position sites for targeted investments
- Cultivate sector strengthening assets that are prime motivators for advancing target industries
- Partner to advance and support broadband initiatives and implementation throughout the region
- In this focus area, the key implementation charge is to:
 - Support strategies that increase the number of collaboratively developed prospect-ready sites on the market, improve their market positioning through infrastructure improvements, and meaningfully engaging sites and buildings by leveraging special assets.
- In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area and align their activities with three or more of the success metrics listed in the focus area description.

In Region 2, applicants are expected to provide meaningful project match and the presence of match is a weighted element for project assessment. By prioritizing substantive applicant match, the Council seeks to enhance impact, leverage available funding, and ensure broad-based support for implementation.

Sustainability and Monitoring

In terms of overall sustainability of the Region 2 Council, there are serious reservations as to whether the Council is sustainable without dedicated state funding support at some level. That said, Council is seeking to reduce operational costs and enhance administrative efficiencies. This is evidenced in a number of ways – such as the streamlining of support and consulting functions in one entity and the preservation of significant funds for strategic reserve.

There are a few challenges to sustainability. Funds for regional and local economic development are a limited pool and regional economic development organizations are also amid their own fundraising campaigns. Soliciting GO Virginia funds threatens to divert funds from EDOs, and those funds are critical to regional industry attraction and targeting activities. GO Virginia Council members have visited the local government bodies across the region to share program information, discuss locality contribution requirements, and encourage proactive identification of possible matching funds by localities for future projects. This proactive outreach has been well-received, but the limited nature of local government resources will continue to make the locality contribution requirement a high bar for many future projects.

Another ongoing challenge is monitoring, coaching, reporting and evaluation of funded projects. As the number of active projects increases, these tasks increase in volume and complexity. Still, Region 2 is actively working to monitor, coach, support, and evaluate funded projects,

All grantees will continue to be monitored and their progress evaluated against their contractual obligations and their contribution to the overall goals of GO Virginia. Every quarter, grantees are asked to provide updates on their progress over the last three months. This includes the following:

1. Narrative description of activities and outcomes.
2. An indication as to whether or not the milestones for a given quarter have been achieved, a description of progress according to that milestone, and if the milestone was not met, a description of both the progress and the barriers. These milestones are taken directly from the contract.
3. A tally of metrics and products, according to contractual deliverables

Staff reviews these reports for completeness and goes back to grantees with any needed clarification. If grantees have not met a milestone, staff follows up with the grantee to make sure we understand the reasons for not meeting a milestone in order to provide a complete report to council and DHCD. In some cases, support organization staff will aid the grantee to help them meet the milestone for the following quarter.

Progress is also tracked against remittance requests and matching fund documentation reports to flag cases where activities and funding do not align.

Staff summarizes these reports into a “stoplight” report for council. Grantees that have met all milestones and are on track with funding are assigned a “green” color. Grantees that need to be monitored by staff in the subsequent quarter, either because of milestone deviation, lags in funding, or other issues are given a “yellow” light. Grantees that are far behind their milestones and have not indicated plans to catch up are given a “red” light, indicating staff intervention.

Each grantee also responds to a short survey via Qualtrics. This survey asks them to describe in greater detail their activities, outputs, and outcomes, framed by elements of the program logic model. All grantees describe their major partnerships for the previous quarter, which answers the question: “how does GOVA funding change the nature of relationships between local government and other partners around economic development”.

Projects in talent, entrepreneurship, technology, and sites and buildings each have unique subsets of questions that speak directly to the ways in which investments in these areas lead to higher than average wage jobs and investment. For example, projects in the talent space ask the grantee to describe the number of employees placed into upskilling programs, the skills learned, and the expected occupation of the employee upon completion of the program.

The survey responses are reviewed and aggregated. The data is monitored quarterly and evaluated in full annually.

CLOSING

This Growth and Diversification Plan builds on the success of the past four years with the GO Virginia program. The plan continues to offer a case for action grounded in a thoroughly researched and deliberated understanding of the economy and labor markets in Region 2. The document brings four target clusters into focus: transportation and autonomy, materials and machinery manufacturing, IT and emerging technologies, and life sciences and healthcare. The plan further provides strategies and metrics for meeting the needs these clusters have in areas such as talent development and attraction, collaborative development of sites and buildings, entrepreneurship and business development, and industry cluster scale-up.

APPENDIX A: INDUSTRY CLUSTER DEFINITIONS

Below is a list of industries comprising Region 2's four industry clusters. These clusters were identified during this 2021 Growth and Diversification planning process and changed from the previous target clusters as a means of refining the region's traded industries and garnering greater support for cluster scale up in the region. All data presented here was provided by Economic Modeling Specialists Incorporated (EMSI), a proprietary economic and workforce development software. This section harnesses the most up-to-date data available; the third quarter of 2021 quarterly census of earnings and wages (QCEW).

Transportation and Autonomy Cluster

Table 26: Transportation and Autonomy Industry Cluster Definitions

NAICS	Description	2021 Jobs	2026 Jobs	2021-2026 % Change	2020 GRP (Millions)	2020 Establishments
TRANSPORTATION AND AUTONOMY		5,302	5,446	2.7%	\$856	31
Transportation		4,765	4,781	0.3%	\$768	22
336120	Heavy Duty Truck Manufacturing	3,216	3,325	3.4%	\$622	5
336211	Motor Vehicle Body Manufacturing	296	274	(7.6%)	\$17.8	4
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	21	17	(16.5%)	\$3.3	2
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	52	72	37.1%	\$2.8	2
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	688	643	(6.5%)	\$69.7	3
336360	Motor Vehicle Seating and Interior Trim Manufacturing	149	161	8.2%	\$7.9	1
336390	Other Motor Vehicle Parts Manufacturing	343	288	(16.1%)	\$44.7	5
Autonomy		537	665	24.0%	\$87.9	9
334290	Other Communications Equipment Manufacturing	106	94	(11.2%)	\$6.3	3
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	115	157	37.2%	\$16.8	1

334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	49	68	38.8%	\$6.5	3
336411	Aircraft Manufacturing	121	170	40.8%	\$23.1	1
336412	Aircraft Engine and Engine Parts Manufacturing	147	176	20.2%	\$35.2	1

Materials and Machinery Manufacturing Cluster

Table 27: Materials and Machinery Manufacturing Cluster Definitions

NAICS	Description	2021 Jobs	2026 Jobs	2021-2026 % Change	2020 GRP (Millions)	2020 Establishments
MATERIALS AND MACHINERY		4,020	4,017	(0.1%)	\$413	50
Plastics and Rubber		2,850	2,856	0.2%	\$294	17
326199	All Other Plastics Product Manufacturing	1,634	1,778	9%	\$168	12
326211	Tire Manufacturing (except Retreading)	741	591	(20%)	\$81.1	2
326220	Rubber and Plastics Hoses and Belting Manufacturing	296	363	22%	\$26.1	1
326291	Rubber Product Manufacturing for Mechanical Use	178	125	(30%)	\$18.4	2
Metalworking and Machinery		1,170	1,161	(0.8%)	\$119	32
331511	Iron Foundries	296	317	7%	\$35.2	4
333249	Other Industrial Machinery Manufacturing	400	333	(17%)	\$41.6	12
333318	Other Commercial and Service Industry Machinery Manufacturing	11	15	33%	\$1.2	2
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing	209	230	10%	\$14.1	5
333517	Machine Tool Manufacturing	254	265	4%	\$27.4	9

Life Sciences & Healthcare Cluster

Table 28: Life Sciences & Healthcare Cluster Definitions

NAICS	Description	2021 Jobs	2026 Jobs	2021-2026 % Change	2020 GRP (Millions)	2020 Establishments
LIFE SCIENCES AND HEALTHCARE		19,716	20,849	5.7%	\$1,948	213
Biopharmaceutical and Medical Device Manufacturing and Research		1,513	1,631	7.8%	\$295	46
325412	Pharmaceutical Preparation Manufacturing	354	340	(4%)	\$82.5	4
325414	Biological Product (except Diagnostic) Manufacturing	82	114	40%	\$53.8	2
333314	Optical Instrument and Lens Manufacturing	322	410	28%	\$31.0	2
339112	Surgical and Medical Instrument Manufacturing	133	177	33%	\$18.0	3
339113	Surgical Appliance and Supplies Manufacturing	265	273	3%	\$51.3	6
339115	Ophthalmic Goods Manufacturing	44	49	11%	\$5.4	4
541714	Research and Development in Biotechnology (except Nanobiotechnology)	38	38	1%	\$8.7	4
541715	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)	276	230	(17%)	\$44.3	21
Residential Care		17,462	18,418	5.5%	\$1,589	73
622110	General Medical and Surgical Hospitals	15,318	15,659	2%	\$1,466	25
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals	607	781	29%	\$49.8	5
623210	Residential Intellectual and Developmental Disability Facilities	607	690	14%	\$26.9	33
623220	Residential Mental Health and Substance Abuse Facilities	929	1,288	39%	\$46.0	10

Elderly Care		10,696	11,308	5.7%	\$488	258
621610	Home Health Care Services	2,522	2,719	7.8%	\$112	161
623110	Nursing Care Facilities (Skilled Nursing Facilities)	5,095	5,268	3.4%	\$250	40
623311	Continuing Care Retirement Communities	2,122	2,366	11.5%	\$89.5	24
623312	Assisted Living Facilities for the Elderly	956	954	(0.2%)	36.0	34
Diagnostic Support		741	800	7.9%	\$63.7	95
811219	Other Electronic and Precision Equipment Repair and Maintenance	102	136	34%	\$8.0	7
339116	Dental Laboratories	49	46	(7%)	\$3.0	16
621511	Medical Laboratories	461	469	2%	\$37.6	62
621512	Diagnostic Imaging Centers	129	149	15%	\$15.2	10

Information Technology and Emerging Technology

Table 29: IT and Emerging Tech Cluster Definitions

NAICS	Description	2021 Jobs	2026 Jobs	2021-2026 % Change	2020 GRP (Millions)	2020 Establishments
IT & EMERGING TECH		11,246	11,561	2.8%	\$1,383	626
IT & Cybersecurity		5,512	6,035	9.5%	\$633	452
511210	Software Publishers	135	145	85%	\$37.7	26
518210	Data Processing, Hosting, and Related Services	135	123	(60%)	\$38.8	23
519130	Internet Publishing and Broadcasting and Web Search Portals	42	49	31%	\$7.9	16
541430	Graphic Design Services	124	127	5%	\$9.0	17
541511	Custom Computer Programming Services	616	586	(23%)	\$108	110
541512	Computer Systems Design Services	1,197	1,292	8%	\$154	138
541513	Computer Facilities Management Services	2,433	2,792	56%	\$186	9
541519	Other Computer Related Services	218	293	279%	\$32.7	25
541690	Other Scientific and Technical Consulting Services	295	298	(9%)	\$39.4	52

561621	Security Systems Services (except Locksmiths)	185	190	70%	\$11.1	14
811212	Computer and Office Machine Repair and Maintenance	88	88	(7%)	\$5.7	16
811213	Communication Equipment Repair and Maintenance	45	51	14%	\$2.8	6
Computers and Electrical Engineering		2,746	2,692	(0.2%)	\$333	24
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	166	195	118%	\$15.2	3
335311	Power, Distribution, and Specialty Transformer Manufacturing	821	950	171%	\$94.7	6
335312	Motor and Generator Manufacturing	1,396	1,328	(15%)	\$153	10
335314	Relay and Industrial Control Manufacturing	286	133	(87%)	\$54.9	4
335921	Fiber Optic Cable Manufacturing	78	85	(6%)	\$15.4	1
Engineering Services (NAICS 541330)		2,988	2,835	(5.1%)	\$418	151

APPENDIX B: REGION 2 MEMBERSHIP

Region 2 Council Members (as of September 30, 2021)

Dr. Eddie Amos,	GE Digital
Amy Ankrum,	Qualtrax
Michelle Austin,	Bank of Botetourt
Dr. Nathaniel Bishop,	Carilion Clinic
Dr. John Capps,	Central Virginia Community College
Kenneth Craig,	Liberty University
Janice Crawford,	Framatome
Beverly Dalton,	English Construction
Sandy Davis,	BCR Property Management
Paul Denham,	Southern Air, Inc.
Dr. John Dooley,	Virginia Tech Foundation
William Fralin,	Medical Facilities of America
Dr. Michael Friedlander,	Fralin Biomedical Research Institute
Vince Hatcher,	Hollingsworth & Vose
Don Halliwill,	Carilion Clinic
Mike Hamlar,	Hamlar-Curtis Funeral Home
Dr. Pat Huber,	New River Community College
Dr. Victor Iannello,	Radiant Physics, Radiant Ventures (R&D)
Fourd Kemper,	Woods Rogers Attorneys at Law
Floyd Merryman,	Sonny Merryman
Marty Muscatello,	Qualtrax
Kim Payne,	Berkley Group
Debbie Petrine,	Commonwealth Care of Roanoke
John Putney,	Lynchburg Regional Business Alliance
Dr. Ray Smoot,	Union Bank and Trust
Luke Towles,	Pinnacle Financial Partners

Working Group Members from Original Plan Process in 2021

Innovation Cluster Scale-Up

- Eddie Amos, Torc Robotics (chair)
- Janice Crawford, Framatome (chair)
- Erin Burcham, Roanoke-Blacksburg Technology Council
- Kevin Byrd, New River Valley Regional Commission
- Stephen Diesel, Method
- Tim Franklin, Partnerships at Radford University
- Kim Henderson, YMCA of Virginia's Blue Ridge
- Kelly Hitchcock, Central Virginia Planning District Commission
- Meredith Hundley, Valleys Innovation Council
- Jill Loope, Roanoke County Economic Development

- Ken McFadyen, Botetourt County Economic Development
- Debbie Petrino, Commonwealth Care of Roanoke
- Mary Zirkle, Planning and Community Development for Town of Bedford

Entrepreneurship and Business Development

- Luke Towles, Pinnacle Bank (chair)
- Marty Muscatello, MM Consulting (chair)
- Julia Boas, Roanoke Regional Partnership
- Summer Bork, New River Valley Regional Commission
- Amanda Forrester, Roanoke Regional Small Business Development Center
- James Harder, Virginia Tech Department of Computer Science
- John Hull, Roanoke Regional Partnership and Western Virginia Regional Industrial Facility Authority
- Meredith Hundley, Valleys Innovation Council
- Aisha Johnson, City of Roanoke Economic Development
- Stephanie Keener, Small Business Development Center - Lynchburg Region
- Megan Lucas, Lynchburg Regional Business Alliance
- Jim Martin, SCORE
- Mary Miller, Regional Accelerator and Mentoring Program
- Lori Saunders, Economic Development Authority of Amherst County
- My Lan Tran, Virginia Asian Chamber of Commerce

Talent Development, Attraction and Retention

- Nathaniel Bishop, Carilion Clinic (chair)
- Pat Huber, New River Community College (chair)
- Crystal Breeding, United Way of Southwest Virginia
- Erin Burcham, Roanoke-Blacksburg Technology Council
- John Capps, Central Virginia Community College
- Jason Clayton, Career and Talent Development at Radford University
- Paul Denham, President of Southern Air, Inc.
- Sara Dunnigan, GO Virginia and Economic Development at Virginia Department of Housing and Community Development
- Rebekah Gunn, Government Relations and Roanoke Community Relations at Virginia Tech
- Victoria Hanson, Amherst Economic Development
- John Hull, Roanoke Regional Partnership
- Steven Laymon, Hollins University
- Melinda Leland, United Way of Southwest Virginia
- Morgan Romeo, Western Virginia Workforce Development Board
- Beth Simms, Franklin County Economic Development
- Kristi Snyder, Rainbow Riders Childcare Centers at Blacksburg
- Scott Weimer, Roanoke Regional Initiatives
- Brian Wells, Hotel Roanoke and Conference Center

Collaborative Sites and Infrastructure Development

- Beverly Dalton, English Construction (chair)

- John Dooley, Virginia Tech Foundation (chair)
- Pam Bailey, Bedford County Economic Development
- Summer Bork, New River Valley Regional Commission
- Kevin Byrd, New River Valley Regional Commission
- Phil Callicott, Workforce Sustainability Project
- Luke Campbell, Botetourt County Economic Development
- Mimi Coles, Permatile Concrete Products Company
- Jerry Dunnavant, Brown Edwards Covenant Real Estate Services
- Deborah Flippo, Draper Aden Associates
- Catherine Fox, Visit Virginia's Blue Ridge
- Helen Franks, OnCall Telecom International
- Jamie Glass, Lynchburg Regional Business Alliance
- Victoria Hanson, Amherst Economic Development
- Jeremy Holmes, Roanoke Valley-Alleghany Regional Commission
- John Hull, Roanoke Regional Partnership and Western Virginia Regional Industrial Facility Authority
- Kirk Johnson, Graystone Companies
- Jill Loope, Roanoke County Economic Development
- Megan Lucas, Lynchburg Regional Business Alliance
- Sarah Merfeld, Springhouse Community School
- Krystal Onaitis, City of Covington
- Jonathan Sweet, Pulaski County
- Brian Wells, Hotel Roanoke and Conference Center

APPENDIX C: PEER REGION DATA

As discussed, in considering long-term growth and impact, Region 2 developed a set of possible peer regions for benchmarking and comparison. In the interest of clarity, we recap discussion of the selection process as follows:

The process began with the identification of metropolitan regions (MSAs) with comparable higher education institutions to account for research, human capital and possible spinout tech companies. Factors that were taken into consideration included:

- Population Density and Growth
- Urban to Rural Ratio (Designated Places with 50,000 or more residents)
- Comparable industry sectors
- Per Capita Income
- Median Household Income
- Gross Regional Product Per Capita
- Composition of population, in terms of age and education attainment (within 1-5% difference compared to Region 2 among different categories e.g. those with bachelor's degrees)

These factors led to the selection of three peer regions from an original list of 28 possible metropolitan regions (MSAs): Birmingham-Hoover, MSA, Champaign-Urbana MSA, and Chattanooga (TN-GA) MSA.

Focusing on MSAs, rather than individual cities, is appropriate, given the fact that GO Virginia Region 2 encompasses a number of counties and cities. Of note is that GO Virginia Region 2 is comprised of 3 smaller MSAs, whereas peer economies consist of individual MSAs; the peer group was appropriately selected with such considerations in mind.

GOVA Region 2 is compared to its peer economies on a variety of considerations, which may be grouped into two broad categories: human-centric and economy-centric categories, though it is acknowledged that there is great interplay between the two categories and their considerations. Regardless, discussion of human-centric considerations sets the stage for the subsequent discussion of overall economic productivity and composition.

The human-centric considerations discussed are as follows:

- Education
- Demographics
- Income
- Housing
- Labor Force

It is important to discuss these categories prior to detailing economic productivity. Understanding available human capital sets the stage for subsequent economic analysis.

More classically-economic focused considerations discussed are as follows:

- Small Business and Entrepreneurship Support
- Industry
- Economy

Discussion of the actual businesses and industries in the economy bridge the gap between human capital and economic productivity, which is arguably the main focus of comparison.

To summarize the findings, before going into explicit detail, GOVA Region 2 tracks closely with its peers on the various metrics used for comparison. All regions have heavy university presences, which may be impacting diversity and human capital, given that university populations may systematically differ from what may be otherwise expected in a random sampling of the population of the United States. There are very similar labor force participation rates and unemployment rates track similarly prior to and during the COVID-19 pandemic.

All the same, the entire peer group, GOVA Region 2 included, underperforms, relative to the rest of the country, in terms of economic productivity (as can be seen in household income). All peer economies are fairly stable over time, though GOVA Region 2's stability manifests as a holding pattern, rather than slow growth, so future focus must ensure that Region 2 does not fall behind its peer economies.

The peer regions and GOVA Region 2 demonstrate enthusiastic support for business development and entrepreneurship, which is important, given sizeable counts of small businesses in each economy. Such continued efforts to support growing business may be vital to capitalize on and retain the human capital present and to support the high-wage target industries detailed earlier.

Education

Similar to GOVA Region 2, the selected peer economies each have a 'flagship' institution, as well as a number of smaller institutions, of higher education.

GOVA Region 2's flagship institution may be considered to be Virginia Tech. Smaller institutions in the region include Radford University and the University of Lynchburg. Birmingham- Hoover's flagship institution may be considered to be the University of Alabama at Birmingham; it is accompanied by smaller institutions, such as Samford University⁵². Champaign-Urbana's flagship institution may be considered to be the University of Illinois at Urbana-Champaign; it is accompanied by smaller institutions, such as Parkland College⁵³. Chattanooga's flagship institution may be considered to be The University of Tennessee-Chattanooga; it is accompanied by smaller institutions, such as Chattanooga State Community College⁵⁴.

⁵² *Birmingham-Hoover, AL*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://ruby.datausa.io/profile/geo/birmingham-hoover-al>.

⁵³ *Champaign-urbana, IL*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/champaign-urbana-il>.

⁵⁴ *Chattanooga, TN-GA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/chattanooga-tn-ga>.

Though all peer economies have valuable institutions of higher education, GOVA Region 2 may have a comparative advantage in that its ‘satellite’ institutions may provide greater support than those from other regions, given proximity, size, and research.

Overall, these educational opportunities translate to tremendous human capital in GOVA Region 2 and in its comparable peer economies. However, developing and retaining such capital are different ventures. Therefore, retention of graduating student populations remains an important focus for future economic growth.

Demographics

The figure below details the diversity, with regard to ethnicity, within the peer economies.

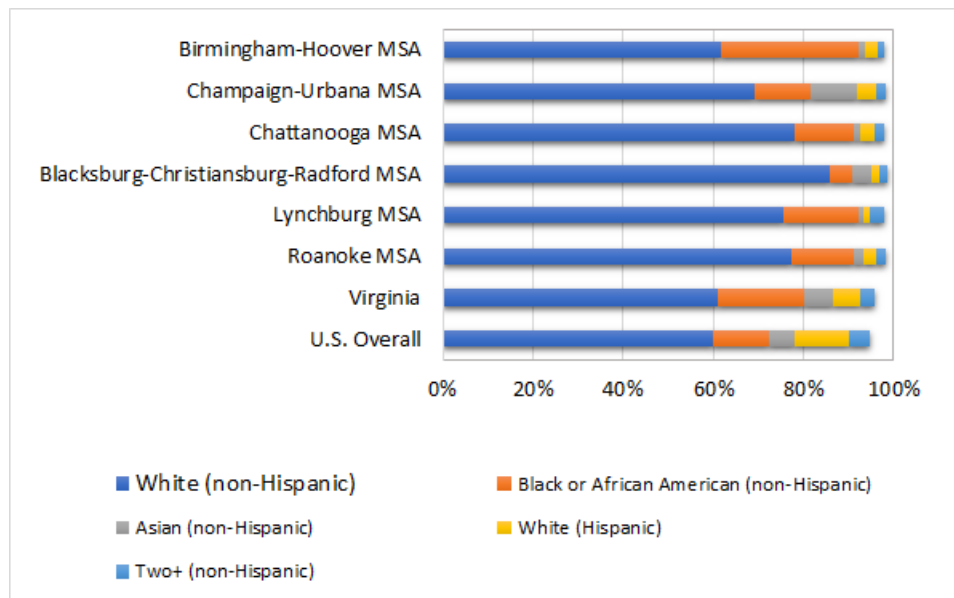


Figure 17: Relative Diversity within Peer Economies^{55 56 57 58 59 60 61 62}

The peer economies and GOVA Region 2 are fairly similar, with regard to ethnic diversity. Of note, though, is the fairly large Black or African American (non-Hispanic) population in the Birmingham-Hoover MSA. This is not surprising, given general demographic trends in the southern United States, but warrants mention, as traditionally underserved groups may benefit from targeted business development

⁵⁵ Birmingham-Hoover, AL. Data USA. (n.d.). Retrieved September 24, 2021, from <https://ruby.datausa.io/profile/geo/birmingham-hoover-al>.

⁵⁶ Chattanooga, TN-GA. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/chattanooga-tn-ga>.

⁵⁷ Champaign-urbana, IL. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/champaign-urbana-il>.

⁵⁸ Blacksburg-Christiansburg-Radford, VA. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/blacksburg-christiansburg-radford-va>.

⁵⁹ Lynchburg, VA. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/lynchburg-va-31000US31340>.

⁶⁰ Roanoke, VA. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/roanoke-va-31000US40220>.

⁶¹ Virginia. Data USA. (n.d.). Retrieved September 24, 2021, from

<https://datausa.io/profile/geo/virginia/#:::text=Virginia%20is%20home%20to%20a%20population%20of%208.54M,in%20Virginia%20than%20any%20other%20race%20or%20ethnicity>.

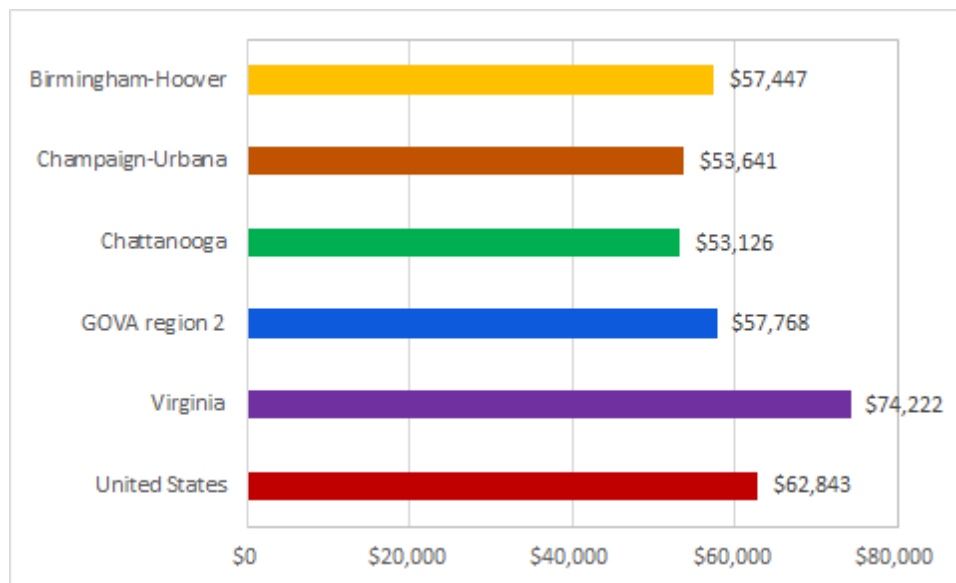
⁶² United States. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/united-states/#:::text=The%20United%20States%20is%20home%20to%20a%20population,United%20States%20than%20any%20other%20race%20or%20ethnicity>.

support. Regardless, GOVA Region 2 and its peer economies tend to have larger White (non-Hispanic) populations than the rest of the United States (and the state of Virginia). In particular, Blacksburg-Christiansburg-Radford MSA has less diversity than the other MSAs. The MSA’s heavy university presence may be influencing this observation, particularly with Virginia Tech being the historical “white state university”. Attracting and retaining diverse human capital should not be overlooked by any of the studied economies and may command greater attention in the future.

Income

GOVA Region 2 is compared to its peers with regard household income, with and without consideration for Cost of Living (COL).

The figure below provides a comparison of median household income data.



Please note, for illustrative purposes, we plot the center of the range for GOVA Region 2's household income range (\$57,768).

Figure 18: Comparative Median Household Income Data^{63 64 65 66}

As can be seen, GOVA Region 2 performs quite favorably within its peer group, though Region 2 and its peers lag behind the rest of the United States (and Virginia). Regardless, it is worth considering that costs of living vary, from economy. Such relative costs are detailed in the figure below:

⁶³ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA.

⁶⁴ Roanoke, VA Metropolitan Statistical Area (MSA). Data USA. Retrieved from [Roanoke, VA | Data USA](#)

⁶⁵ Blacksburg-Christiansburg-Radford Metropolitan Statistical Area (MSA). Data USA.

⁶⁶ Lynchburg, VA Metropolitan Statistical Area (MSA). Data USA.

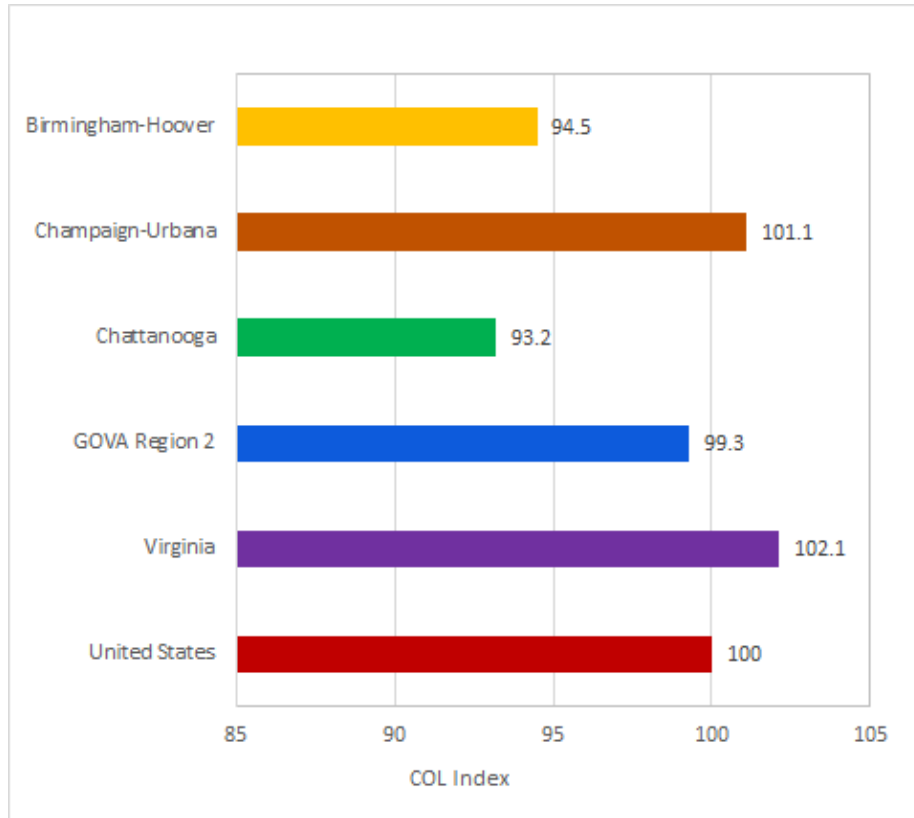


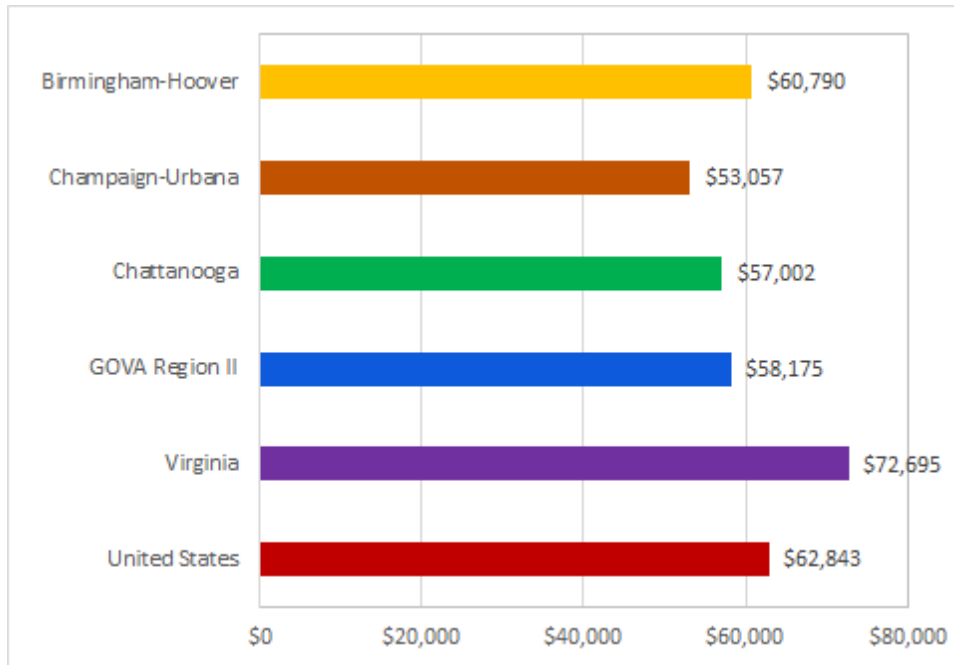
Figure 19: Comparative COL Index in Peer Economies⁶⁷

One can see that the COL in GOVA Region 2 is on the upper end of its peer groups', though is fairly consistent with that of the larger United States, which serves as our baseline (with a COL=1). Virginia's overall COL is higher, though note that this may be heavily impacted by the COL in northern regions of the state.

Adjusting the aforementioned household income by these Cost of Living (COL) metrics yields a comparison of effective household income.

⁶⁷ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA.

The figure below presents the adjusted median household incomes, standardizing household incomes to their equivalent values, relative to the larger U.S. economy:



Note: COL of United States=1 and serves as the overall benchmark.

Figure 20: Comparative Median Household Incomes, Adjusted for COL ^{68 69 70 71}

GOVA Region 2's household income, adjusted for Cost of Living, is lower than the rest of the United States and the Commonwealth/State of Virginia. It compares similarly with its peers. The boost that GOVA Region 2's household income receives is fairly minimal, though this still provides a competitive edge over Champaign-Urbana MSA, which saw effective income translated downward. Regardless, these findings imply that standards of living may be lower than those throughout the rest of the nation. Attracting high-paying jobs may remedy this income lag, but at the same time, may be hampered by such income lag; the two-way nature of this challenge warrants greater attention.

⁶⁸ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA.

⁶⁹ Roanoke, VA Metropolitan Statistical Area (MSA). Data USA. Retrieved from [Roanoke, VA | Data USA](#)

⁷⁰ Blacksburg-Christiansburg-Radford Metropolitan Statistical Area (MSA). Data USA.

⁷¹ Lynchburg, VA Metropolitan Statistical Area (MSA). Data USA.

Housing

The figure below details home ownership rates in the peer economies.

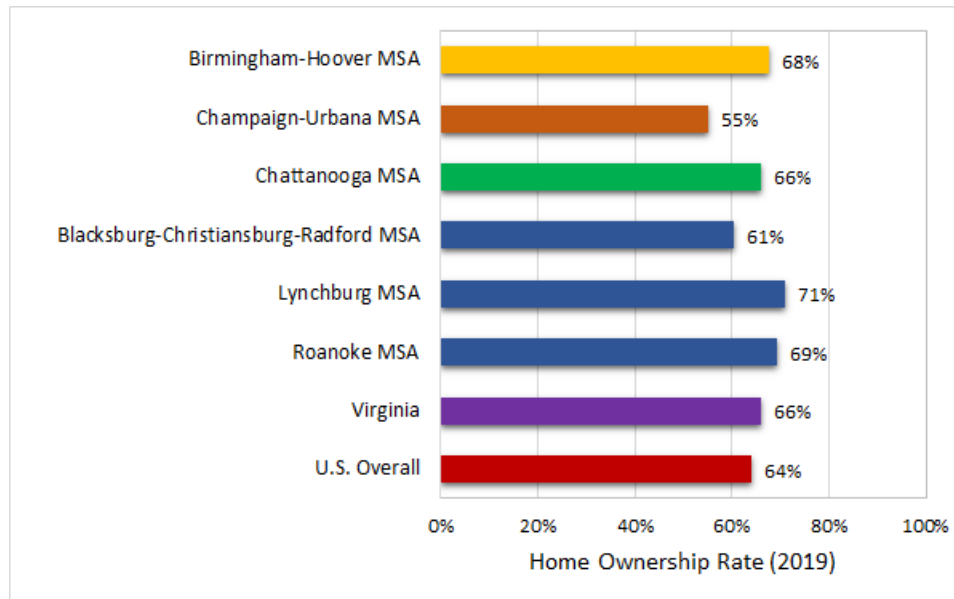


Figure 21: Home Ownership Rates in Peer Economies^{72 73 74 75 76 77 78 79}

The MSAs that comprise GOVA Region 2 tend to have home ownership rates that are fairly comparable to those in the peer group. Home ownership rates in GOVA Region 2 fluctuate above and below the Virginia average. Of consideration is the degree to which the Blacksburg-Christiansburg-Radford MSA's heavy academic presence may contribute to its somewhat lower home ownership rate. In a small MSA, a large temporary student (and even faculty or staff) population may substantially impact home ownership rates.

⁷² *United States*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/united-states/#:~:text=The%20United%20States%20is%20home%20to%20a%20population,United%20States%20than%20any%20other%20race%20or%20ethnicity>.

⁷³ *Virginia*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/virginia/#:~:text=Virginia%20is%20home%20to%20a%20population%20of%208.54M,in%20Virginia%20than%20any%20other%20race%20or%20ethnicity>.

⁷⁴ *Roanoke, VA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/roanoke-va-31000US40220>.

⁷⁵ *Blacksburg-Christiansburg-Radford, VA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/blacksburg-christiansburg-radford-va>.

⁷⁶ *Lynchburg, VA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/lynchburg-va-31000US31340>.

⁷⁷ *Birmingham-Hoover, AL*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://ruby.datausa.io/profile/geo/birmingham-hoover-al>.

⁷⁸ *Chattanooga, TN-GA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/chattanooga-tn-ga>.

⁷⁹ *Champaign-urbana, IL*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/champaign-urbana-il>.

The figure below details median property values in the peer economies:

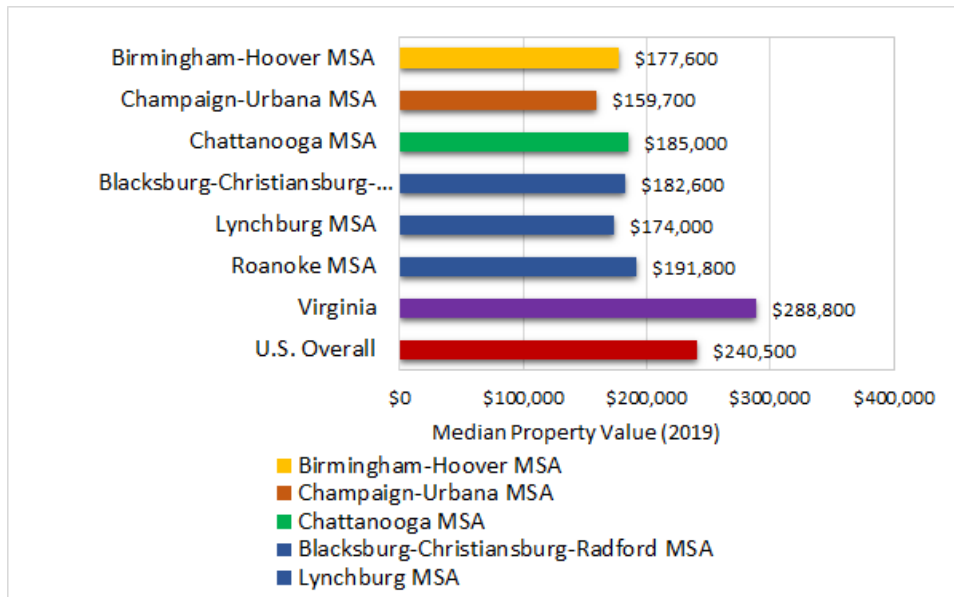


Figure 22: Median Property Values in Peer Economies ^{80 81 82 83 84 85 86 87}

The chart above suggests that housing values/property values in GOVA Region 2's MSAs and its peer MSAs are depressed, relative to the U.S. and to Virginia. Northern Virginia's property values may be heavily affecting Virginia's mean property value. With such influence, GOVA Region 2's MSAs may appear to lag behind the rest of the state. But, when compared with its peer group, GOVA Region 2 seems on-par, given its economic setting, etc. Regardless, GOVA Region 2's property values appear to be comparable to its peers.

⁸⁰ *United States*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/united-states/#:~:text=The%20United%20States%20is%20home%20to%20a%20population,United%20States%20than%20any%20other%20race%20or%20ethnicity>.

⁸¹ *Virginia*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/virginia/#:~:text=Virginia%20is%20home%20to%20a%20population%20of%208.54M,in%20Virginia%20than%20any%20other%20race%20or%20ethnicity>

⁸² *Roanoke, VA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/roanoke-va-31000US40220>.

⁸³ *Blacksburg-Christiansburg-Radford, VA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/blacksburg-christiansburg-radford-va>.

⁸⁴ *Lynchburg, VA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/lynchburg-va-31000US31340>.

⁸⁵ *Birmingham-Hoover, AL*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://ruby.datausa.io/profile/geo/birmingham-hoover-al>.

⁸⁶ *Chattanooga, TN-GA*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/chattanooga-tn-ga>.

⁸⁷ *Champaign-urbana, IL*. Data USA. (n.d.). Retrieved September 24, 2021, from <https://datausa.io/profile/geo/champaign-urbana-il>.

The figure below details the degree to which households within the peer economies may be housing-burdened.

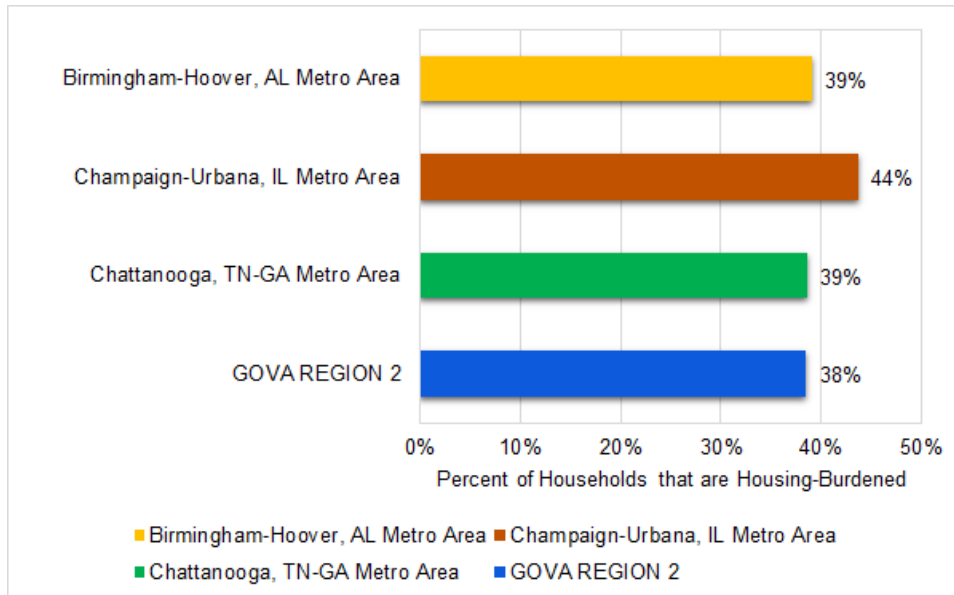


Figure 23: Percent of Households that are Housing-Burdened⁸⁸

All peer regions are fairly comparable, in terms of housing burdened households, defined by those where rent accounts for 30% or more of household income. Of note is that Champaign-Urbana has a slightly higher rate than its peers. The heavy university presence in these economies may contribute to these findings, as high levels of human capital in smaller MSAs may reduce housing burdens.

⁸⁸ Selected Housing Characteristics. Table ID: DP04. American Community Survey 2019 ACS DP5Y2019. ACS 5-Year Estimates Data Profiles. Birmingham-Hoover, AL Metro Area; Champaign-Urbana, IL Metro Area; Chattanooga, TN-GA Metro Area; Blacksburg-Christiansburg, VA Metro Area; Jefferson, GA Micro Area; Lynchburg, VA Metro Area; Roanoke, VA Metro Area. Business and Economy. Retrieved from <https://data.census.gov/cedsci/table?t=Business%20and%20Economy&g=310M500US13820,13980,16580,16860,27600,31340,40220&tid=ACSDP5Y2019.DP04&hidePreview=true>

Labor Force

The figure below details labor force participation rates over time in the various peer economies.

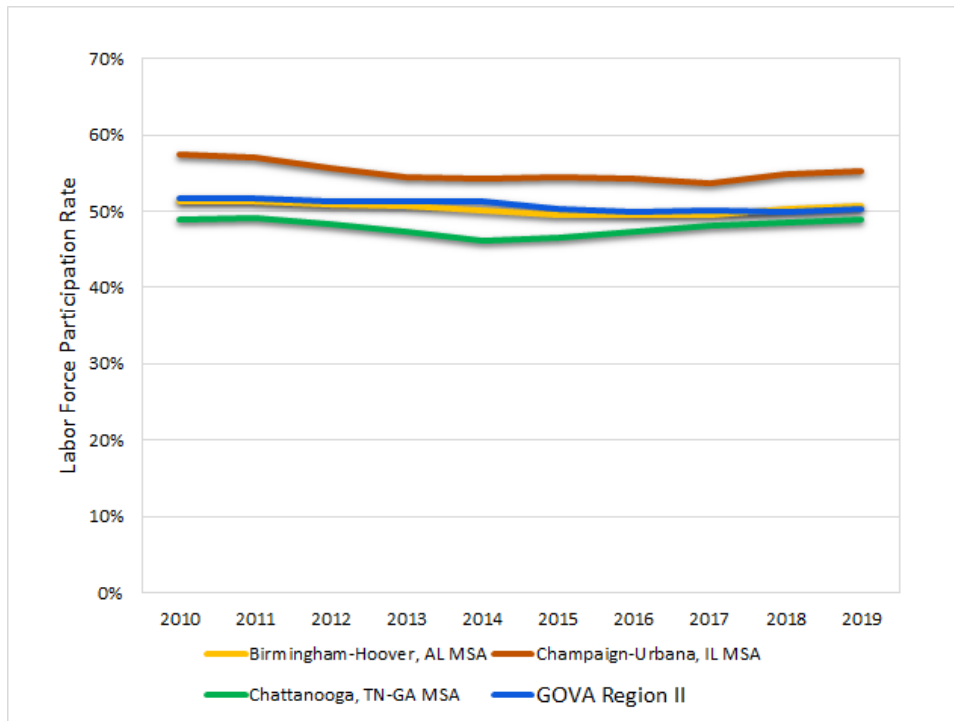


Figure 24: Civilian Labor Force Participation Rate within Peer Economies⁸⁹

One can see that GOVA Region 2's Civilian Labor Force Participation Rate is in line with those of comparable MSAs. Its rate consistently falls between the higher and lower ends of the range and tracks closely with Birmingham-Hoover, MSA's. Regardless, labor force participation within the peer economies has remained fairly steady over time.

⁸⁹ Local Area Unemployment Statistics Smoothed Seasonally Adjusted Metropolitan Area Estimates. Last Modified 2 June 2021. U.S. Bureau of Labor Statistics.

The figure below details how unemployment rates have changed over time in the peer economies.

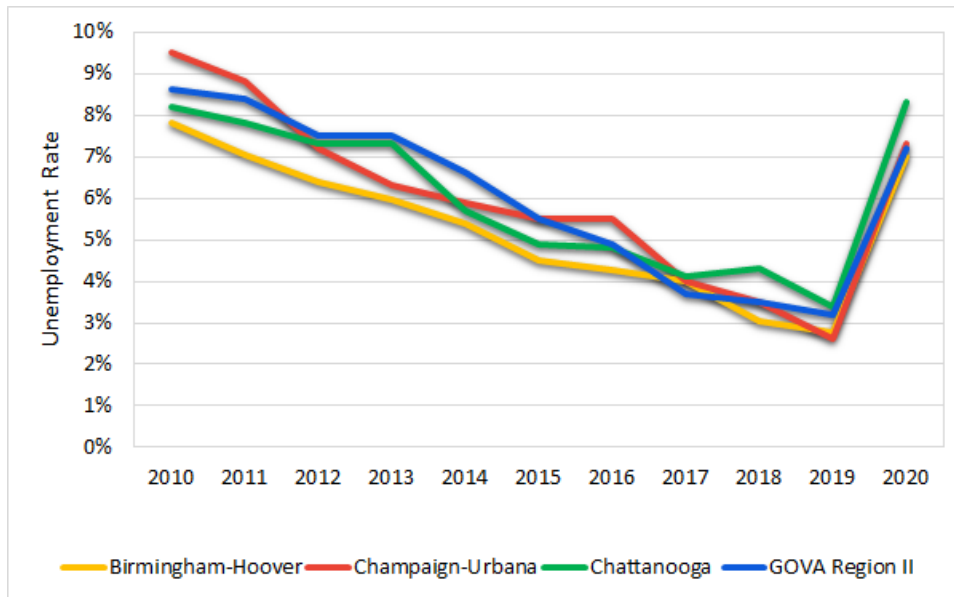


Figure 25: Unemployment Rate Changes within Peer Economies ⁹⁰

GOVA Region 2's unemployment rate tracks similarly with those of its peers, but has tended to remain lower than those of its peers in recent years. All economies have seen a recent rebound in unemployment rates that coincide with the onset of the COVID-19 pandemic. Ensuring continued recovery from the pandemic's economic shocks and preventing relapse are thus important focuses for the future.

Small Business and Entrepreneurship Support

The peer economies in question are similar to GOVA Region 2 in that they also provide small businesses and entrepreneurs with support. Various support organizations available to small businesses and entrepreneurs in each of the peer economies, though note that the list below represents a subset of all available resources within each of the peer economies. Regardless, economic development efforts in each of the economies appear to be acknowledging the need to support small business growth and development.

⁹⁰ Local Area Unemployment Statistics Smoothed Seasonally Adjusted Metropolitan Area Estimates. Last Modified 2 June 2021. U.S. Bureau of Labor Statistics.

The table below details select incubators and resources available to small businesses and entrepreneurs in each of the peer economies:

Table 30: Small Business/Entrepreneurship Support Resources

GOVA Region 2	Birmingham-Hoover	Champaign-Urbana	Chattanooga
Valley's Innovation Council ⁹¹	Innovation Depot ⁹²	EnterpriseWorks ⁹³	Launch ⁹⁴
The Mill (The Advancement Foundation) ⁹⁵	Birmingham Small Business Development Center ⁹⁶	Duality Incubator ⁹⁷	Greater Chattanooga Economic Partnership ⁹⁸
RAMP (Regional Accelerator and Mentorship Program) ⁹⁹	Velocity ¹⁰⁰	gener8or ¹⁰¹	Innovation District ¹⁰²

Expanding upon discussion of support organizations geared toward small and growing firms, peer economies are compared on the composition of their business communities by firm size. The comparison does not weight firms by size. All firms are accounted for equally in the two charts that follow.

The figures below detail the absolute and relative compositions of firms within each of the peer economies.

⁹¹ *Entrepreneurship*. Center for Economic and Community Engagement | Virginia Tech. (2021, April 8). Retrieved September 24, 2021, from HYPERLINK "<https://cece.vt.edu/GOVAR2/GOVirginiaEntrepreneurship.html>"<https://cece.vt.edu/GOVAR2/GOVirginiaEntrepreneurship.html>.

⁹² *Innovation Depot - Birmingham, AL*. Innovation Depot -. (2021, August 26). Retrieved September 24, 2021, from <https://innovationdepot.org/>.

⁹³ *Incubator*. Research Park. (2021, July 28). Retrieved September 24, 2021, from <https://researchpark.illinois.edu/locate-here/enterpriseworks-incubator/>.

⁹⁴ *Launch*. LAUNCH. (n.d.). Retrieved September 24, 2021, from <https://launchchattanooga.org/>.

⁹⁵ *Entrepreneurship*. Center for Economic and Community Engagement | Virginia Tech. (2021, April 8). Retrieved September 24, 2021, from <https://cece.vt.edu/GOVAR2/GOVirginiaEntrepreneurship.html>.

⁹⁶ *Greater Birmingham SBDC - Small Business Development Center*. Alabama Small Business Development Center Network | Alabama SBDC Network. (2019, May 17). Retrieved September 24, 2021, from <http://asbdc.org/greater-birmingham-small-business-development-center/>.

⁹⁷ Grainger Engineering Office of Marketing and Communications. (n.d.). *Nation's first quantum accelerator, duality, launches*. The Grainger College of Engineering | UIUC. Retrieved September 24, 2021, from <https://grainger.illinois.edu/news/stories/duality-launches>.

⁹⁸ Interactive, P. (n.d.). *Entrepreneurship*. Entrepreneurship | Greater Chattanooga Economic Partnership. Retrieved September 24, 2021, from <https://www.greaterchatt.com/locate-expand/entrepreneurship/>.

⁹⁹ *Entrepreneurship*. Center for Economic and Community Engagement | Virginia Tech. (2021, April 8). Retrieved September 24, 2021, from <https://cece.vt.edu/GOVAR2/GOVirginiaEntrepreneurship.html>.

¹⁰⁰ Walls, P. (2021, July 20). *8 best startup accelerators & incubators in Birmingham, AL [2021] - starter story*. Starter Story RSS. Retrieved September 24, 2021, from <https://www.starterstory.com/birmingham-accelerators-incubators>.

¹⁰¹ *Illinois Agtech Accelerator*. Research Park. (2021, April 26). Retrieved September 24, 2021, from https://researchpark.illinois.edu/tenant_directory/gener8tor/.

¹⁰² Interactive, P. (n.d.). *Entrepreneurship*. Entrepreneurship | Greater Chattanooga Economic Partnership. Retrieved September 24, 2021, from <https://www.greaterchatt.com/locate-expand/entrepreneurship/>.

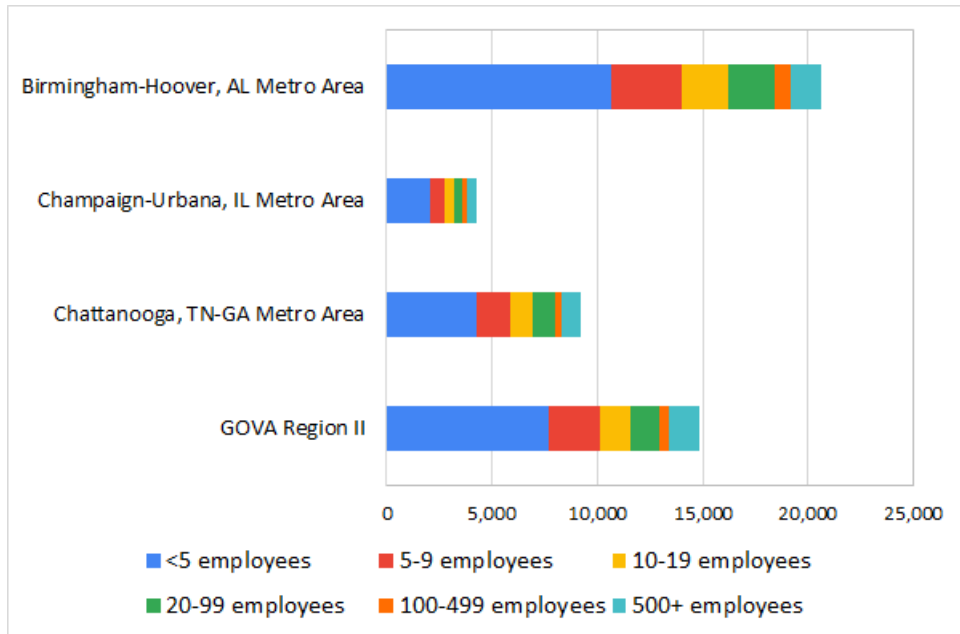


Figure 26: Absolute Distribution of Firms in Various Sizes Within Peer Economies¹⁰³

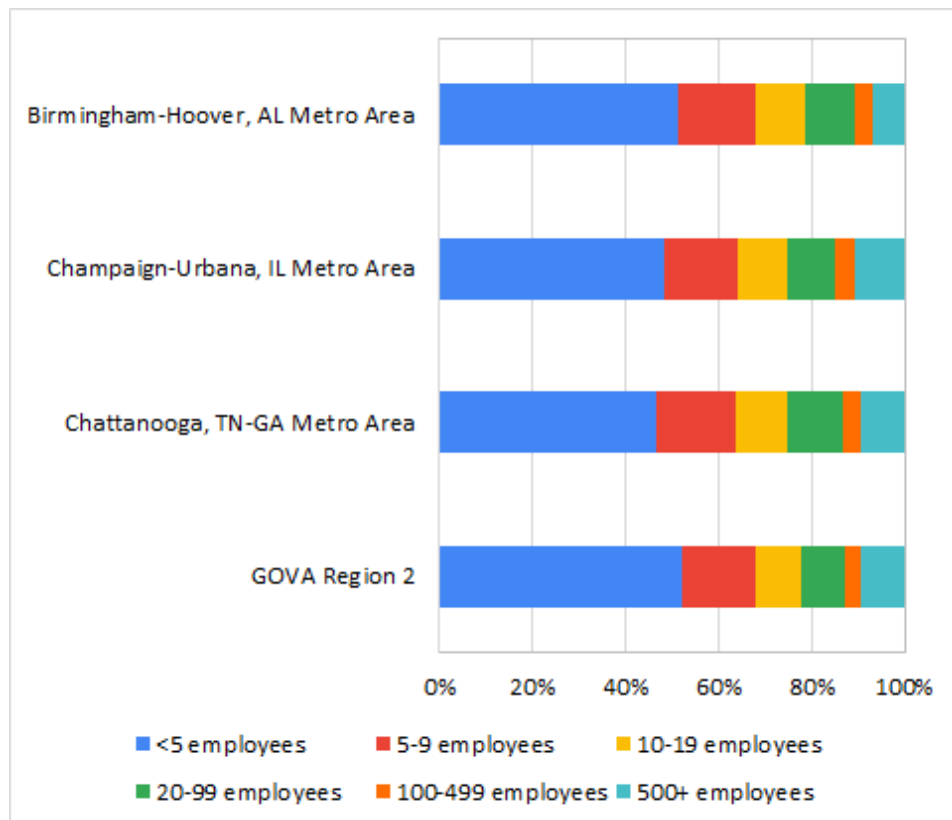


Figure 27: Relative Distribution of Firms in Various Sizes Within Peer Economies¹⁰⁴

¹⁰³ 2018 SUSB Annual Data Tables by Establishment Industry. May 2021, last revised 27 August 2021. U.S. Census Bureau.

¹⁰⁴ 2018 SUSB Annual Data Tables by Establishment Industry. May 2021, last revised 27 August 2021. U.S. Census Bureau.

Roughly half of all businesses in these economies have fewer than five employees and roughly three-quarters of businesses have fewer than 20 employees, which highlights the importance of the aforementioned small-business support.

One can see that GOVA Region II compares closely with Birmingham-Hoover (as is also the case in the subsequent chart), in terms of the number of firms of a given type. It falls between this MSA and Chattanooga, TN-GA. All three distributions are essentially the same, with minor discrepancies. Regardless, results must be interpreted with caution, given the lack of weighting by firm market capitalization, which may suggest different conclusions.

Industry

The tables in this section present the data underlying the figures detailing how employment in the various clusters has changed over time. Please note, we include percent changes, as well as information regarding job change in the larger state of Virginia and the United States, as a whole.

Table 31: Job Change in Transportation and Autonomy Cluster¹⁰⁵

	Birmingham-Hoover, AL	Champaign-Urbana, IL	Chattanooga, TN-GA	GOVA Region 2	Virginia	United States
Percent Change	(16%)	17%	49%	1%	7%	(1%)
Jobs (2015)	2,028	604	801	5,251	12,298	1,029,317
Jobs (2021)	1,707	708	1,196	5,302	13,203	1,016,510

GOVA Region 2’s employment is not projected to grow to the same relative extent of its peer economies. However, the region’s absolute starting size is larger than its peers, which may be influencing the slower growth, over time. Regardless, we see highly variable growth throughout the various peer economies, though note that GOVA Region 2’s established industry will remain competitive, even as smaller peers see dramatic growth. It is worth noting that Virginia’s employment growth is fairly strong, so care should be taken to ensure GOVA Region 2 does not rely on such rising trends to insulate itself from threats in the future.

Table 32: Job Change in Materials and Machinery Cluster¹⁰⁶

	Birmingham-Hoover, AL	Champaign-Urbana, IL	Chattanooga, TN-GA	GOVA Region2	Virginia	United States
--	-----------------------	----------------------	--------------------	--------------	----------	---------------

¹⁰⁵ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA. 2017-2021. GOVA2_FOODBEV Clusters.

¹⁰⁶ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA. 2017-2021. GOVA2_IT Clusters.

Percent Change	(23%)	(72%)	49%	9%	(16%)	(4%)
Jobs (2015)	4,451	629	1,949	3,673	11,169	655,269
Jobs (2021)	3,441	173	2,898	4,020	9,419	630,597

GOVA Region 2 is projected to see 9% growth in this cluster. While not the largest relative growth, it compares favorably with its peers, 2 of which are projected to see declines in employment. Regardless, GOVA Region 2 remains highly competitive, relative to the state of Virginia and to the rest of the United States, both of which are projected to see declines in this cluster over the same horizon. This projects optimism, though focus should be dedicated to ensure sinking statewide and national employment trends do not hamper GOVA Region 2’s outlook in the future.

Table 33: Job Change in IT and Emerging Tech Cluster¹⁰⁷

	Birmingham-Hoover, AL	Champaign-Urbana, IL	Chattanooga, TN-GA	GOVA Region2	Virginia	United States
Percent Change	18%	(27%)	37%	1%	13%	19%
Jobs (2015)	11,039	3,031	3,567	11,173	247,367	4,617,932
Jobs (2021)	12,971	2,203	4,887	11,246	278,620	5,493,456

GOVA Region 2’s employment is, again, expected to hold fairly steady. Its peer groups are expected to see more dramatic change in either direction; Birmingham-Hoover, the closest peer economy in size, is expected to see 18% growth. This suggests that, even though GOVA Region 2 is well developed, its stability may not necessarily be attributed solely to its size, as other economies, such as Birmingham-Hoover, Virginia, and the United States, are projected to see marked growth. Emphasis should be placed on ensuring the stability of employment in this cluster does not morph into a competitive disadvantage in time. Employment in this peer group appears to be relatively variable, and future attention should focus on ensuring GOVA Region 2 remains competitive, in time.

Table 34: Job Change in Life Science and Healthcare Cluster¹⁰⁸

¹⁰⁷ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA. 2017-2021. GOVA2_Manufacturing Clusters.

¹⁰⁸ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA. 2017-2021. GOVA2_LifeSci Clusters.

	Birmingham-Hoover, AL	Champaign-Urbana, IL	Chattanooga, TN-GA	GOVA Region 2	Virginia	United States
Percent Change	3%	31%	1%	19%	7%	7%
Jobs (2015)	22,391	4,180	8,110	16,553	143,736	6,864,856
Jobs (2021)	23,068	5,481	8,208	19,716	154,050	7,354,798

Job growth is expected to be strong in this cluster. Though not the largest, by a relative metric (overshadowed by Champaign-Urbana), GOVA Region 2’s 19% growth remains impressive, given its well-developed size. Life Sciences and Healthcare cluster employment has a very optimistic outlook, as Region 2 compares favorably to its peers on relative growth, absolute growth, or both, as well as to both Virginia and the United States, in terms of relative growth.

Economy

The figure below details how real GDP has changed over time in the various peer economies:

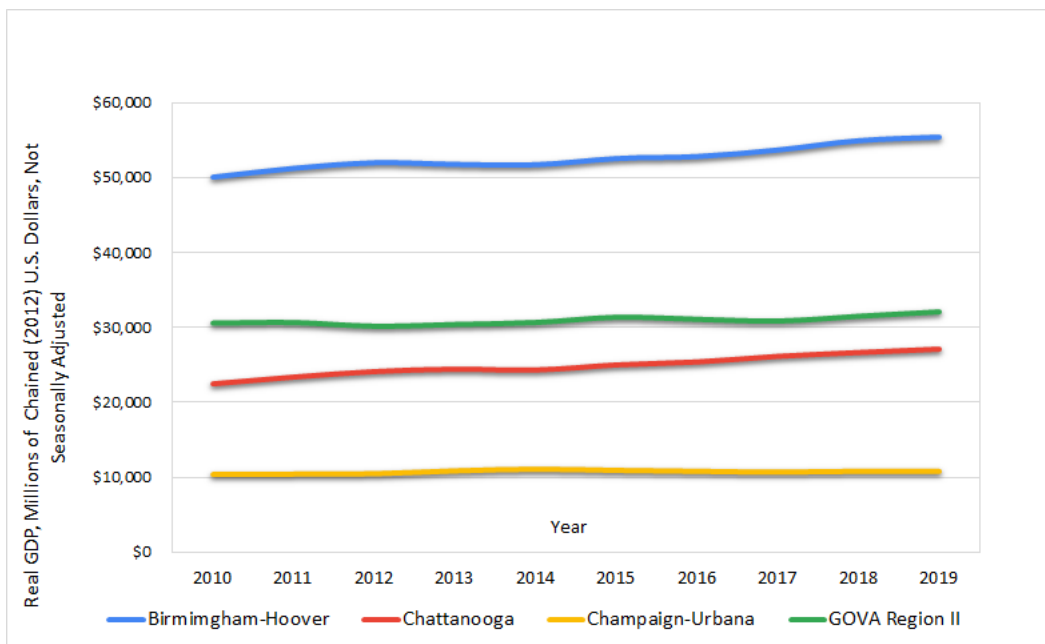


Figure 28: Real GDP by MSA^{109 110 111 112 113 114}

¹⁰⁹ Total Real Gross Domestic Product for Chattanooga, TN-GA (MSA). RGMP16860. FRED.

¹¹⁰ Total Real Gross Domestic Product for Birmingham-Hoover, AL (MSA). RGMP13820. FRED.

¹¹¹ Total Real Gross Domestic Product for Champaign-Urbana, IL (MSA). RGMP16580. FRED.

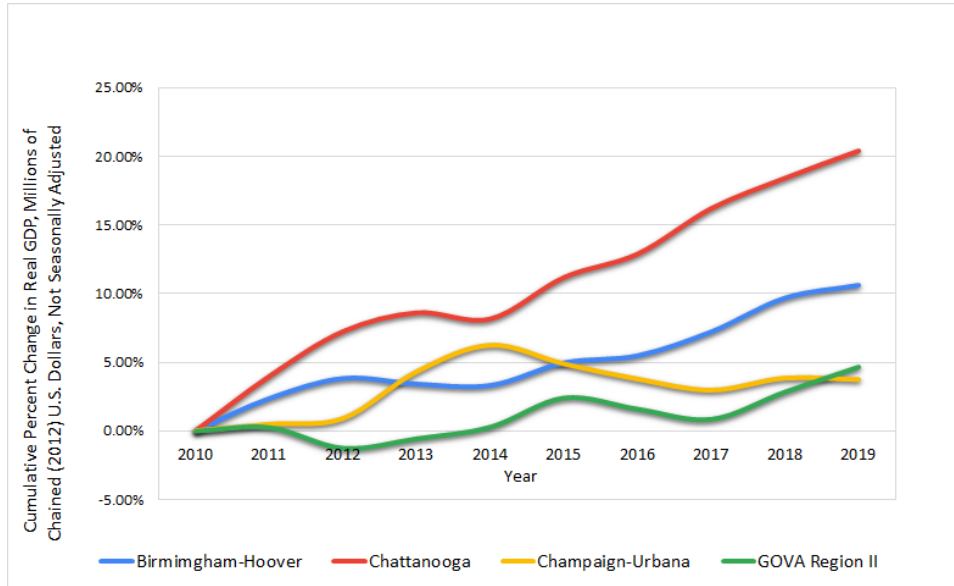
¹¹² Total Real Gross Domestic Product for Blacksburg-Christiansburg-Radford, VA (MSA). RGMP13980. FRED.

¹¹³ Total Real Gross Domestic Product for Roanoke, VA (MSA). RGMP40220. FRED.

¹¹⁴ Total Real Gross Domestic Product for Lynchburg, VA (MSA). RGMP31340. FRED.

GOVA Region 2's overall productivity is in the middle of its peer group, though analysis must consider that GOVA Region 2 is comprised of 3 MSAs, relative to the others'. Viewing any singular MSA from the region, relative to a peer group MSA, may lead to different conclusions. Regardless, GOVA Region 2's productivity falls in the middle of its peers and tracks similarly to its peers over time. The change in Real GDP is fairly small, but positive over time in the peer economies and GOVA Region II, though Birmingham-Hoover and Chattanooga MSAs may outpace Region 2 in the long run, if the exhibited trends continue.

The figure below details how Real GDP has changed on a percent-basis.



Note: Base Year = 2010

Figure 29: Percent Change in Real GDP by MSA^{115 116 117 118 119 120}

Cumulatively, Chattanooga's sustained higher growth leads to a markedly higher outcome after 10 years. GOVA Region II does have fairly consistent positive growth, with two notable dips, but its growth is not as strong as that of other peer economies.

A per-capita comparison may be more appropriate, given the different population sizes of the MSAs and particularly to address the fact that GOVA Region II is comprised of three MSAs, not one.

The figure below details per-capita productivity over time in the various peer economies.

¹¹⁵ Total Real Gross Domestic Product for Chattanooga, TN-GA (MSA). RGMP16860. FRED.

¹¹⁶ Total Real Gross Domestic Product for Birmingham-Hoover, AL (MSA). RGMP13820. FRED.

¹¹⁷ Total Real Gross Domestic Product for Champaign-Urbana, IL (MSA). RGMP16580. FRED.

¹¹⁸ Total Real Gross Domestic Product for Blacksburg-Christiansburg-Radford, VA (MSA). RGMP13980. FRED.

¹¹⁹ Total Real Gross Domestic Product for Roanoke, VA (MSA). RGMP40220. FRED.

¹²⁰ Total Real Gross Domestic Product for Lynchburg, VA (MSA). RGMP31340. FRED.

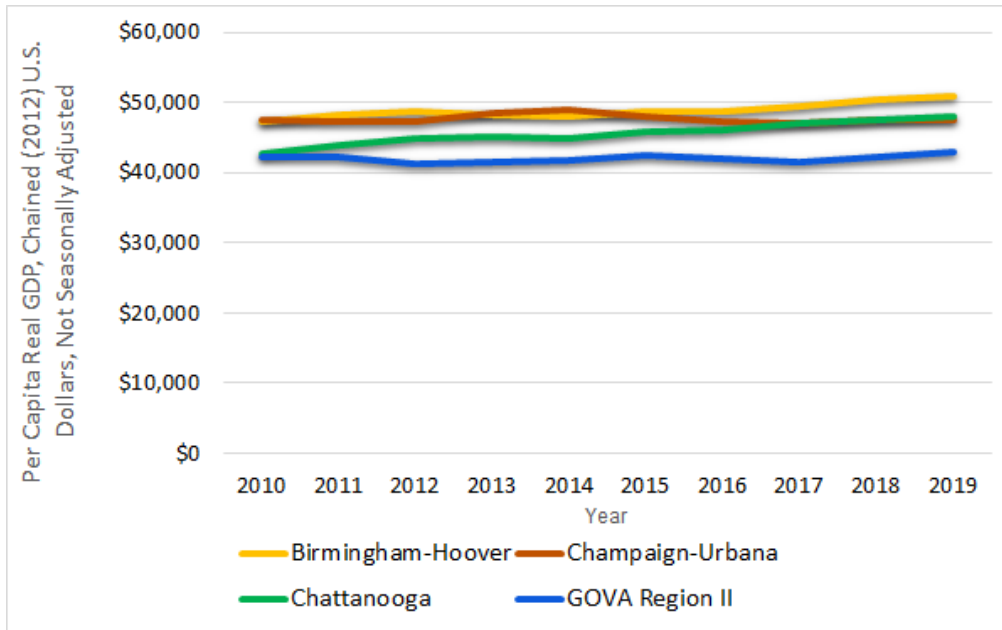


Figure 30: Real GDP Per Capita within Peer Economies^{121 122 123 124 125 126 127}

Real GDP per capita has held fairly steady in the peer economies, though GOVA Region II does, in fact, lag behind its peers, by roughly 10% in many instances. Other economies have demonstrated growth, in time, so it will be important to ensure GOVA Region II’s stability does not manifest as a productivity lag in the future. In other words, the ‘holding pattern’ may cause the Region to be left behind by MSAs like Chattanooga and Birmingham-Hoover, if not remedied.

The figure below details relative change in the per-capita productivity over time.

¹²¹ Total Real Gross Domestic Product for Chattanooga, TN-GA (MSA). RGMP16860. FRED.

¹²² Total Real Gross Domestic Product for Birmingham-Hoover, AL (MSA). RGMP13820. FRED.

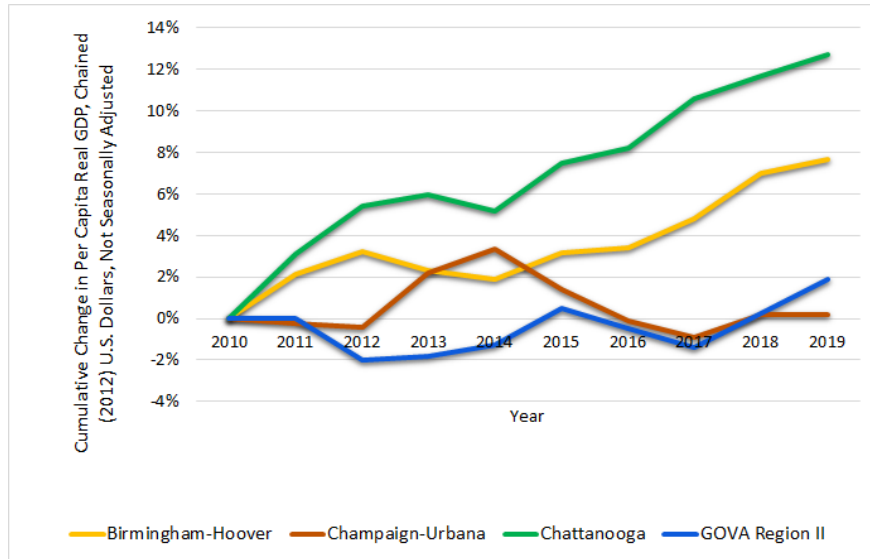
¹²³ Total Real Gross Domestic Product for Champaign-Urbana, IL (MSA). RGMP16580. FRED.

¹²⁴ Total Real Gross Domestic Product for Blacksburg-Christiansburg-Radford, VA (MSA). RGMP13980. FRED.

¹²⁵ Total Real Gross Domestic Product for Roanoke, VA (MSA). RGMP40220. FRED.

¹²⁶ Total Real Gross Domestic Product for Lynchburg, VA (MSA). RGMP31340. FRED.

¹²⁷ Metropolitan and Micropolitan Statistical Areas Population Totals and Components of Change: 2010-2019. Annual Estimates of the Resident Population: April 1, 2020 to July 1, 2019. U.S. Census Bureau.



Note: Base Year = 2010

Figure 31: Cumulative Percent Change in Real GDP Per Capita within Peer Economies^{128 129 130 131 132}

GOVA region II’s real GDP per capita has grown, over time. The lower relative overall changes in Real GDP per Capita, compared to those of the relative overall changes in real GDP, imply that the full scale of economic growth may support, or be due to, larger populations and that, accordingly, standards of living (to the extent that real GDP per capita may serve as a proxy for standards of living) may not be growing to the same degree of the overall economy.

The peer group analysis concludes with a table of select characteristics of the peer economies in question, though readers are invited to refer to more in-depth discussion in preceding sections.

¹²⁸ Total Real Gross Domestic Product for Birmingham-Hoover, AL (MSA). RGMP13820. FRED.

¹²⁹ Total Real Gross Domestic Product for Champaign-Urbana, IL (MSA). RGMP16580. FRED.

¹³⁰ Total Real Gross Domestic Product for Blacksburg-Christiansburg-Radford, VA (MSA). RGMP13980. FRED.

¹³¹ Total Real Gross Domestic Product for Roanoke, VA (MSA). RGMP40220. FRED.

¹³² Total Real Gross Domestic Product for Lynchburg, VA (MSA). RGMP31340. FRED.

Table 35: Assorted Characteristics of Peer Groups

Metropolitan Area	Population (2021)	Pop Growth (2015-2021)	Population Per Square Mile (2019)	Per Capita Income (2019)	Median Household income (2019)	GDP Per Capita (2019; 2012 dollars)	City-Rural Ratio
GOVA Region 2	785,790	1.33%	149.64	\$30,583	\$55,065 - \$60,471	\$43,009	0.42
Birmingham-Hoover, AL	1,095,527	1.43%	242.9	\$33,131	\$57,447	\$50,831	0.35
Chattanooga, TN-GA	574,489	4.90%	271	\$30,615	\$53,126	\$48,036	0.47
Champaign-Urbana, IL	226,373	0.21%	157.75	\$30,181	\$53,641	\$47,485	0.55

Sources: 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154

From the table, one can see that GOVA Region 2’s population is on the larger end of the scale, but it must be noted again that Region 2 is comprised of three MSAs, not one. Its population density is the lowest, even though its City-Rural ratio is not, implying potentially a more gradual population distribution than other economies.

GOVA Region 2’s City-Rural ratio is fairly comparable to its peers, though it does fall on the more rural end of the distribution. Such considerations may be responsible for the region’s lower IT sector growth. The Region’s rural economic activity is important and it is crucial to ensure more classically-urban sectors remain strong for overall regional prosperity. Regardless, final remarks detail once again that GOVA Region 2 is not an outlier within its peer group.

¹³³ Go Virginia Region 2 Growth and Diversification Plan. August 2017. GO Virginia: Virginia Initiative for Growth & Opportunity in Each Region. Retrieved from https://cece.vt.edu/content/dam/cece_vt_edu/govirginia_documentation/GOVA_region2_gandd.pdf

¹³⁴ Champaign-Urbana, IL Metro Area. Census Reporter. Retrieved from [Champaign-Urbana, IL Metro Area - Profile data - Census Reporter](#)

¹³⁵ Chattanooga, TN Metro Area. Census Reporter. Retrieved from [Chattanooga, TN-GA Metro Area - Profile data - Census Reporter](#)

¹³⁶ Birmingham-Hoover, AL Metro Area. Census Reporter. Retrieved from [Birmingham-Hoover, AL Metro Area - Profile data - Census Reporter](#)

¹³⁷ Blacksburg-Christiansburg, VA Metro Area. Census Reporter. Retrieved from [Blacksburg-Christiansburg, VA Metro Area - Profile data - Census Reporter](#)

¹³⁸ Lynchburg, VA Metro Area. Census Reporter. Retrieved from [Lynchburg, VA Metro Area - Profile data - Census Reporter](#)

¹³⁹ Roanoke, VA Metro Area. Census Reporter. Retrieved from [Roanoke, VA Metro Area - Profile data - Census Reporter](#)

¹⁴⁰ Metropolitan and Micropolitan Statistical Areas Population Totals and Components of Change: 2010-2019. Annual Estimates of the Resident Population: April 1, 2020 to July 1, 2019. U.S. Census Bureau.

¹⁴¹ Total Real Gross Domestic Product for Chattanooga, TN-GA (MSA). RGMP16860. FRED.

¹⁴² Total Real Gross Domestic Product for Birmingham-Hoover, AL (MSA). RGMP13820. FRED.

¹⁴³ Total Real Gross Domestic Product for Champaign-Urbana, IL (MSA). RGMP16580. FRED.

¹⁴⁴ Total Real Gross Domestic Product for Blacksburg-Christiansburg-Radford, VA (MSA). RGMP13980. FRED.

¹⁴⁵ Total Real Gross Domestic Product for Roanoke, VA (MSA). RGMP40220. FRED.

¹⁴⁶ Total Real Gross Domestic Product for Lynchburg, VA (MSA). RGMP31340. FRED.

¹⁴⁷ EMSI Regional Comparison Report. Virginia, Champaign-Urbana, IL, United States, GOVA_Region2, Birmingham-Hoover, AL, Chattanooga, TN-GA.

¹⁴⁸ Roanoke, VA Metropolitan Statistical Area (MSA). Data USA. Retrieved from [Roanoke, VA | Data USA](#)

¹⁴⁹ Blacksburg-Christiansburg-Radford Metropolitan Statistical Area (MSA). Data USA.

¹⁵⁰ Lynchburg, VA Metropolitan Statistical Area (MSA). Data USA.

¹⁵¹ GOVA Region 2 Population Demographics Table, 2015-2021. EMSI.

¹⁵² Birmingham-Hoover, AL MSA Population Demographics Table, 2015-2021. EMSI.

¹⁵³ Chattanooga, TN-GA MSA Population Demographics Table, 2015-2021. EMSI.

¹⁵⁴ Champaign-Urbana, IL MSA Population Demographics Table, 2015-2021. EMSI.