



GO VIRGINIA REGION 5 GROWTH AND DIVERSIFICATION PLAN BIENNIAL UPDATE 2019

August 1, 2019

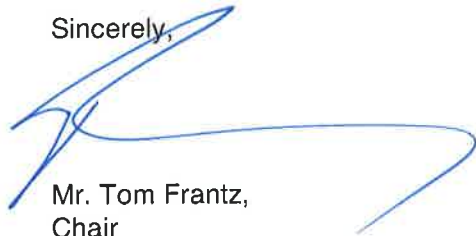
**Prepared for the Region 5 Council by
The Dragas Center for Economic Analysis and Policy at
Old Dominion University**

Acknowledgements

This report represents the biennial update of the Region 5 Growth and Diversification Plan. The report was prepared for the Region 5 Council by the Dragas Center for Economic Analysis and Policy at Old Dominion University. The material in the report was reviewed and edited by members of the Region 5 Council. In addition, the proposed future projects in the report were taken from a brainstorming session held with Council members and members of the RVA-Hampton Roads Megaregion Collaborative.

We would like to thank Jim Spore, Donna Morris and the entire staff of ReInvent Hampton Roads for coordinating meetings between the authors and the Council during the production of this report. We would also like to acknowledge Shawn Avery and the Hampton Roads Workforce Council for making the results of their recent talent alignment report available for use in this report. Finally, we thank the members of the Region 5 Council for their constant work to elevate the economic condition of Hampton Roads and the Eastern Shore.

Sincerely,



Mr. Tom Frantz,
Chair



Ms. Anne Conner
Vice-Chair

Table of Contents

EXECUTIVE SUMMARY	5
SECTION 1: INTRODUCTION.....	7
SECTION 2: DATA UPDATE FOR REGION 5.....	9
SECTION 3: RECENT NON-GO VIRGINIA INITIATIVES IN REGION 5	53
SECTION 4: A REVIEW OF THE REGION’S 6 PRIORITY CLUSTERS	58
SECTION 5: EXAMINING WORKFORCE GAPS IN THE PRIORITY CLUSTERS	60
SECTION 6: POSSIBLE STRATEGIES TO ADDRESS REGION 5’S ECONOMIC CHALLENGES	64
SECTION 7: CONCLUDING REMARKS.....	66

List of Figures

FIGURE 1 - INDEX OF POPULATION GROWTH FOR THE U.S., VIRGINIA, AND REGION 5	10
FIGURE 2 - COMPONENTS OF POPULATION CHANGE FOR REGION 5.....	15
FIGURE 3 - YEAR OVER YEAR CHANGE IN POPULATION AGE 20 – 34, VIRGINIA AND REGION 5.....	17
FIGURE 4 - NOMINAL AND REAL GROSS DOMESTIC PRODUCT FOR HAMPTON ROADS	20
FIGURE 5 - GROWTH IN REAL GROSS DOMESTIC PRODUCT FOR HAMPTON ROADS	21
FIGURE 6 - INDEX OF REAL GDP FOR THE U.S., VIRGINIA, AND HAMPTON ROADS	22
FIGURE 7 - ESTIMATED DIRECT DEPARTMENT OF DEFENSE SPENDING IN HAMPTON ROADS	25
FIGURE 8 - MILITARY AND FEDERAL CIVILIAN EMPLOYMENT IN REGION 5	26
FIGURE 9 - MILITARY AND FEDERAL CIVILIAN COMPENSATION IN REGION 5	27
FIGURE 10 - FEDERAL SPENDING ON CONTRACTS IN REGION 5	28
FIGURE 11 - NOMINAL PER CAPITA INCOME, U.S., VIRGINIA, AND GO VIRGINIA REGIONS	32
FIGURE 12 - LOCATION QUOTIENTS AND ANNUAL AVERAGE EMPLOYMENT GROWTH	35
FIGURE 13 - AVERAGE ANNUAL WAGE PER WORKER AND TOTAL EMPLOYMENT IN REGION 5	38
FIGURE 14 - NUMBER OF ESTABLISHMENTS IN REGION 5.....	39
FIGURE 15 - PERCENT OF JOBS CREATED BY SMALL FIRMS, U.S. VIRGINIA, AND REGION 5	42
FIGURE 16 - NET JOB CREATION BY YOUNG FIRMS FOR REGION 5, PITTSBURGH, AND SILICON VALLEY ...	43
FIGURE 17 - EDUCATIONAL ATTAINMENT OF POPULATION AGED 25 PLUS	44
FIGURE 18 - DEGREES AWARDED IN COMPUTER AND MATHEMATICAL OCCUPATIONS	47
FIGURE 19 - ENGINEERING AND ENGINEERING TECHNOLOGIES AND ENGINEERING-RELATED FIELDS	48
FIGURE 20 - FEDERAL RESEARCH AND DEVELOPMENT EXPENDITURES AS PERCENTAGE OF GDP	49
FIGURE 21 - REAL FEDERAL DEFENSE AND NONDEFENSE R&R EXPENDITURES.....	50
FIGURE 22 - PATENT TECHNOLOGY DIFFUSION INDEX BY SELECTED METROPOLITAN AREA	51
FIGURE 23 - UNIVERSITY-BASED KNOWLEDGE SPILLOVERS INDEX BY SELECTED METROPOLITAN AREA...	52

List of Tables

TABLE 1 - POPULATION AND ANNUAL POPULATION GROWTH FOR THE U.S., VIRGINIA, AND REGION 5	13
TABLE 2 - POPULATION AND ANNUAL POPULATION GROWTH FOR REGION 5 AND REGION 5 LOCALITIES ...	14
TABLE 3 - COMPONENTS OF POPULATION CHANGE, VIRGINIA AND GO VIRGINIA REGIONS	16
TABLE 4 - CHANGE IN POPULATION AGE 20 – 34, VIRGINIA AND GO VIRGINIA REGIONS	18
TABLE 5 - REAL GROSS DOMESTIC PRODUCT, VIRGINIA AND GO VIRGINIA REGIONS	23
TABLE 6 - REAL GROSS DOMESTIC PRODUCT BY REGION 5 LOCALITY	24
TABLE 7 - EMPLOYMENT GROWTH, U.S., VIRGINIA, AND GO VIRGINIA REGIONS	29
TABLE 8 - EMPLOYMENT GROWTH, U.S., VIRGINIA, AND REGION 5 LOCALITIES	30
TABLE 9 - PER CAPITA INCOME AND GROWTH IN REAL PER CAPITA INCOME	31
TABLE 10 - PER CAPITA INCOME IN REGION 5 LOCALITIES	33
TABLE 11 - LOCATION QUOTIENTS FOR CLUSTER EMPLOYMENT AND ESTABLISHMENTS FOR REGION 5	36
TABLE 12 - ANNUAL AVERAGE ESTABLISHMENT GROWTH, U.S., VIRGINIA, AND GO VIRGINIA REGIONS ...	40
TABLE 13 - ANNUAL AVERAGE ESTABLISHMENT GROWTH, U.S., VIRGINIA, AND REGION 5 LOCALITIES	41
TABLE 14 - EDUCATIONAL ATTAINMENT OF POPULATION AGED 25 PLUS	45
TABLE 15 - CRITICAL OCCUPATION GAPS BY CLUSTER	62

Executive Summary

The purpose of this document is to update and amend (where necessary) the original plan developed in 2017. As required by the Virginia Growth and Opportunity Act, each regional council shall review and amend their Economic Growth and Diversification Plan not less than biennially. The production of this update and addendum provided a valuable opportunity for Region 5 to review the relevant economic fundamentals in the region, reaffirm the priority clusters in the region and reexamine the original list of economic challenges that could be addressed through future Go Virginia funding. This summary provides a brief overview of the report's findings:

1. Economic conditions in Region 5 have been steadily improving over the last two years following a painfully long recovery from the 2009-2010 contraction. Growth in regional real gross domestic product (GDP), growth in per-capita income and growth in employment have all improved and stabilized in the last two years after a dismal period of growth from 2010-2015. Regional real GDP grew at 1% in 2017, is estimated to have grown 2.2% in 2018 and forecasted to grow by 2.4% in 2019. Some of the economic improvement is, no doubt, a function of increases in federal spending, but the data clearly suggest the Region 5 economy has stabilized following a turbulent decade.
2. Section 3 lists a number of non-Go Virginia initiatives that will add meaningful analysis, infrastructure and research capability to Region 5. We call special attention to:
 - The Jefferson Lab Electron Ion Collider bid,
 - The Maritime Industrial Base Ecosystem initiative, which was recently awarded \$1.3 million from the Office of Economic Adjustment, and,
 - The Regional Site Inventory and Certification Project.
3. The update reaffirms the priority clusters that were proposed in the original plan.
 - Port Operations, Logistics and Warehousing
 - Advanced Manufacturing
 - Cybersecurity, Data Analytics and Mod-Sim
 - Shipbuilding and Ship Repair
 - Water Technologies
 - Unmanned Systems and Aerospace

Region 5's strengths remain in industries related to the water - port, shipping, logistics, shipbuilding and ship repair. The region is also seeing meaningful growth in three technology-oriented industries – cyber security, unmanned systems and aerospace. Recent Go Virginia and non-Go Virginia initiatives are contributing to growth in these areas. Several of those initiatives are outlined in the report.

4. The report highlights workforce and talent development as a continuing area of concern for Region 5. Creating, attracting and retaining a workforce that can support growth of the priority clusters remains an issue. In particular, the report highlights a critical shortage of engineering and engineering technology workers in the region. These workers are crucial to the manufacturing firms that populate the region's clusters. Moreover, the shortages in these particular occupations are not just at the bachelor's level and above. There are critical shortages of technically skilled workers at all levels of education including those occupations requiring levels of education below post-secondary as well. These shortages threaten the short-run growth potential in the clusters.
5. The region has been very active in the Go Virginia process. To date, the region has received 6 per-capita grants and all are performing at or above expectations. There is an increasing amount of interest by Region 4 and Region 5 to find projects of mutual benefit. These discussions are occurring inside the RVA-Hampton Roads Megaregion Collaborative.

The dominant theme of Region 5's biennial update is one of cautious optimism. Economic conditions are improving, and recent initiatives point to even better economic conditions on the horizon. The region is still dependent on federal spending, but federal contracting is part of what the region does well. Rather than discuss diversification, the report suggests that agility should become a goal for the region. Agility could come from new companies that are completely untethered from the ebbs and flows of government spending (firm diversification), or agility could come from existing government contracting companies finding commercial uses for their products and services (dual-use). Finding projects that support either firm diversification or dual use will be a high priority for Region 5.

Section 1: Introduction

In August of 2017, Go Virginia Region 5 submitted its initial Growth and Diversification Plan. The purpose of that plan was to provide empirically-driven recommendations to grow and diversify the economy in Region 5. That report was accepted by both the Region 5 Council and the Go Virginia Board. For the last two years, that document has served as the guiding document for the region. In the spirit of the language from the Go Virginia board, the Growth and Diversification plan serves to “...*identify economic opportunities, needs, and challenges, establish priorities among those opportunities, and outline needed enhancements where GO Virginia grant funds can (a) support collaborative programs between at least two or more localities and (b) that will lead to the creation of more higher paying jobs.*”

The 2017 plan established three main economic goals for Region 5:

- 1. Create a coordinated region capacity for innovation in the region’s key cluster areas.**
- 2. Increase the pace of Small Medium sized Enterprises (SME) job creation through both expansion of existing firms and, in particular, the attraction of out-of-region firms in key cluster areas.**
- 3. Close all skills, credentialing and degree gaps in the regional clusters’ workforce by 2022 through both in-region production and talent importation.**

In addition, the plan recommended that the region should focus its efforts in 6 priority clusters:

- 1. Port Operations, Logistics and Warehousing**
- 2. Advanced Manufacturing**
- 3. Cyber Security, Data Analytics and Mod-Sim**
- 4. Shipbuilding and Ship Repair**
- 5. Water Technologies**
- 6. Unmanned Systems and Aerospace**

The purpose of this document is to update and amend (where necessary) the original plan developed in 2017. As required by the Virginia Growth and Opportunity Act, each regional council shall review and amend their Economic Growth and Diversification Plan not less than biennially. The production of this update and addendum provided a valuable opportunity for Region 5 to review the relevant economic fundamentals in the region, reaffirm the priority clusters in the region and reexamine the original list of economic challenges that could be addressed through future Go Virginia funding.

Creating regional economic agility is the prevailing theme in this update. Recent increases in federal spending to the region have renewed the concerns of over-dependence on the military and, perhaps, strengthened calls for diversification. However, the region excels in government contracting and there seems to be obvious opportunities within priority clusters to grow both government and commercial market shares. During the production of this update, members of the Region 5 council expressed the need to embrace our standing with the federal government but create an economic environment that would be *agile* enough to withstand potential contractions of government spending. Agility could come from new companies that are completely untethered from the ebbs and flows of government spending (firm diversification), or agility could come from existing government contracting companies finding commercial uses for their products and services (dual-use). Finding projects that support either firm diversification or dual use will be a high priority for Region 5.

The remainder of the document is organized as follows:

- Section 2 provides an update (where possible) of the original plan's baseline metrics used to motivate the five economic challenges facing Region 5.
- Section 3 identifies some of the recent non-GO Virginia funded initiatives that are helping to diversify the economy and grow high-paying jobs.
- Section 4 discusses the six original priority clusters and their continued appropriateness for the region.
- Section 5 examines the magnitude of existing workforce gaps in the priority clusters.
- Section 6 proposes a set of economic challenges that may be addressed through future Go Virginia funding.
- Section 7 provides some concluding remarks.

Section 2: Data Update for Region 5

One of the primary goals of this report is to provide an update of the baseline metrics that were reported in the original plan in 2017. With only two additional years of data available at best, it is unlikely that the region has seen dramatic improvement in the conditions we reported in 2017. However, it is a worthwhile exercise to reexamine the economic conditions in Region 5 both for possible improvement and for continued applicability.

The original 2017 plan contained five economic challenges facing Region 5 as well as a number of baseline metrics presented to empirically defend the choice of those five challenges. As a reminder, the challenges were:

1. **Region 5's economic growth is not keeping pace with the United States or Virginia.**
2. **Region 5 is overly reliant on a small set of large firms in its key cluster areas.**
3. **Region 5 is creating small and medium sized enterprises (SMEs) at a pace far below its peer metro areas.**
4. **Region 5 is not creating a workforce for the next-generation knowledge-based economy at a quick enough pace.**
5. **Region 5 lacks a deliberate and comprehensive innovation strategy.**

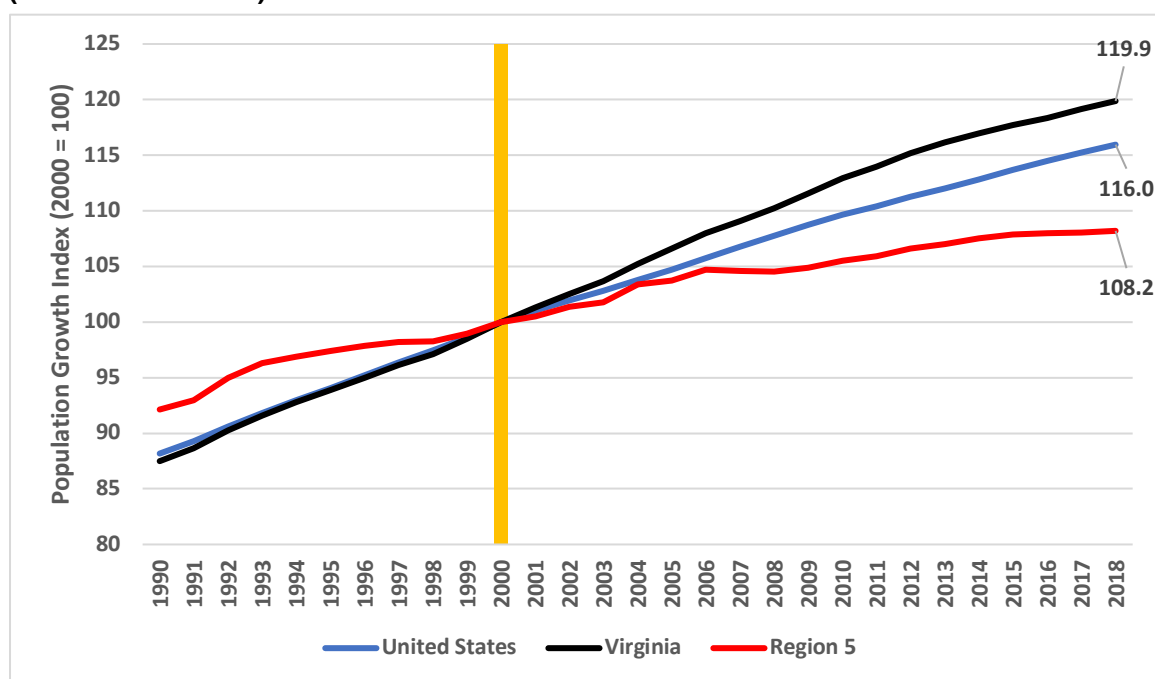
This section of the report will present updates to the economic measures used to motivate these challenges. To preview, Region 5 has marginally improved over the last two years in nearly every measure. This is good news indeed. However, federal spending levels have also dramatically improved during the last two years. At the moment we are left wondering if the improving economy in Region 5 a function of an improvement in the underlying structure of the region or is just the product of a favorable federal spending cycle.

Challenge 1: Region 5's Economic Growth is Not Keeping Pace with the United States or Virginia.

Region 5 represents Virginia's second largest economic region, but an examination of its broad growth trends show a region still encountering significant headwinds. Whether it is the size of the region's population, economic output, or workforce, the region is not keeping pace with national or statewide trends. Many of these trends are related, interconnected and have only marginally improved since the original report was submitted in 2017.

With an estimated population of 1.8 million, approximately 1 in 5 Virginians resided in Region 5 in 2018. Region 5's share of Virginia's population, however, has declined over the last two decades, falling from about 24.1 percent in 1990 to 22.9 percent in 2000 to 20.8 percent in 2018. Net domestic migration, that is, individuals leaving Region 5 for other regions within Virginia and other states, and individuals coming from other regions or other states has been negative, only partly offset by international migration. Relatively poor economic performance and job growth has led to slower rates of population growth and relatively poor levels of human capital, and establishment creation. Figure 1 illustrates how Region 5's population growth has lagged behind that of the state and nation this century, in part due to its relatively stagnant economic fortunes. Region 5's total population grew by 8.2 percent this century, compared to 16 percent for the U.S. and 19.9 percent for the Commonwealth.

Figure 1 - Index of Population Growth for the U.S., Virginia, and Region 5 (Base Year = 2000)



Source: U.S. Census Bureau, 1990 Components of Population Change, 2000 Intercensal Estimates, 2018 Population Estimates and Dragas Center for Economic Analysis and Policy. Estimates, where possible, are for July 1st for comparison purposes. Resident population of the United States.

Table 1 shows that Virginia's population growth outpaced that of the nation from 1990 to 2009 and has equaled that of the U.S. this decade. While population growth has slowed each decade for the nation, state, and region, Region 5's population growth since 2000 has consistently remained below that of the state and nation. Region 5 is failing to keep pace. The average annual growth of Region 5's total population was 0.3 percent from 2010 to 2018. This tied Region 5 for 6th out of the 9 regions in terms of population growth from 2010 to 2018, the lowest among the Go Virginia regions that exhibited positive population growth. Anemic population

growth presents a significant challenge to a region that desires to spur economic growth through innovation and private sector job creation. Without enough in-migration, there may not be enough individuals to fill available jobs, stifling the potential for growth. It remains to be seen whether the recent return to economic growth will result in a higher population growth rate over time.

Taking a longer view, Region 5's population growth has been slower than that of Virginia since 1990. While the total population in Region 5 has grown, a smaller percentage of Virginia's population resides in Region 5. Prior to 1960, the U.S. Census estimated that the geographic population center of Virginia was west of Richmond. In 1970, the geographic population center began a dramatic shift to the northeast.¹ By 2040, the geographic population center will be near Fredericksburg. By 2040, the Weldon Cooper Center estimates that one-half of the state's population will live in Northern Virginia, which is broadly defined as the area bordered on the south by Fredericksburg, on the north by the Potomac River, and on the west by the Shenandoah Valley.² Faster population growth in other regions is, in effect, pulling the population center of the Commonwealth towards Northern Virginia. The 'urban crescent' is becoming increasingly lopsided, weighed down by the economic gravity and population of Northern Virginia. Conventional wisdom suggests that people follow jobs. If that is true, then the relatively anemic economic growth in Region 5 contributes to Region 5's relatively slow population growth.

Table 2 illustrates the variation in population growth rates among the localities in Region 5. James City County has consistently grown since 1990, with an annual average population growth rate of 1.5 percent for the current decade. Williamsburg, which only observed a slight increase in population in the 1990s, has grown more robustly this century. Chesapeake, which was the third largest city in Region 5 in 2018, continues to grow, albeit at a slower rate compared to earlier in the century. Chesapeake's growth is in stark contrast to Norfolk, for example, which only grew by 1,078 residents this decade. If the trend continues for the foreseeable future, it is likely that Chesapeake will become Region 5's second largest city within the next five years.

Virginia Beach, the largest city in Region 5, accounted for 1 out of every 4 residents in Region 5 in 2018, however, its growth this decade was well below the average for the Commonwealth. The seven largest jurisdictions in Region 5 (all independent cities) accounted for approximately 81.6 percent of the population but only two (Chesapeake and Suffolk) grew faster than the Commonwealth. Several other localities in Region 5 have not grown or have contracted in terms of population this decade. In the case of Accomack, Franklin, Northampton, and Southampton

¹ U.S. Census Bureau. Historical State Centers of Population by State for 1810-2010 Censuses.

² University of Virginia Weldon Cooper Center for Public Service, StatCh@t, June 26, 2017.

counties, for example, some of the declines may be explained in part by the continued shift of the U.S. population from rural to urban areas, as individuals seek out economic opportunities and amenities. More troubling are the contractions of the cities of Hampton, Newport News, and Portsmouth. Together, over 1 out of 5 people live in these cities, generating over \$1 out of every \$3 in regional GDP.

**Table 1 - Population and Annual Population Growth for the U.S., Virginia, and Region 5
1990, 2000, 2010, and 2018**

Region	1990 Population	2000 Population	2010 Population	2018 Population	1990-1999 Annual Growth	2000-2009 Annual Growth	2010-2018 Annual Growth	2018 Population Share
Southwest	393,511	398,740	401,772	378,495	0.2%	0.1%	-0.7%	4.4%
West Central	612,021	660,808	714,614	733,742	0.7%	0.7%	0.3%	8.6%
Southside	366,116	387,778	383,699	366,539	0.6%	-0.1%	-0.6%	4.3%
South Central	704,670	848,221	982,732	1,048,925	1.9%	1.6%	0.8%	12.3%
Hampton Roads	1,500,234	1,628,348	1,718,421	1,761,865	0.8%	0.5%	0.3%	20.7%
Eastern	487,598	564,438	665,976	732,052	1.5%	1.7%	1.2%	8.6%
Northern	1,472,561	1,829,631	2,245,532	2,522,001	2.1%	2.0%	1.5%	29.6%
Valley	386,523	445,222	509,072	539,330	1.4%	1.4%	0.7%	6.3%
Central	282,699	336,206	401,862	434,736	1.7%	1.9%	1.0%	5.1%
Virginia	6,216,884	7,105,817	8,023,680	8,517,685	1.3%	1.2%	0.7%	--
United States	248,790,925	282,162,411	309,326,085	327,167,434	1.2%	0.9%	0.7%	--

Source: U.S. Census Bureau, 1990 Components of Population Change, 2000 Intercensal Estimates, 2018 Population Estimates and Dragas Center for Economic Analysis and Policy. Percentages may not sum to 100 percent due to rounding. Estimated annual growth is the Compound Annual Growth Rate. Estimates, where possible, are for July 1st for comparison purposes. Resident population of the United States.

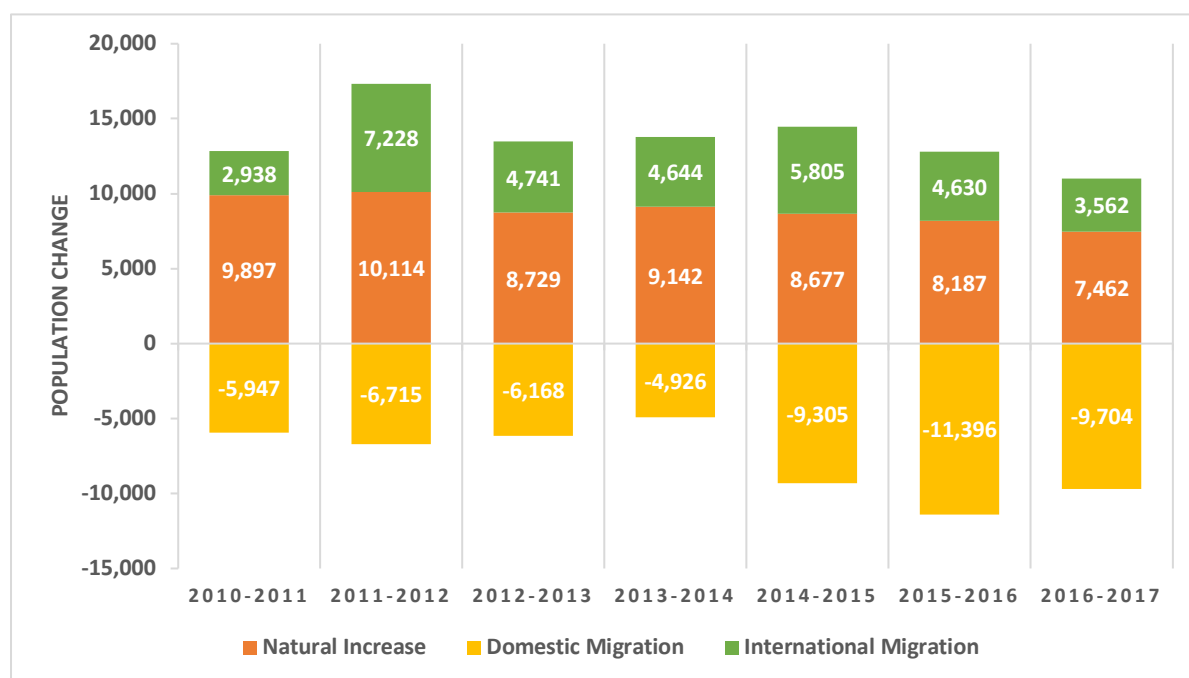
**Table 2 - Population and Annual Population Growth for Region 5 and Region 5 Localities
1990, 2000, 2010, and 2018**

Region	1990 Population	2000 Population	2010 Population	2018 Population	1990-1999 Annual Growth	2000-2009 Annual Growth	2010-2018 Annual Growth	2018 Population Share
Accomack	31,803	38,215	33,147	32,412	1.9%	-1.5%	-0.3%	1.8%
Franklin	39,773	47,546	56,186	56,195	1.8%	1.8%	0.0%	3.2%
Isle of Wight	25,178	29,849	35,313	36,953	1.7%	1.9%	0.6%	2.1%
James City	35,037	48,536	67,668	76,397	3.3%	3.5%	1.5%	4.3%
Northampton	13,089	13,025	12,409	11,735	0.0%	-0.5%	-0.7%	0.7%
Southampton	17,035	17,493	18,637	17,586	0.3%	0.7%	-0.7%	1.0%
York	42,661	57,119	65,268	67,846	3.0%	1.5%	0.5%	3.9%
Chesapeake city	153,335	200,224	223,550	242,634	2.8%	1.1%	1.0%	13.8%
Hampton city	134,245	146,054	137,336	134,313	0.9%	-0.6%	-0.3%	7.6%
Newport News city	172,324	180,236	180,925	178,626	0.5%	0.0%	-0.2%	10.1%
Norfolk city	261,425	234,986	242,998	244,076	-1.2%	0.3%	0.1%	13.9%
Poquoson city	11,033	11,582	12,145	12,190	0.5%	0.5%	0.0%	0.7%
Portsmouth city	103,833	100,337	95,445	94,632	-0.3%	-0.6%	-0.1%	5.4%
Suffolk city	52,220	64,216	84,823	91,185	2.0%	3.0%	0.9%	5.2%
Virginia Beach city	395,542	426,918	438,855	450,189	0.7%	0.2%	0.3%	25.6%
Williamsburg city	11,701	12,012	13,716	14,896	0.3%	1.5%	1.0%	0.8%
Hampton Roads	1,500,234	1,628,348	1,718,421	1,761,865	0.8%	0.5%	0.3%	--

Source: U.S. Census Bureau, 1990 Components of Population Change, 2000 Intercensal Estimates, 2018 Population Estimates and Dragas Center for Economic Analysis and Policy. Percentages may not sum to 100 percent due to rounding. Estimated annual growth is the Compound Annual Growth Rate. Estimates, where possible, are for July 1st for comparison purposes. Resident population of the United States.

Next, we break down the sources of population changes in Region 5. As illustrated in Figure 2, there are three components to population change: the natural increase in the population (births minus deaths), net domestic migration, and net international migration. Regions that are growing typically have positive rates of natural increase, net domestic migration, and net international migration. From 2010 to 2017, the population of Region 5 increased by 41,595 individuals. The natural increase of the population from 2000 to 2017 was 62,208. On the other hand, 54,161 individuals left Region 5, with the largest outflows occurring from 2015 to 2017. If not for the net inflow of 33,548 individuals from other countries, Region 5 would have barely grown this decade.

**Figure 2 - Components of Population Change for Region 5
2010 – 2017**



Source: U.S. Census Bureau, 2017 Components of Change Estimates and Dragas Center for Economic Analysis and Policy.

The outflow of residents is not a problem isolated to Region 5. As illustrated in Table 3, several regions have experienced net negative domestic migration from 2010 to 2017. Two regions (Southwest and Southside) also have natural decreases in the population and the lowest levels of international migration in the Commonwealth. Combined, Hampton Roads and Northern Virginia have seen almost 110,000 residents depart this decade. In some cases, these flows are to other regions in the Commonwealth. In other cases, residents have left Virginia entirely as evidenced by Virginia's net negative domestic migration of 58,941. Northern Virginia's net international migration more than offset its domestic outmigration, unlike Region 5, where international migration only partially offset domestic migration losses.

**Table 3 - Components of Population Change, Virginia and GO Virginia Regions
2010 - 2017**

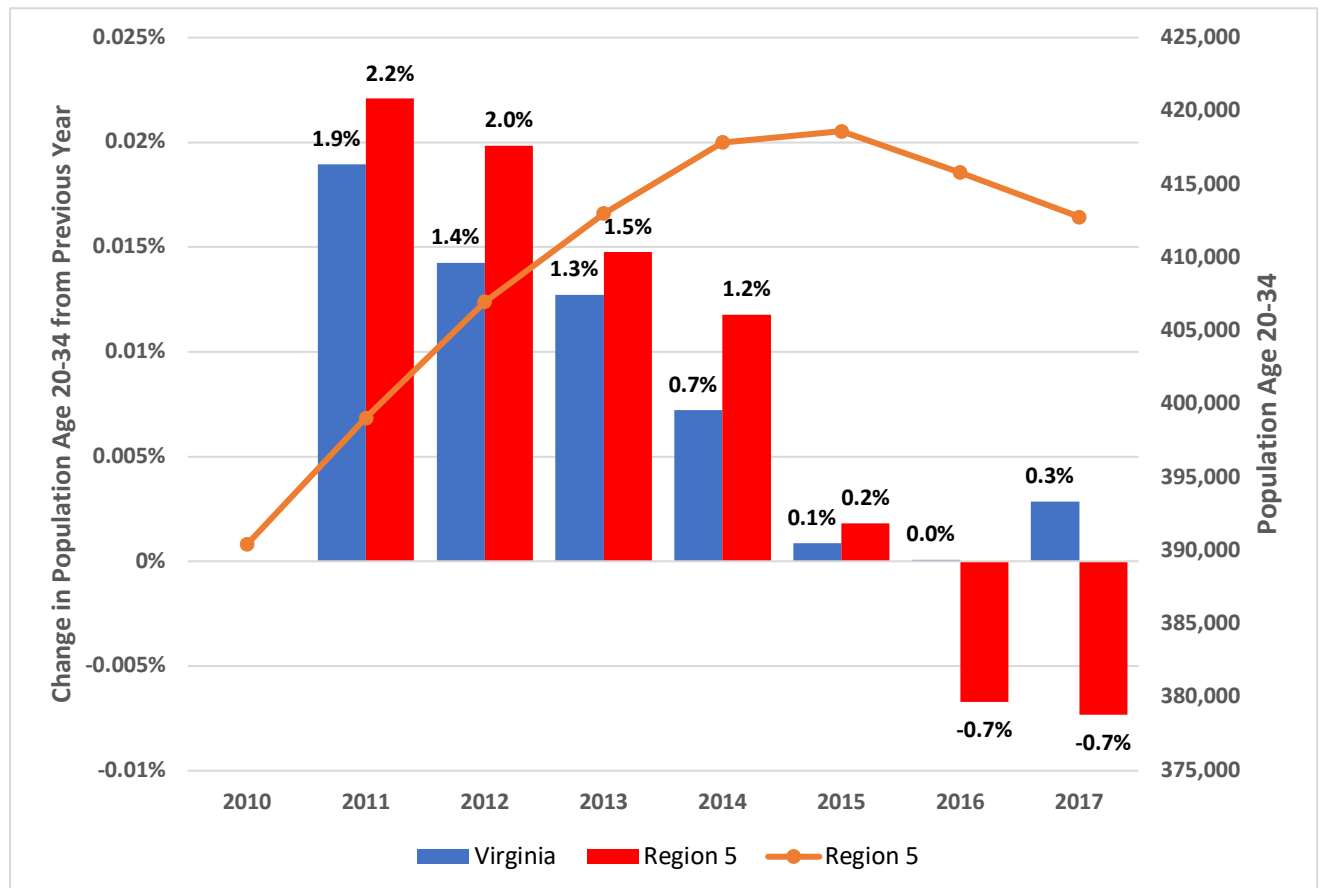
	Natural Increase	Domestic Migration	International Migration	Population Change
Southwest	-9,511	-11,067	483	-20,095
West Central	2,351	1,350	12,532	16,233
Southside	-7,515	-8,773	963	-15,325
South Central	23,101	14,237	19,530	56,868
Hampton Roads	62,208	-54,161	33,548	41,595
Eastern	21,446	27,045	9,455	57,946
Northern	167,539	-54,361	140,172	253,350
Valley	5,410	13,796	6,270	25,476
Central	8,244	12,993	6,946	28,183
Virginia	273,273	-58,941	229,899	444,231

Source: U.S. Census Bureau, 2017 Components of Change Estimates and Dragas Center for Economic Analysis and Policy.

As the 'baby-boomer' generation retires, whether a region can attract and retain younger individuals is a key element of population growth and economic vitality. Figure 3 illustrates the year-over-year change in the age 20 to 34 population for Region 5 and Virginia. Through 2014, Region 5's year-over-year growth rate in the population of 'millennials' exceeded that of the state, however, population growth was decelerating even early in the decade. In 2015, however, population growth in this age bracket dramatically slowed and then declined outright in 2016 and 2017 for Region 5.

In 2017, the growth rate for the population age 20 to 34 for Virginia returned to positive territory. The same cannot be said for Region 5. In 2015, there were almost 419,000 individuals age 20 to 34 in Region 5, falling to about 416,000 in 2016, and to almost 413,000 in 2017. We can reasonably conclude that part of the domestic outmigration from Region 5 was younger individuals. Whether these individuals were seeking better economic fortunes, an improved quality of life, or cultural amenities is not known. This trend, if not reversed, will undoubtedly reshape the region's workforce in the coming years and act as a limit on potential economic growth.

**Figure 3 - Year over Year Change in Population Age 20 – 34, Virginia and Region 5
2010 – 2017**



Source: U.S. Census Bureau, 2017 Components of Change Estimates and Dragas Center for Economic Analysis and Policy.

Table 4 presents the last two years of data for the population age 20-34 for GO Virginia regions and the Commonwealth. Three regions (Hampton Roads, Southside, and Southwest) lost population in the 20 to 34 age group for this period. These declines mostly offset the gains in other regions, illustrating why Virginia's 20 to 34 age population only grew by 0.3 percent from 2016 to 2017.

**Table 4 - Change in Population Age 20 – 34, Virginia and GO Virginia Regions
2016 – 2017**

Region	2016 20-34 Population	2017 20-34 Population	2016 to 2017 Change in 20-34 Population
Southwest	64,624	63,374	-1.9%
West Central	157,864	158,580	0.5%
Southside	63,582	63,440	-0.2%
South Central	193,509	195,062	0.8%
Hampton Roads	415,810	412,759	-0.7%
Eastern	162,197	164,094	1.2%
Northern	516,941	520,544	0.7%
Valley	105,176	105,723	0.5%
Central	83,377	84,501	1.3%
Virginia	1,763,080	1,768,077	0.3%

Source: U.S. Census Bureau, 2017 Components of Change Estimates and Dragas Center for Economic Analysis and Policy.

Measuring economic performance at the city and county level has typically been fraught with uncertainty as studies have been specific to the time period and region in question and, in many cases, not replicable or comparable. In 2018, however, the Bureau of Economic Analysis (BEA) released prototype estimates of Gross Domestic Product (GDP) for counties in the United States for 2012 through 2015.³ While subject to substantial lag, these estimates provide consistent, comparable measures of economic activity for Region 5 and other GO Virginia Regions in the Commonwealth. Comparisons over longer periods of time, across states, and different levels of government, however, require use of the BEA's MSA-level estimates of GDP. We first turn to these MSA level estimates to discuss how Region 5 performs relative to Virginia and the United States.

Figure 4 illustrates that the economy of the Virginia Beach – Norfolk – Newport News (“Hampton Roads”) MSA performed well in the first decade of the 2000s.⁴ After peaking at an inflation-

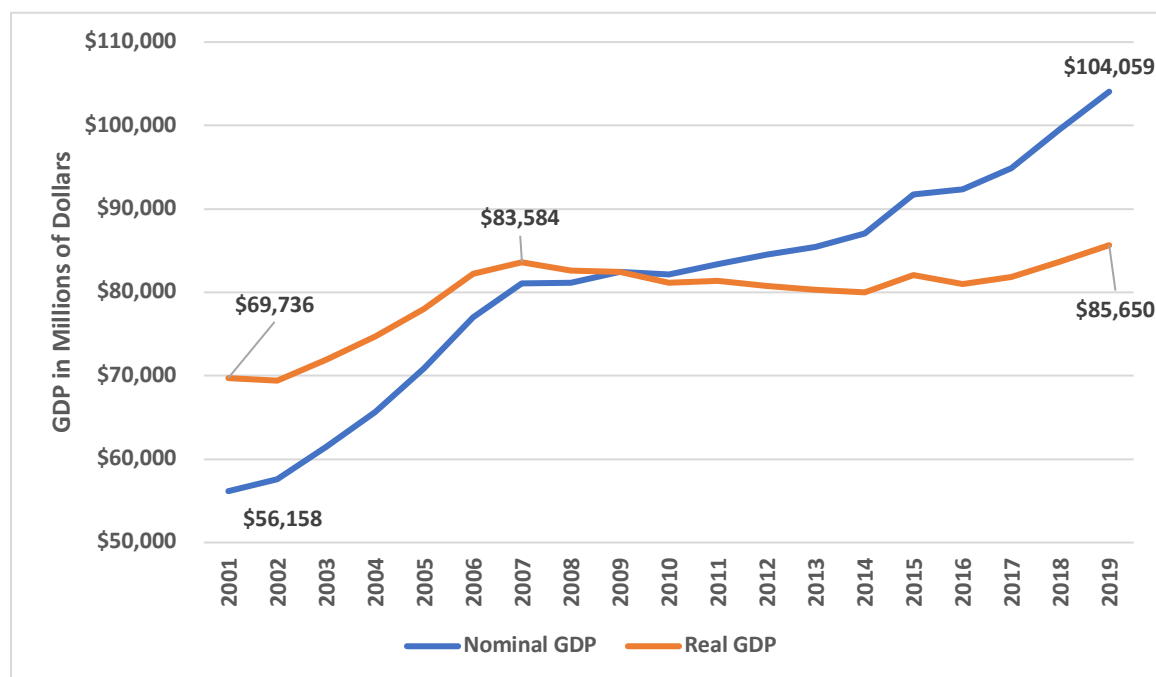
³ U.S. Bureau of Economic Analysis, Prototype Estimates of County Level GDP, 2018.

<https://www.bea.gov/data/gdp/gdp-county>

⁴ The Virginia Beach – Norfolk – Newport News MSA consists of the following cities: Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg. The counties in the MSA are: Currituck County (North Carolina), James City County, Gates County (North Carolina), Gloucester County, Isle of Wight County, Mathews County, and York County. How about Franklin city, Camden County (North Carolina) and Southampton County. This geographic definition is slightly different than the Go Virginia Region 5 cities and counties. Where possible we will examine data at the Region 5 level, but occasionally, we will have to fall back on the MSA for certain data.

adjusted value of \$83.6 billion in 2007, the metropolitan area economy stagnated from the twin blows of the Great Recession and the impact of the Budget Control Act of 2011 and its subsequent amendments (commonly referred to as ‘sequestration’). The Hampton Roads economy only returned to consistent growth in 2017 and is now forecast to grow for a third consecutive year in 2019.

**Figure 4 - Nominal and Real Gross Domestic Product for Hampton Roads
2001 – 2019***

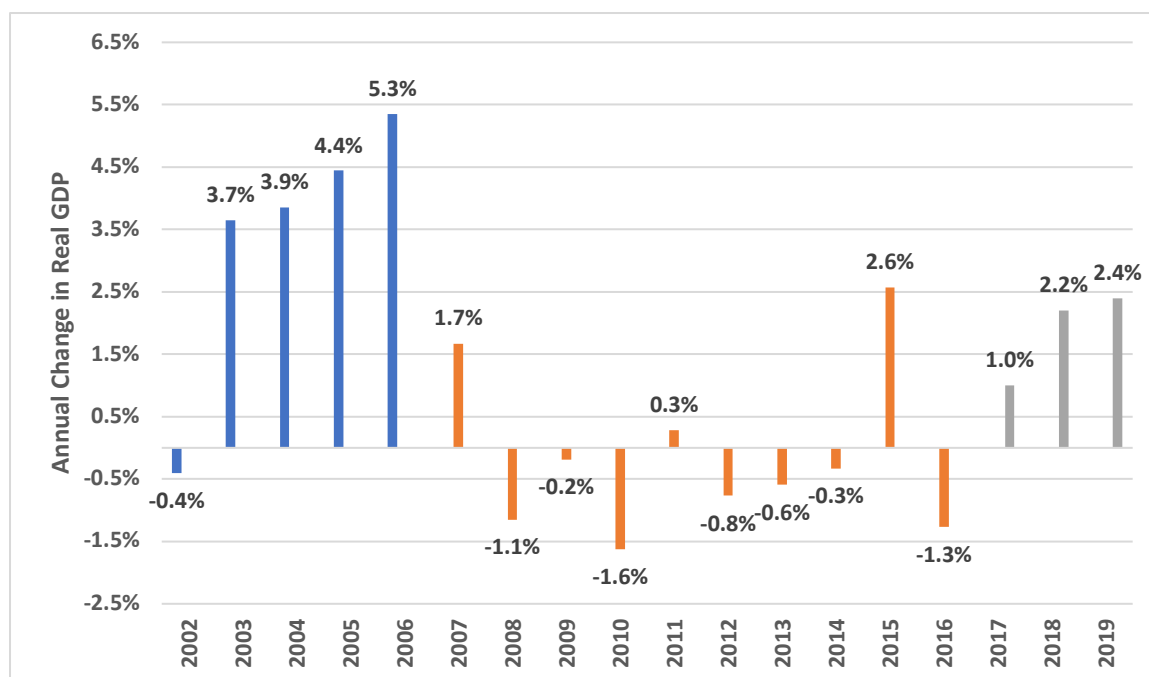


*Source: U.S. Bureau of Economic Analysis. Real GDP in 2009 chained dollars. *2018 estimate and 2019 forecast provided by the Dragas Center for Economic Analysis and Policy.*

Figure 5 shows the annual change in real (inflation-adjusted) GDP for the Hampton Roads MSA. From 2003 to 2006, the region's economy outperformed Virginia and the U.S., growing at an annual average rate of 4.1 percent. Rapid increases in federal spending, specifically for defense, fueled economic growth. The 'lost decade' that followed, however, is illustrative of one of the economic challenges facing the region. Stagnant federal spending and lackluster job creation resulted in GDP contracting at an average annual rate of -0.1 percent from 2007 to 2016. The significant increases in Department of Defense (DoD) defense spending in Fiscal Years (FY) 2017 through 2019 lifted economic growth in the MSA but were still below the growth rates observed early in the century.

Relative to Virginia and the U.S., however, the Hampton Roads MSA's economic performance has left much to be desired. As illustrated in Figure 6, after a relatively slow start at the beginning of the century, regional economic growth outpaced that of the U.S. by 2006 and, briefly, the Commonwealth in 2007. The Great Recession of 2007 – 2009 resulted in a decline in economic performance at the national, state, and regional level. The economic expansion at the national level, however, was not mirrored in Virginia until mid-decade and in Hampton Roads until 2017.

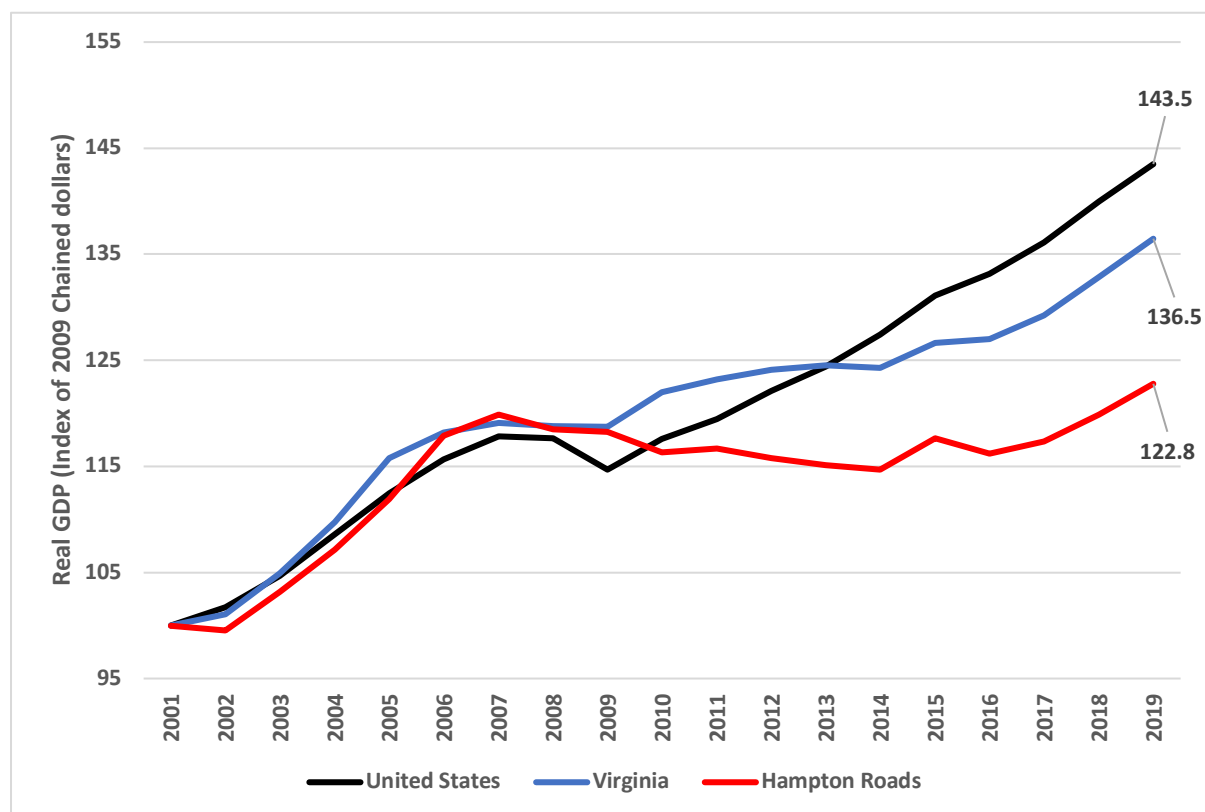
**Figure 5 - Growth in Real Gross Domestic Product for Hampton Roads
2002 – 2019***



Source: U.S. Bureau of Economic Analysis. Real GDP in 2009 chained dollars. *2018 estimate and 2019 forecast provided by the Dragas Center for Economic Analysis and Policy. Annual percentage change in real GDP.

Even though regional growth is forecasted to increase to 2.4 percent in 2019, the performance gap between the Virginia and U.S. economies remains. Currently, real GDP in Hampton Roads is forecast to be \$85.6 billion at the end of 2019. **If Hampton Roads had grown at the same pace as the U.S. economy this century, real GDP in 2019 could have exceeded \$100 billion. This gap in economic growth represents the cost of the decade of stagnant growth in the aftermath of the Great Recession and sequestration.**

**Figure 6 - Index of Real GDP for the U.S., Virginia, and Hampton Roads
2001 – 2019***



Source: U.S. Bureau of Economic Analysis. Real GDP in 2009 chained dollars. *2018 estimate and 2019 forecast provided by the Dragas Center for Economic Analysis and Policy. Base year of the index is 2001.

As illustrated in Table 5, in real (inflation-adjusted) terms, the 16 independent cities and counties that form Region 5 generated approximately \$95.8 billion in economic activity in 2015. Region 5 accounted for about 21.1 percent of Virginia's economic output in 2015, ahead of every other region except Northern Virginia. Northern Virginia generated 40.4 percent of Virginia's GDP while the South Central region accounted for a 12.5 percent share of economic activity. These three regions, which are often referred to as the 'urban crescent', accounted for 74 percent of all economic activity in Virginia in 2015.⁵

The 2012 - 2015 period was not one of stellar economic performance for Virginia and for many regions within the Commonwealth. The Commonwealth's economic performance lagged that of many neighboring states and the United States. Among the GO Virginia Regions, Region 5's economic performance was better than average, ranking it fourth among the nine regions.

⁵ The county level GDP estimates will not sum to the MSA level estimates. For a discussion of the methodology and comparison of the county and MSA GDP estimates, see <https://apps.bea.gov/scb/2019/03-march/0319-county-level-gdp.htm>

**Table 5 - Real Gross Domestic Product, Virginia and GO Virginia Regions
2012 and 2015**

Region	2012	2015	Estimated Annual Growth	Percent of Virginia's 2015 GDP
Southwest	\$11,702,349	\$11,595,464	-0.2%	2.6%
West Central	\$27,401,368	\$28,178,304	0.7%	6.2%
Southside	\$9,422,954	\$9,317,261	-0.3%	2.1%
South Central	\$52,800,910	\$56,746,482	1.8%	12.5%
Hampton Roads	\$92,651,386	\$95,759,524	0.8%	21.1%
Eastern	\$34,781,109	\$32,976,795	-1.3%	7.3%
Northern	\$181,529,620	\$183,616,080	0.3%	40.4%
Valley	\$17,354,076	\$18,041,398	1.0%	4.0%
Central	\$17,306,278	\$17,940,679	0.9%	4.0%
Virginia	\$ 444,950,050	\$ 454,171,987	0.5%	--

Source: U.S. Bureau of Economic Analysis, Prototype Estimates of County Level GDP and Dragas Center for Economic Analysis and Policy. Real GDP in 2012 chained dollars. Percentages may not sum to 100 percent due to rounding. Estimated annual growth is the Compound Annual Growth Rate.

Table 6 displays the GDP estimates for localities within Region 5. Virginia Beach accounted for 26.2 percent of economic activity in 2015, followed by Norfolk (22.3 percent), Newport News (12.1 percent), and Chesapeake (10.3 percent). Adding Hampton (6.7 percent), Portsmouth (5.5 percent), and Suffolk (4.6 percent) to this list yields the 'Seven Cities.' The Seven Cities accounted for 87.7 percent of real GDP in 2015. In other words, almost \$0.90 of every \$1 of economic activity in Region 5 comes from these cities. While geographically diverse, economic activity is concentrated within the major cities in Region 5.

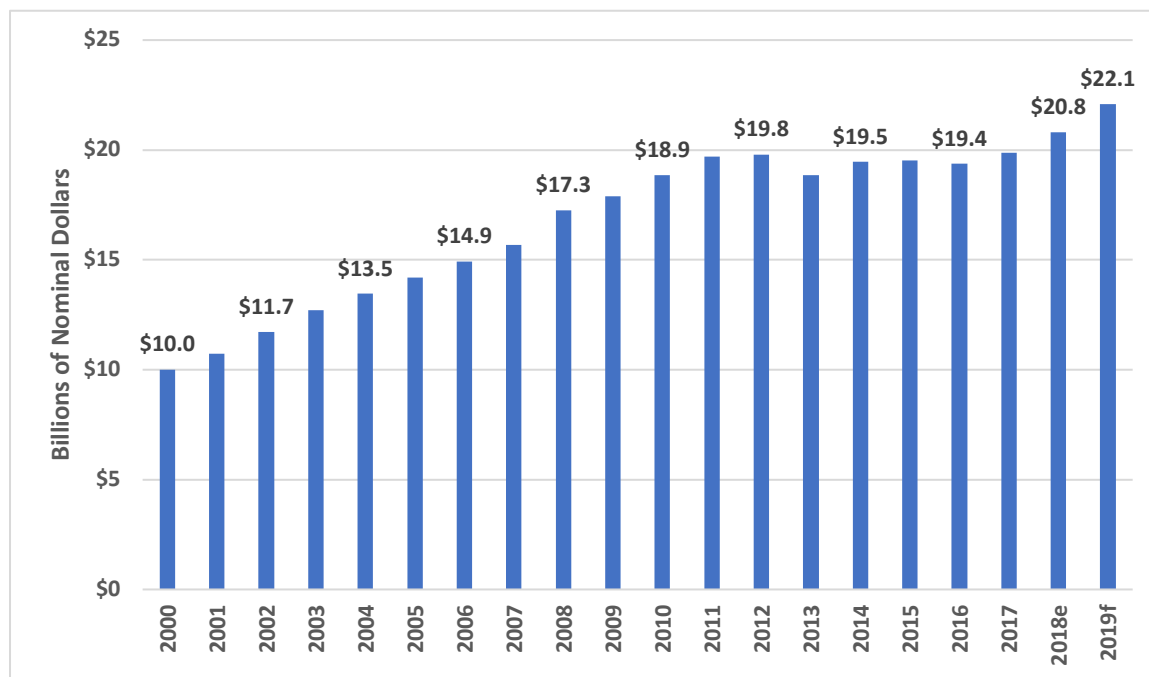
**Table 6 - Real Gross Domestic Product by Region 5 Locality
2012 and 2015**

Location	2012	2015	Estimated Annual Growth	Percent of Region 5's 2015 GDP
Accomack	\$2,382,212	\$2,462,348	0.83%	2.6%
Franklin	\$1,109,079	\$1,209,426	2.19%	1.3%
Isle of Wight	\$1,326,816	\$1,362,260	0.66%	1.4%
Northampton	\$347,024	\$328,104	-1.39%	0.3%
Chesapeake city	\$9,320,962	\$9,886,452	1.48%	10.3%
Hampton city	\$6,326,584	\$6,425,656	0.39%	6.7%
Newport News city	\$11,568,021	\$11,572,706	0.01%	12.1%
Norfolk city	\$20,659,234	\$21,373,985	0.85%	22.3%
Portsmouth city	\$4,988,844	\$5,259,462	1.33%	5.5%
Suffolk city	\$3,926,925	\$4,425,996	3.04%	4.6%
Virginia Beach city	\$24,158,365	\$25,043,602	0.90%	26.2%
James City + Williamsburg	\$3,991,029	\$3,716,340	-1.77%	3.9%
Southampton + Franklin City	\$545,672	\$532,240	-0.62%	0.6%
York + Poquoson	\$2,000,619	\$2,160,947	1.95%	2.3%

Source: U.S. Bureau of Economic Analysis, Prototype Estimates of County Level GDP and Dragas Center for Economic Analysis and Policy. Real GDP in 2012 chained dollars. Percentages may not sum to 100 percent due to rounding. When necessary, the BEA combines localities to produce GDP estimates. Estimated annual growth is the Compound Annual Growth Rate.

As mentioned previously, recent increases in federal spending could be driving much of the improvement in Region 5's economic conditions. The impact of tight federal budgets was significant and costly. As shown in Figure 7, from 2000 to 2012 direct DoD spending in the metro area almost doubled, from \$10 billion to \$19.8 billion. The passage of the Budget Control Act of 2011 (BCA 2011) and the imposition of discretionary spending caps, however, resulted in an approximate \$1 billion decline in direct DoD spending in 2013. It took four years for direct spending to recover to 2012 levels. Direct spending is forecast to increase to \$22.1 billion in 2019, fueling economic growth in the region.

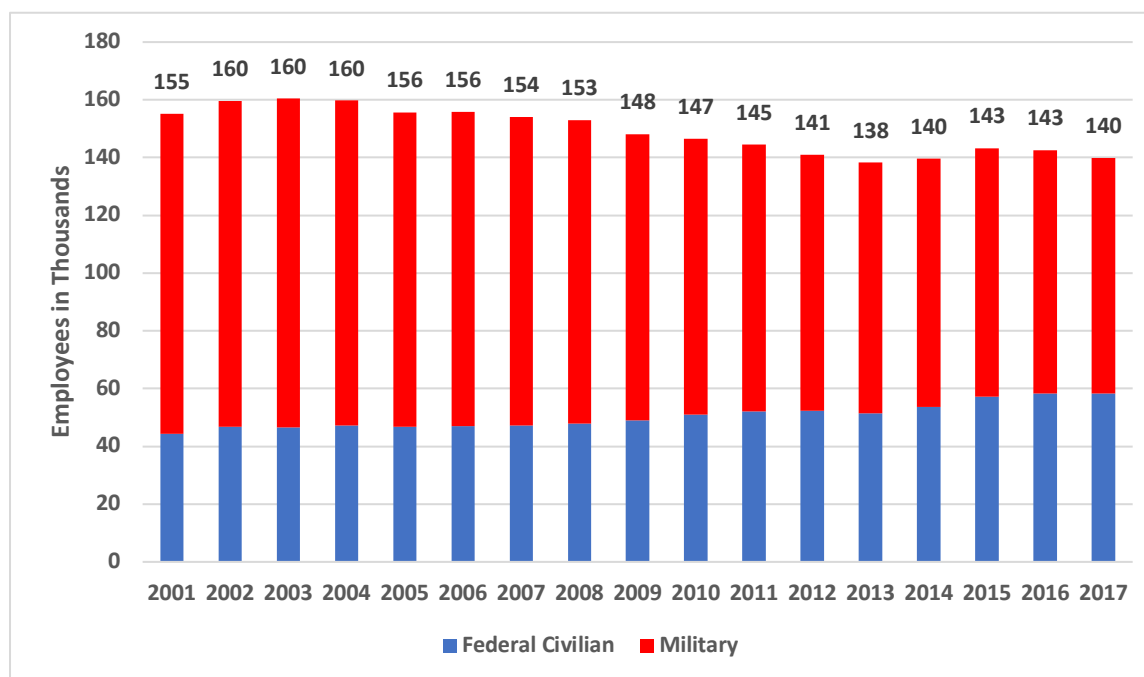
**Figure 7 - Estimated Direct Department of Defense Spending in Hampton Roads
2000 – 2019***



Source: Department of Defense and Dragas Center for Economic Analysis and Policy.

An important transmission mechanism of federal spending into the region is the employment of federal civilian employees and military personnel. Figure 8 presents the composition and total federal employment in Region 5 from 2001 to 2017. First, as a share of total federal employment, the number of military personnel employed in Region 5 has declined from a peak of approximately 114,000 in 2003 to about 82,000 in 2017. Over the same period, federal civilian employment increased by about 11,500, partly offsetting the decline in military personnel. Region 5 not only had the largest number of military personnel but was also the largest in terms of total federal employment in 2017 with 10,000 more employees than the next largest region, Northern Virginia.

**Figure 8 - Military and Federal Civilian Employment in Region 5
2001 – 2017**

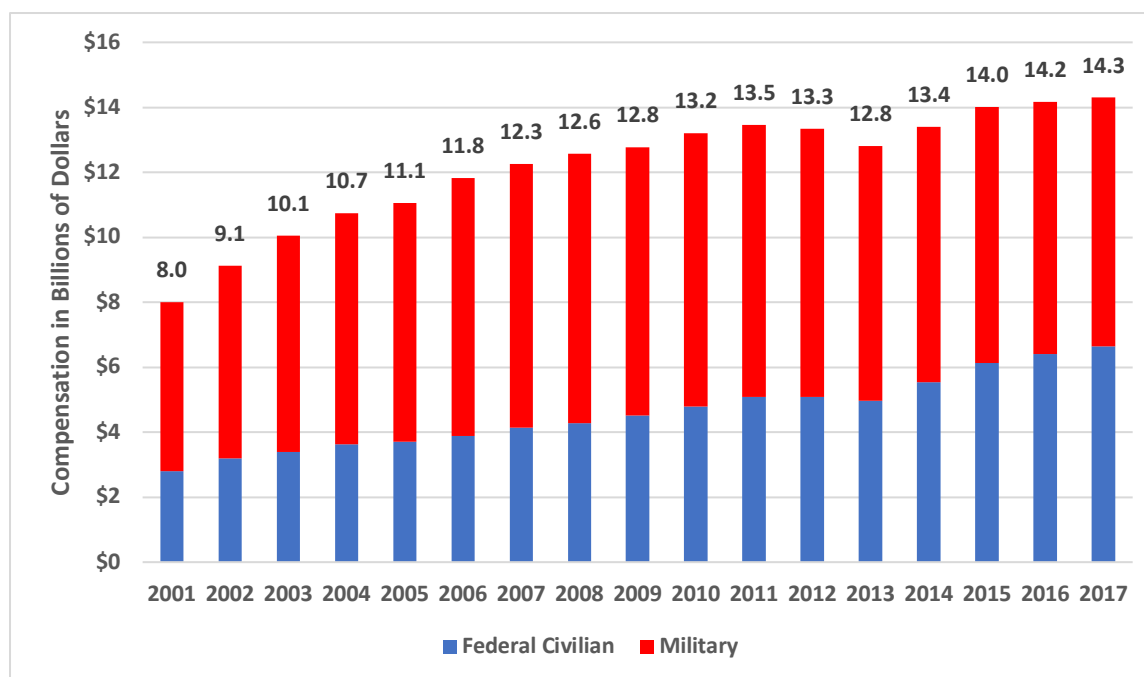


Source: U.S. Bureau of Economic Analysis, CAEMP25N, Total Full-Time and Part-Time Employment by NAICS Industry, and Dragas Center for Economic Analysis and Policy.

Figure 9 illustrates that the total compensation of federal civilian employees and military personnel (wages, salaries, and benefits) reached \$14.3 billion in 2017. The average annual compensation for a federal civilian employee in Region 5 in 2017 was \$114,044, 1.9 times greater than the average compensation of \$57,301 for all employees in Region 5.⁶ Average compensation for military personnel in 2017 was \$93,912, approximately 1.6 times greater than the average compensation for the region. A downturn in federal civilian employment or the number of military personnel stationed in the region would require multiple private sector jobs to replace the lost compensation.

⁶ The estimate of \$57,301 represents an estimate of average total compensation and, therefore, is higher than the average wage estimate of \$46,015.

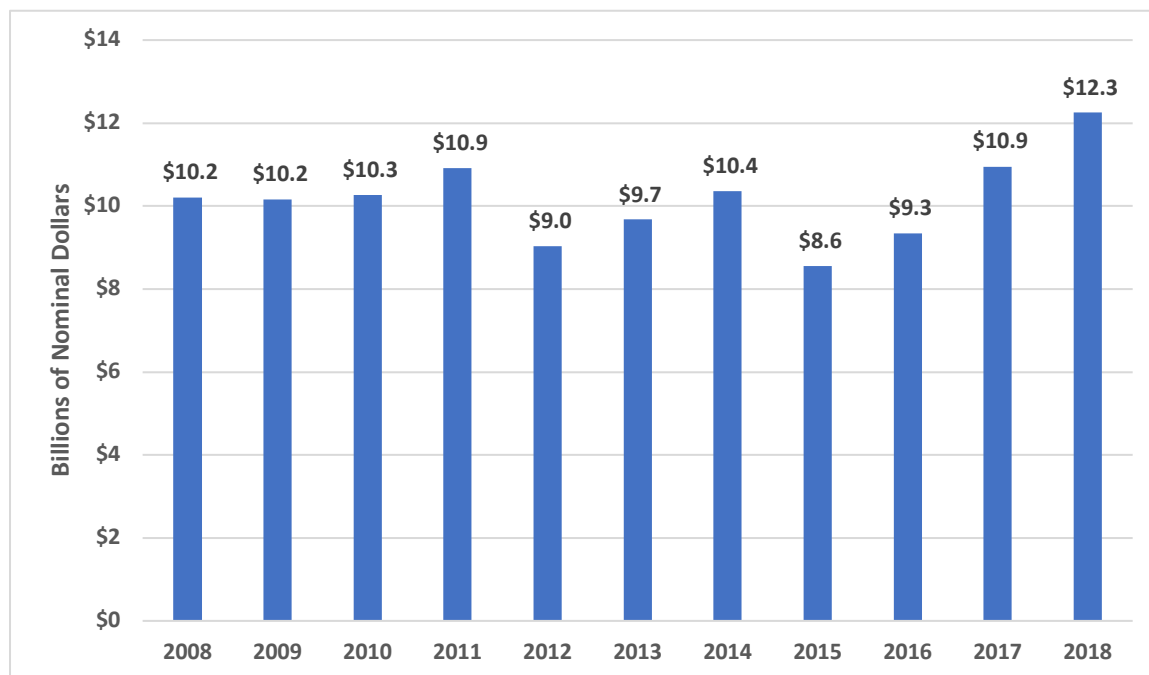
Figure 9 - Military and Federal Civilian Compensation in Region 5
Billions of Nominal Dollars
2001 – 2017



Source: U.S. Bureau of Economic Analysis, Source: U.S. Bureau of Economic Analysis, CAEMP25N, Total Full-Time and Part-Time Employment by NAICS Industry, and Dragas Center for Economic Analysis and Policy. Compensation includes wage, salaries, employer provided benefits, and employer contributions to social insurance programs.

An equally important component of federal spending is the number of federal contracts that flow into Region 5. Figure 10 illustrates the level of federal contracts in Region 5 since 2008. Federal spending on contracts in Region 5 fell by \$1.9 billion from FY 2011 to FY 2012. After recovering to \$10.4 billion in FY 2014, federal contract awards fell by \$1.8 billion in FY 2015, finally recovering to FY 2011 levels in 2017. The recent surge in federal contracts in FY 2016 through FY 2018 provided the stimulus for the recent uptick in the metropolitan area economy but also illustrated the dependence of the regional economy on federal spending.

**Figure 10 - Federal Spending on Contracts in Region 5
2008 – 2018**



Source: USAspending.gov and Dragas Center for Economic Analysis and Policy. Data obtained June 2019.

Economic growth and employment growth are closely tied. As illustrated in Table 7, the average annual growth rate for employment for Region 5 has consistently been lower than Virginia since 1990 mirroring the trend in the region's GDP growth rate. As illustrated in Table 7, employment growth in Region 5 and Virginia outpaced that of the U.S. for the first decade of the century, primarily due to rapid increases in discretionary federal spending and the disproportionate impact of the Great Recession on employment in other areas of the United States.

Since 2010, however, employment growth for the nation has outpaced that of the Commonwealth and is almost double that of Region 5. The good news is that there has been a recent uptick in employment in Region 5, in part due to increased federal spending in the region. However, even with these increases in federal spending, employment growth in Region 5 continues to lag the state and the nation.

**Table 7 - Employment Growth, U.S., Virginia, and GO Virginia Regions
1990 - 2018**

	Annual Employment Growth 1990-1999	Annual Employment Growth 2000-2009	Annual Employment Growth 2000-2018
United States	1.30%	0.24%	1.43%
Virginia	1.15%	0.97%	1.07%
Southwest	0.24%	0.25%	-0.38%
West Central	0.67%	0.01%	0.42%
Southside	0.02%	-0.87%	0.56%
South Central	1.58%	0.93%	1.43%
Hampton Roads	1.06%	0.73%	0.75%
Eastern	1.26%	1.43%	1.46%
Northern	1.44%	1.60%	1.41%
Valley	1.47%	0.82%	1.01%
Central	1.29%	1.73%	1.29%

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, 1990 – 2018 and Dragas Center for Economic Analysis and Policy. Data last revised by the BLS on April 19, 2019. Annual growth rate is the Compound Annual Growth Rate

Relative to other GO Virginia Regions, Region 5's employment performance remains below average. The Eastern (Region 6), Northern (Region 7), and Central (Region 9) areas have observed annual average employment growth above 1 percent since 1990. More recently, annual employment growth has risen this decade for the South Central and Eastern regions, with employment growth almost double that of Region 5. The Southwest region has the lowest employment growth performance among the GO Virginia Regions and has experienced a contraction in employment this decade.

Next, we take a micro-level look at employment growth. Table 8 illustrates annual average employment growth rate for the jurisdictions within Region 5. James City County grew the fastest since 2010, with an annual average growth rate of 1.9 percent. Three jurisdictions, Chesapeake, James City County, and Suffolk have shown consistent employment growth exceeding 1 percent since 1990. From 2010 to 2018, Chesapeake's employment expanded at a 1.4 percent annual rate, followed by Suffolk at 1.2 percent, Williamsburg at 1.2 percent and York at 0.9 percent. It is no coincidence that Chesapeake, James City County, Suffolk, and York had some of the largest population increases in Region 5 over the same period. Accomack, which has posted significant employment losses earlier in the decade, has experienced a recovery in

Go Virginia Region 5 Biennial Update

employment and, on average, has seen positive employment growth this decade. Northampton county, on the other hand, saw employment contract at an annual average rate of 1.6 percent since 2010. Northampton also, on average, lost 0.7 percent of its population this decade. Undoubtedly, poor economic performance and a lack of employment opportunities creates a strong incentive for individuals to move to other jurisdictions within the region or outside the region entirely. The challenge is to create the conditions for growth not only in the largest employment jurisdictions but all across Region 5.

**Table 8 - Employment Growth, U.S., Virginia, and Region 5 Localities
1990 - 2018**

	Annual Employment Growth 1990-1999	Annual Employment Growth 2000-2009	Annual Employment Growth 2000-2018
United States	1.30%	0.24%	1.43%
Virginia	1.15%	0.97%	1.07%
Region 5	1.06%	0.73%	0.75%
Accomack	-0.4%	0.5%	0.5%
Franklin	2.1%	0.4%	0.1%
Isle of Wight	2.0%	2.2%	0.8%
James City	3.3%	3.3%	1.9%
Northampton	-0.7%	0.9%	-1.6%
Southampton	1.2%	0.3%	0.1%
York	3.9%	1.0%	0.9%
Chesapeake city	3.4%	1.3%	1.4%
Hampton city	0.4%	-0.1%	0.2%
Newport News city	0.6%	0.9%	0.4%
Norfolk city	-1.9%	0.0%	0.6%
Poquoson city	0.6%	0.3%	0.2%
Portsmouth city	-0.5%	0.0%	0.4%
Suffolk city	2.6%	3.2%	1.2%
Virginia Beach city	1.3%	0.3%	0.8%
Williamsburg	1.0%	0.8%	1.2%

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, 1990 – 2018 and Dragas Center for Economic Analysis and Policy. Data last revised by the BLS on April 19, 2019. Annual growth rate is the Compound Annual Growth Rate

Region 5's real per capita income lagged behind both Virginia and the U.S. in 2017 in absolute terms and annual average growth rate. Table 9 illustrates that Region 5's nominal per capita income for 2017 was \$46,844, 10 percent below that of the nation and 17 percent below that of the Commonwealth. Personal income growth has also slowed significantly in Region 5 relative to previous decades, failing to keep pace with the improved performance of the U.S. economy and the relatively stable growth in per capita personal income in Virginia. Slower personal income growth is another incentive for individuals to seek economic opportunities outside Region 5.

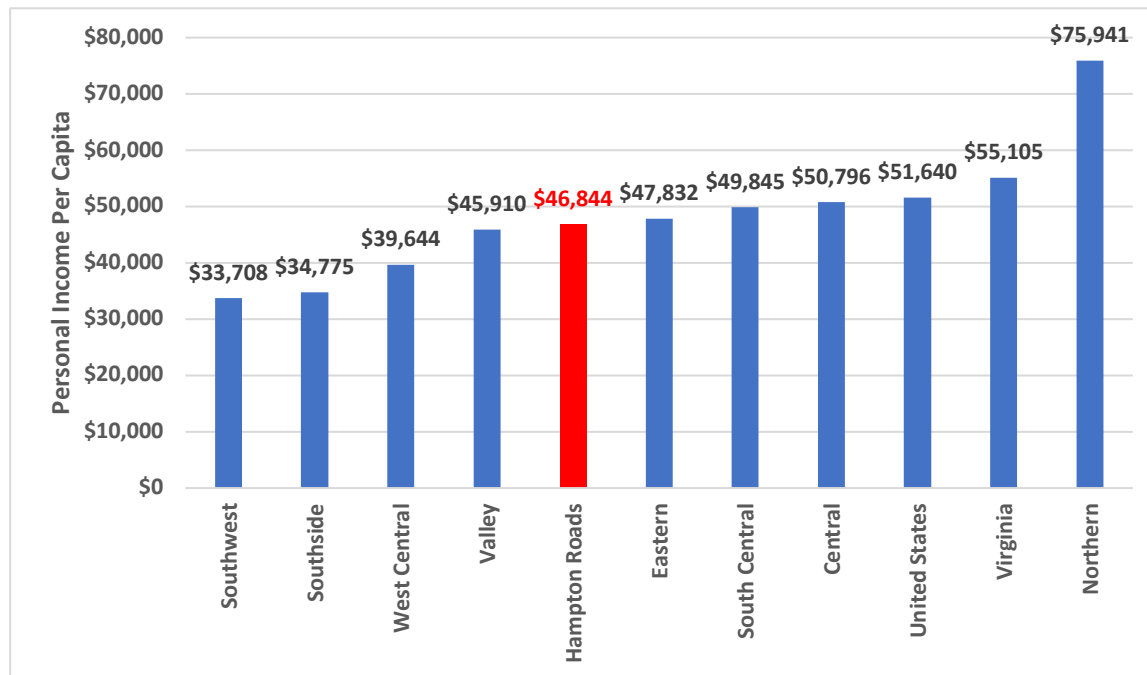
**Table 9 - Per Capita Income and Growth in Real Per Capita Income
United States, Virginia, and GO Virginia Region 5, 2017**

	2017 Nominal Per Capita Income	2017 Real Per Capita Income	Annual Growth 1990-1999	Annual Growth 2000-2009	Annual Growth 2010-2017
United States	\$51,640	\$47,845	2.2%	0.6%	1.8%
Virginia	\$55,105	\$51,055	2.3%	1.2%	1.1%
Region 5	\$46,844	\$43,401	1.9%	1.9%	1.0%

Source: U.S. Bureau of Economic Analysis, Personal Income by County, Table CA1 and National Income and Product Accounts, GDP Implicit Price Deflator, Table 1.1.4, and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate. Mean of county and city per capita income is displayed for Region 5. Base year for real per capita income is 2012.

Figure 11 displays 2017 personal income for the U.S., Virginia, and GO Virginia regions. When compared to other GO Virginia regions, Region 5's 2017 personal income per capita ranks 5th among the 9 regions. While Northern Virginia's personal income per capita is significantly higher than the Commonwealth average, personal income growth slowed substantially in Region 7 this decade. Northern Virginia's average personal income growth was 1.4 percent from 2000 to 2009 but slowed to 0.3 percent this decade, the lowest among GO Virginia regions. The Central, Eastern, South Central, Southside, Valley, and West Central regions have all experienced personal income growth greater than 1 percent this decade.

Figure 11 - Nominal Per Capita Income, U.S., Virginia, and GO Virginia Regions 2017



Source: U.S. Bureau of Economic Analysis, Personal Income by County, Table CA1 and Dragas Center for Economic Analysis and Policy. Mean of county and city per capita income is displayed for Go Virginia Regions.

Table 10 displays 2017 per capita income jurisdiction in Region 5 and the annual average growth rates in real per capita income for each jurisdiction. While the Southampton and Franklin City combined locality and Northampton posted the highest per capita income growth rates for Region 5 from 2010 to 2017, we also must note that Franklin’s population has not grown this decade and Northampton’s and Southampton’s population has contracted at an annual rate of 0.7 percent over the same period. Thus, the increase in per capita income is driven more by population change than increased economic activity for these jurisdictions.

The combined jurisdiction of James City County and Williamsburg had the highest per capita income levels in 2017 at \$62,350, followed by the combined area of York and Poquoson at \$56,763. Virginia Beach, the largest jurisdiction in Region 5, had the 3rd highest level of per capita income at \$55,108 in 2017. With the exception of Virginia Beach, however, per capita income growth has slowed this decade for the most populous jurisdictions in Region 5.

Table 10 - Per Capita Income in Region 5 Localities

Location	2017 Nominal Per Capita Income	Annual Growth 1990-1999	Annual Growth 2000-2009	Annual Growth 2010-2017
Accomack	\$40,701	0.9%	3.5%	1.1%
Isle of Wight	\$53,168	2.4%	3.0%	0.7%
Northampton	\$45,848	2.0%	2.8%	2.2%
Chesapeake city	\$48,569	1.8%	2.0%	0.4%
Hampton city	\$42,133	1.7%	1.3%	0.6%
Newport News city	\$41,646	0.7%	2.1%	0.7%
Norfolk city	\$40,094	1.8%	1.2%	0.4%
Portsmouth city	\$40,026	1.1%	2.4%	0.4%
Suffolk city	\$49,779	2.3%	2.8%	0.7%
Virginia Beach city	\$55,108	1.8%	1.2%	1.4%
James City + Williamsburg	\$62,350	3.6%	1.4%	1.1%
Southampton + Franklin City	\$40,917	1.9%	0.6%	2.7%
York + Poquoson	\$56,763	1.3%	2.2%	0.7%

Source: U.S. Bureau of Economic Analysis, Personal Income by County, Table CA1 and National Income and Product Accounts, GDP Implicit Price Deflator, Table 1.1.4, and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate. Base year for real per capita income is 2012. When necessary, the BEA combines localities.

While economic performance has improved for most jurisdictions in Region 5, the relative economic performance of the region leaves much to be desired. Leveraging the existing federal footprint to enable private sector growth is necessary in the short-term to improve economic resiliency. Increasing economic diversification in the private sector also remains a challenge.

Challenge 2: Region 5 is Overly Reliant on a Small Set of Large Firms in its Key Cluster Areas.

Of all the challenges set forth in the initial Growth and Diversification Plan, Challenge 2 was identified as the most critical for the region's future success. Indeed, a strength and weakness of Region 5 is its unique relationship with the federal government, specifically the DoD. The economic fortunes of the region are not only determined by policies and politics in Washington, D.C. Due to the nature of federal contracting, firms tend to be large and not well diversified. The behavior and performance of these large firms determines and drives the economic fortunes in Region 5. As a result, Region 5 tends to be "top-heavy" in its key industries.

Figure 12 presents a selection of industries, defined by 2-digit and 3-digit North American Industry Classification System (NAICS) code, for the Hampton Roads MSA by location quotient (LQ) and annual average growth in employment from 2009 Q1 to 2019 Q1.⁷ Machinery Manufacturing immediately stands out with a LQ of 3 and annual average employment growth greater than 2 percent for 2009 Q1 to 2019 Q1. The relatively high LQ suggests that the Hampton Roads MSA employs a higher proportion of its workforce in the Machinery Manufacturing cluster than the national average. This industry cluster is also growing robustly, well above the average level of employment growth for the MSA for the period in question. This suggests that fostering investment and growth in this sector would build upon the comparative advantage for the Hampton Roads MSA and potentially spur increased job creation in the future.

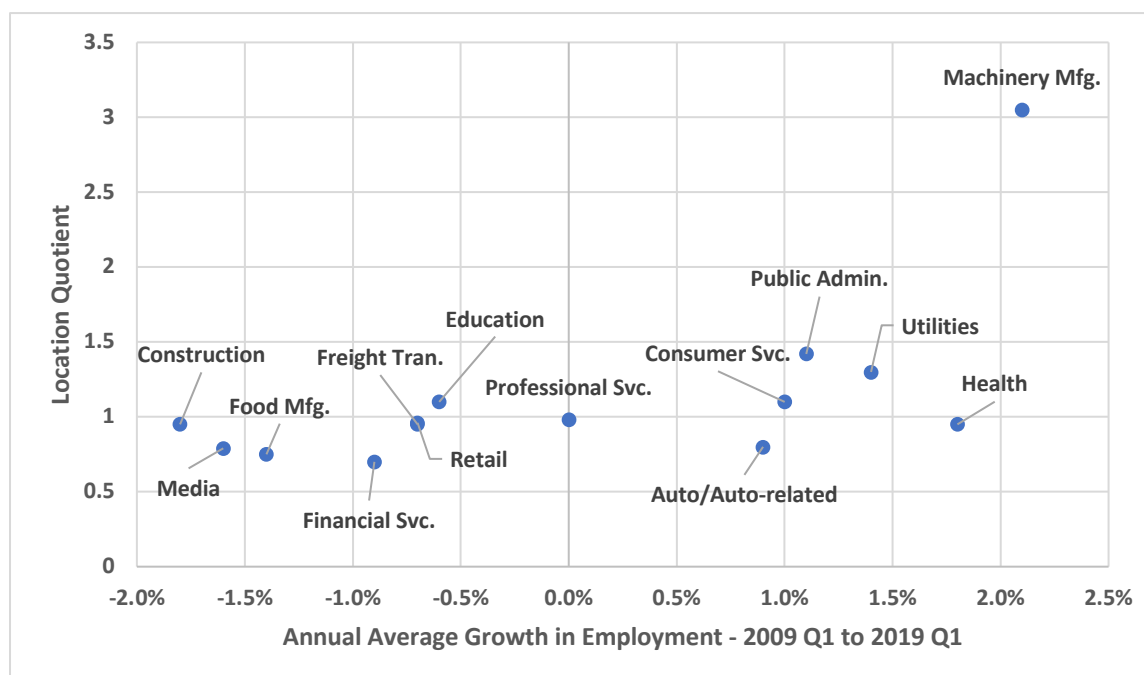
Several other high-level industry clusters stand out in Figure 12. As one might expect given the large presence of the federal government and large cities, public administration has a LQ greater than 1 and has grown over the decade in question. The metropolitan area has a higher percentage of its workforce employed by the federal government and military and the data reflects this labor effort. The Utilities cluster has a LQ of 1.4 and grew at almost 1.5 percent annually from 2009 Q1 to 2019 Q1. There is a potential competitive advantage, especially with increased interest in renewable energy, particularly offshore wind energy production.

Figure 12 also illustrates that several industry clusters have struggled over the period in question. The retail industry cluster has approximately the same share of jobs as the national

⁷ Location quotients (LQs) measure the relative percentage of a region's cluster employment, as compared with the cluster's national employment share. If a region has a LQ of 1, it means that the industry cluster represents the same share of employment regionally as it does nationally. A LQ of 2, on the other hand, would indicate that the cluster's share of employment regionally is twice the national average. By similar logic, one can use LQs to examine establishments. A LQ greater than 1 implies that the region has a greater share of workers or establishments than are required to make the product or service that supplies the region. The additional employment or establishments would presumably be used to produce extra products or services for export from the region, potentially indicating a comparative regional advantage.

average but, like the nation, has contracted over the decade. Employment in Financial Services has declined and, with an LQ of 0.70, it appears that the metropolitan area does not have a competitive advantage in this area.

**Figure 12 - Location Quotients and Annual Average Employment Growth
Selected Industries (2-digit NAICS and 3-digit NAICS)
Hampton Roads Metropolitan Statistical Area**



Source: JobsEq, Industry Clusters for Virginia Beach – Norfolk – Newport News, VA – NC, MSA as of 2019 Q1.

Table 11 presents similar data for the set of priority industry clusters identified as key to fostering growth in a more diverse set of firms in Region 5.⁸ All but one priority cluster (Cyber, Data Analytics and Mod-sim) have employment LQs equal to or greater than 1. Several clusters continue to have LQs above 2 illustrating a tremendous concentration of activity in those industries when compared to the United States.

If a cluster's LQ is greater than 1, the region is relatively concentrated in that cluster when compared to the national average. Unsurprisingly, Ship Repair and Ship Building continues to

⁸ These clusters are based on the clusters determined as priorities by the Region 5 council and presented starting on page 33 of Region 5's Economic Growth and Diversification Plan (<https://www.dhcd.virginia.gov/sites/default/files/Docx/gova/region-five/region-5-growth-diversification-plan.pdf>)

lead the region with the highest employment LQ of 43.2. This means the proportion of employees in the regional workforce in this cluster is 43 times higher than the national average.

Table 11 - Location Quotients for Cluster Employment and Establishments for Region 5

Clusters	Employment LQ	Establishment LQ	Region 5 Avg Estab. Size	US Avg Estab. Size	Avg. Annual Employment Growth 2016-2018
Port Ops, Logistics & Warehousing	1.2	1	29.1	21.9	5.2%
Advanced Manufacturing	2.6	1.2	68.6	37.7	1.0%
Cyber Security, Data Analytics and Mod-Sim	0.7	0.7	16.1	17.1	4.8%
Ship Repair & Ship Building	43.2	6.7	493.0	93.0	6.3%
Water Technologies	1.22	1			1.0%
Unmanned Systems and Aerospace	3.5	1.3	25.6	93.0	3.6%
Region 5 Total	--	--	14.6	--	1.0%
USA Total	--	--	--	16.2	1.4%

Source: US Census Bureau, 2015 County Business Patterns and JobsEq.

Column 3 of Table 11 presents the LQs for the number of establishments. This is a measure of the concentration of firms in the cluster. If a cluster has an employment LQ that is significantly larger than its establishment LQ, then that industry is dominated by a limited number of larger firms. Conversely, industry clusters with establishment LQs that are significantly larger than their employment LQs are likely to have a what we would term “bench strength” which can be important when trying to attract talent to the region.

The Ship Repair and Ship Building industry cluster, for example, has an employment LQ of 43.2 and establishment LQ of 6.7. Employment in this cluster is 43 times more concentrated and establishments are 6.7 times more concentrated in the region than the national average. The two numbers taken together suggest that the massive amount of employment in this cluster is dominated by just a few large firms. This should not be a surprise as the cluster is dominated by large employers such as Huntington Ingalls Industries/Newport News Shipbuilding and BAE

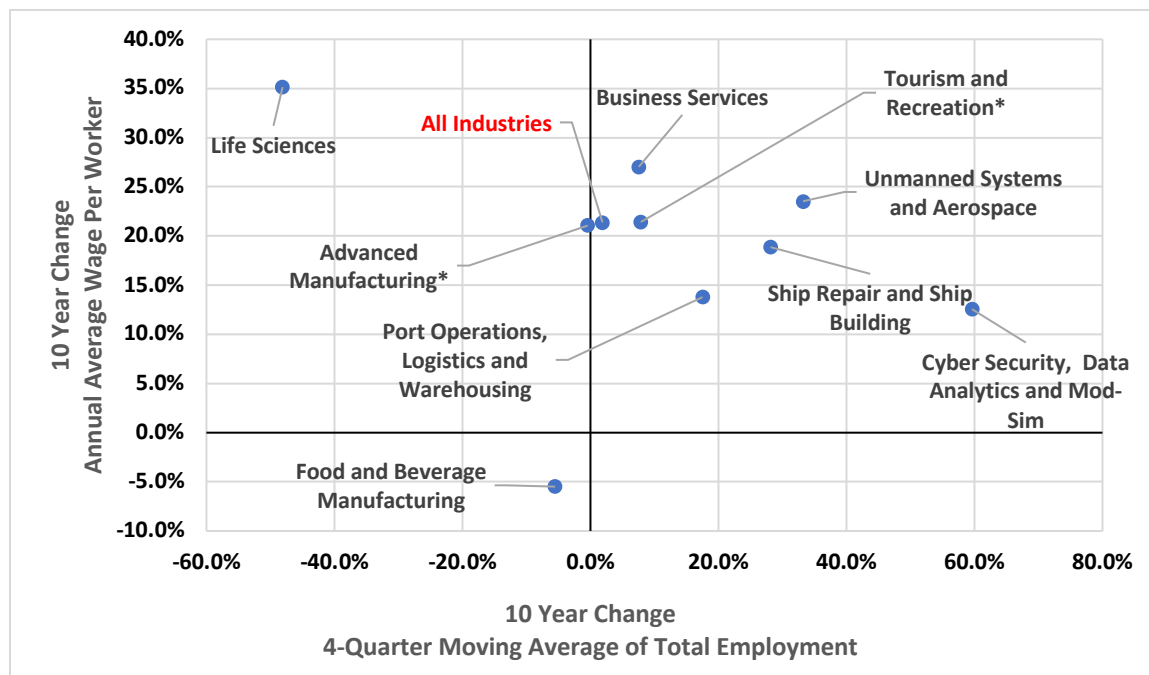
Systems Norfolk Ship Repair. The relatively high concentration of this cluster in the region illustrates the uniqueness of the regional economy as it pertains to national security.

Finally, column 6 of Table 11 provides average annual employment growth for each of the 6 clusters, for Region 5 all industry employment and for United States all industry employment over the time period 2016-2018. This time period represents the period since submission of the first Growth and Diversification Plan for Region 5. In general, all 6 of the clusters have experienced sizable employment growth over this three-year period. The numbers confirm the strength of the 6 clusters chosen for Region 5. All 6 clusters averaged employment growth at or above Region 5's employment growth overall (1.0%) and 4 of the 6 saw average growth above the average employment growth for the United States overall (1.4%).

Figure 13 displays how the Region 5 priority clusters and a set of strong regional clusters have performed over the last decade with respect to total employment and average annual wages per worker. In total, all industries in Region 5 observed lackluster gains in employment from 2009 Q1 to 2019 Q1, with total employment only growing by 1.9 percent. Average annual wages per worker for all industries grew by 21.4 percent over the same period. There is a modicum of good news. The Unmanned Systems and Aerospace and Business Services clusters outperformed the average of all the industries in Region 5, with above average gains in employment and wages. Several clusters, including, Data Analytics, Port Operations, Logistics, and Warehousing, Ship Repair and Ship Building, and Tourism and Recreation had above average gains in employment but lower than average gains in average wages per worker. For these clusters, employment was growing faster than the overall economy but wages were not keeping pace.

There are two outliers worth discussing. First, Food and Beverage Manufacturing employment and wages declined by approximately 5.5 percent over the decade. This sector appears to be employing fewer people at less pay per worker. Second, while average pay in the Life Sciences cluster has increased 35 percent over the decade, employment decreased by 48 percent. One cannot conclude that a cluster is thriving if employment has fallen by almost half within a decade. Finally, Water Technology is not included in the analysis. The cluster is simply too new to analyze over the last decade.

**Figure 13 - Average Annual Wage Per Worker and Total Employment in Region 5
10 Year Change
2009 Q1 – 2019 Q1**

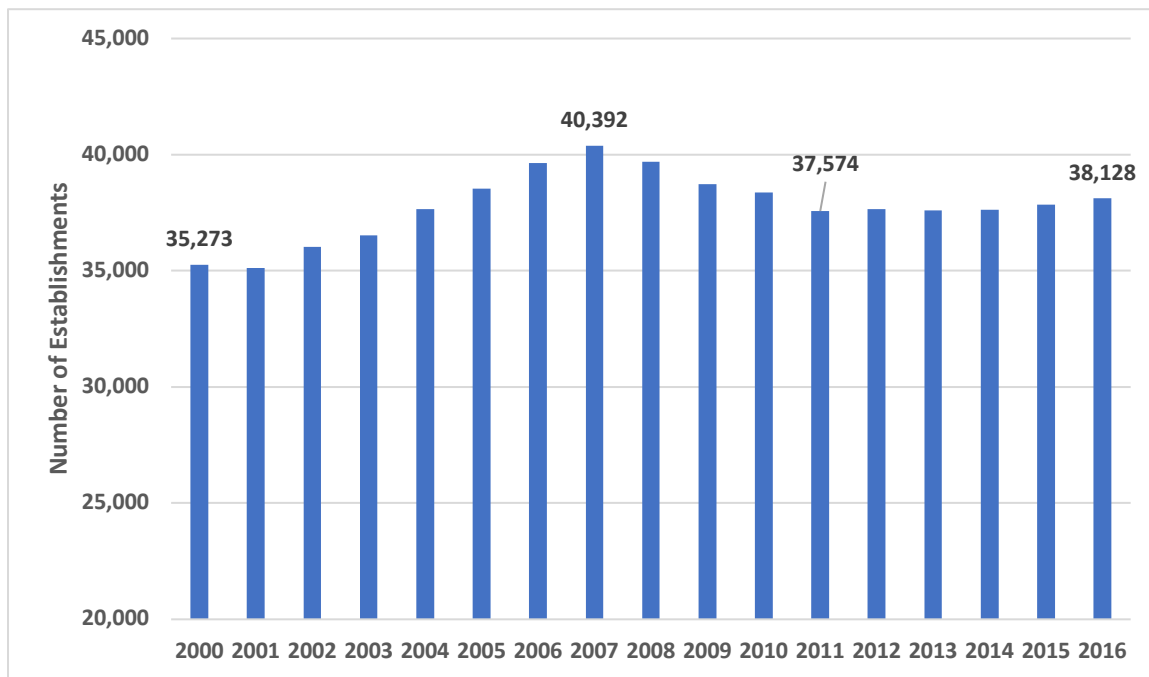


Source: JobsEq, GO Virginia Region 5 Industry Clusters as of 2019 Q1.

Challenge 3: Region 5 is Creating Small and Medium Sized Enterprises (SMEs) at a Pace Far Below its Peer Metro Areas.

An establishment is a single physical location where business is conducted or where services or industrial operations are performed. A region's economic activity is not only reflected in the value of output and the number of individuals employed by businesses but also in whether the number of establishments is growing over time. Figure 14 illustrates that, at the start of the century, establishment growth in Region 5 reflected economic performance. However, the number of establishments in Region 5 peaked at 40,000 establishments in 2007. During the Great Recession and its aftermath, the number of establishments fell, reaching its nadir in 2011. While there has been some recovery from the trough in 2011, the number of establishments in Region 5 in 2016 was still 5.6 percent below the 2007 peak.

**Figure 14 - Number of Establishments in Region 5
2000 – 2016**



Source. U.S. Census Bureau, *County Business Patterns* and Dragas Center for Economic Analysis and Policy.

Table 12 presents the annual establishment growth for Region 5, other GO Virginia Regions, Virginia, and the United States. A familiar story emerges from this data. From 1990 to 1999, establishment growth in Region 5 was positive, yet Region 5 ranked only ahead of the Eastern region. The impact of the Great Recession is clearly seen in establishment growth from 2000 to 2009, with Region 5 maintaining its pace of establishment growth while the United States' growth slowed dramatically. Only the Northern, South Central, and Central regions had

establishment growth rates higher than the national and state average this decade. Several regions exhibited contractions in establishments from 2010 to 2016. At the state level, the slower pace of establishment creation reflected the tepidness of the Virginia economy for this period.

Table 12 - Annual Average Establishment Growth, U.S., Virginia, and GO Virginia Regions 1990 - 2016

	Annual Establishment Growth 1990-1999	Annual Establishment Growth 2000-2009	Annual Establishment Growth 2010-2016
United States	1.4%	0.6%	0.8%
Virginia	1.7%	1.1%	0.6%
Southwest	1.2%	-0.9%	-1.2%
West Central	1.5%	0.5%	-0.4%
Southside	1.6%	-0.3%	-1.1%
South Central	2.7%	2.0%	0.8%
Hampton Roads	1.0%	1.0%	-0.1%
Eastern	0.3%	0.2%	0.3%
Northern	2.6%	1.9%	1.6%
Valley	1.2%	0.9%	0.0%
Central	2.0%	1.3%	0.5%

Source. U.S. Census Bureau, County Business Patterns and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate

Table 13 presents establishment growth rates by jurisdiction for Region 5. Focusing on the current decade, only Suffolk and Williamsburg had establishment growth rates in excess of the national average. Williamsburg's establishment growth rate from 2010 to 2016 of 2.1 percent was over 3 times greater than the state average and over twice the national average. However, this is a recovery from a contraction in the previous two decades rather than an expansion from previous growth. Of particular concern is the contraction in the number of establishments in 9 of the 16 jurisdictions in Region 5 from 2010 to 2016. The loss of establishments in these jurisdictions is another sign of lagging economic activity and, in many cases, corresponds to slow (or declining) population and employment growth. Creating the environment to spur establishment creation is a key challenge for Region 5.

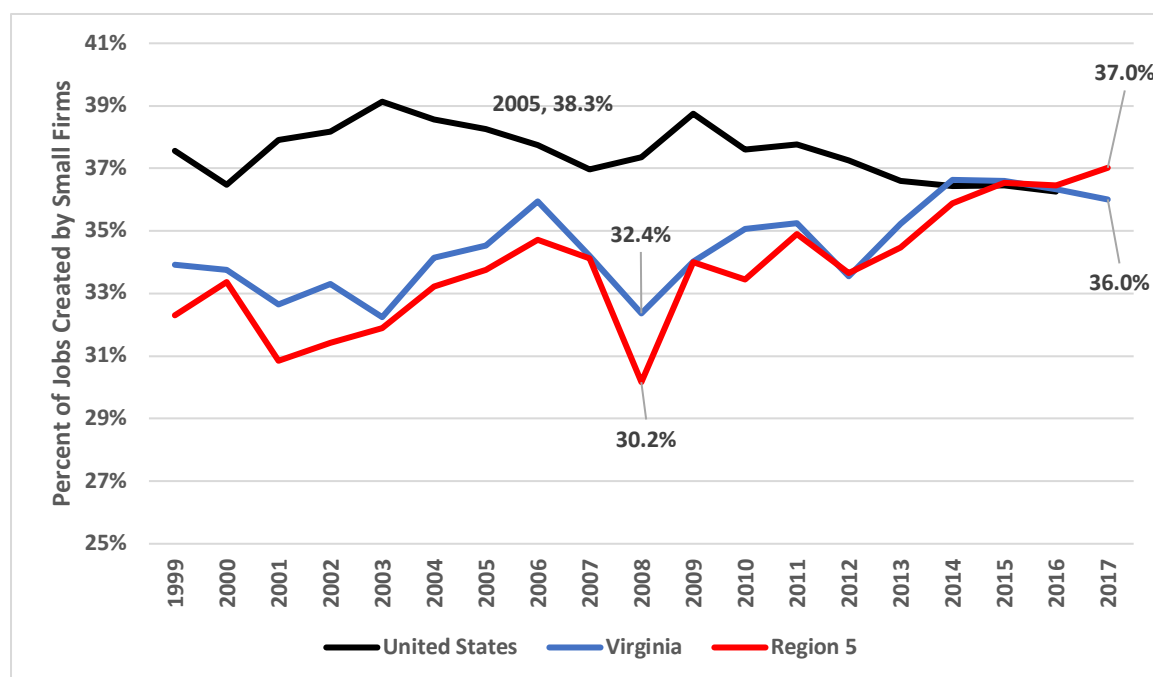
Table 13 - Annual Average Establishment Growth, U.S., Virginia, and Region 5 Localities 1990 - 2016

	Annual Establishment Growth 1990-1999	Annual Establishment Growth 2000-2009	Annual Establishment Growth 2010-2016
United States	1.4%	0.6%	0.8%
Virginia	1.7%	1.1%	0.6%
Region 5	1.0%	1.0%	-0.1%
Accomack	1.2%	0.2%	-2.0%
Franklin	2.7%	2.5%	0.5%
Isle of Wight	1.6%	2.2%	-0.1%
James City	12.8%	5.4%	0.7%
Northampton	0.4%	0.5%	-1.2%
Southampton	2.8%	-1.6%	-1.1%
York	5.5%	2.4%	-0.6%
Chesapeake city	3.4%	2.0%	0.0%
Hampton city	0.0%	-0.2%	-0.3%
Newport News city	0.4%	0.3%	0.1%
Norfolk city	-1.2%	0.8%	-1.5%
Poquoson city	0.5%	2.5%	-1.8%
Portsmouth city	-0.6%	0.9%	-1.0%
Suffolk city	0.7%	2.9%	1.0%
Virginia Beach city	1.7%	0.7%	0.5%
Williamsburg	-4.7%	-5.5%	2.1%

Source. U.S. Census Bureau, County Business Patterns and Dragas Center for Economic Analysis and Policy. Annual growth rate is the Compound Annual Growth Rate

Small firms create new jobs. Historically, small firms that employ fewer than 9 employees in Region 5 have generated a smaller share of new jobs than the national average. This historical trend, however, appears to be reversing in recent years. Figure 15 illustrates the contribution of private sector small firms to job creation in the U.S., Virginia, and Region 5.

**Figure 15 - Percent of Jobs Created by Small Firms, U.S. Virginia, and Region 5
Firm Size – 0 to 19 Employees
1999 – 2017**



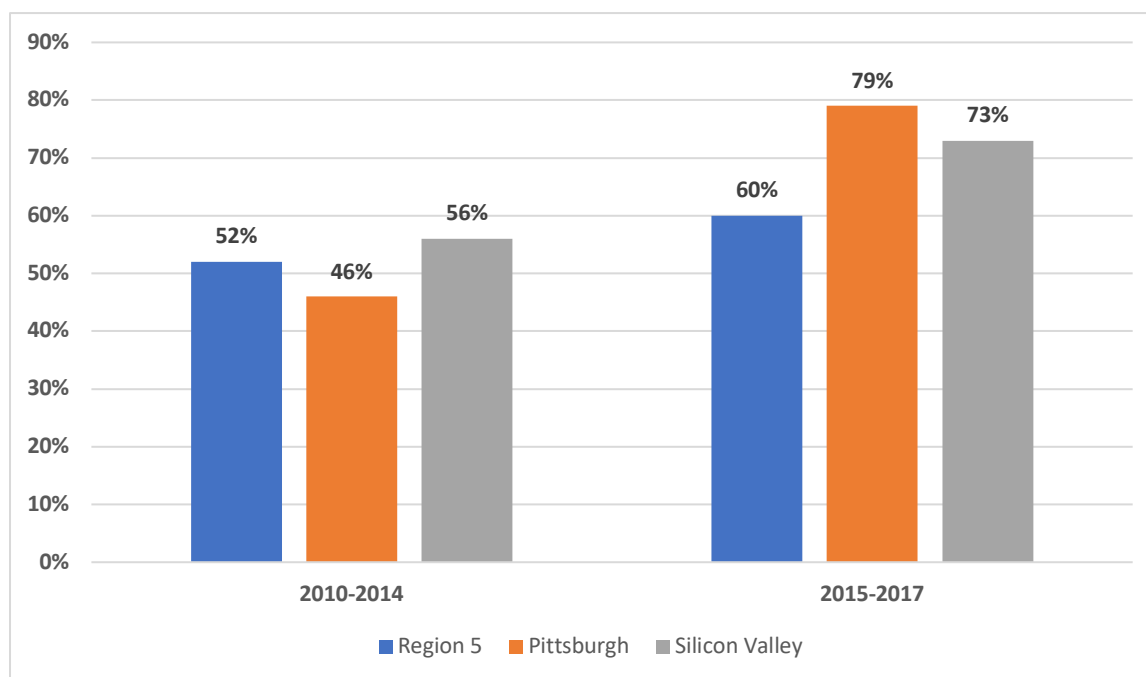
Source. U.S. Census Bureau, Quarterly Workforce Indicators and Dragas Center for Economic Analysis and Policy. Annual averages. Data for 2017 are not available for the United States. Private sector firms only.

Historically, small firms have contributed approximately 37.5 percent of new jobs in the United States. From 1999 to 2012, small firms in the Commonwealth and Region 5 contributed a smaller share than the national average, illustrating the role of larger firms in job creation. Since 2012, however, job creation by small firms has risen as a proportion of all jobs created and Region 5 exceeded the national average in 2016. However, there is a note of caution. As illustrated in Figure 15, small firm job creation for the nation in 2017 was approximately 10 percent below the peak of 38% in 2005. The recent improvement in job creation from the trough of 2008 is a welcome bit of good news for Region 5.

Young firms, defined as firms 5 years or younger, are the greatest source of job creation each year in the United States. The most vibrant, dynamic economic regions of the country also have very high levels of young firm job creation. Figure 16 looks at the share of young firm net job creation for three regions of the United States (Region 5, Pittsburgh, PA and Silicon Valley) for two separate time periods in the last decade. Region 5 has experienced a healthy increase in the share of jobs created by young firms in the last two years. About 60% of all jobs are being created in young firms compared to about 52% in the early years of the decade. However, when compared to Pittsburgh and Silicon Valley, Region 5's share seems paltry. In the last two

years, 79% of Pittsburgh’s jobs and 73% of Silicon Valley’s jobs have been generated by young firms. Region 5 has a long way to go to create the dynamism it needs, though the region is trending in the right direction.

**Figure 16 - Net Job Creation by Young Firms for Region 5, Pittsburgh, and Silicon Valley
Share of Total Net Job Creation
2010-2017**



Source: U.S. Census Bureau, Quarterly Workforce Indicators

The pace of job creation by small firms and young firms has recently improved. However, the Virginia Beach – Norfolk – Newport News MSA still performs poorly when compared to other metropolitan areas in the nation. A 2016 innovation index developed by Indiana University Business Research Center showed that the Hampton Roads MSA ranked 256 out of 380 metropolitan areas in the U.S. in change in establishment births to total establishments.⁹ This ranking suggests a below average business environment.

The relative lack of economic dynamism is not new. The reliance on federal spending, the Port of Virginia, manufacturing, and tourism are strengths that provide robust growth when federal spending, trade, and overall economic activity in the U.S. are increasing. On the other hand, the dominance of these sectors ‘crowds out’ entrepreneurial activity and the region lacks a distinct entrepreneurial culture that is separate from the pillars of the economy. This will remain a long-

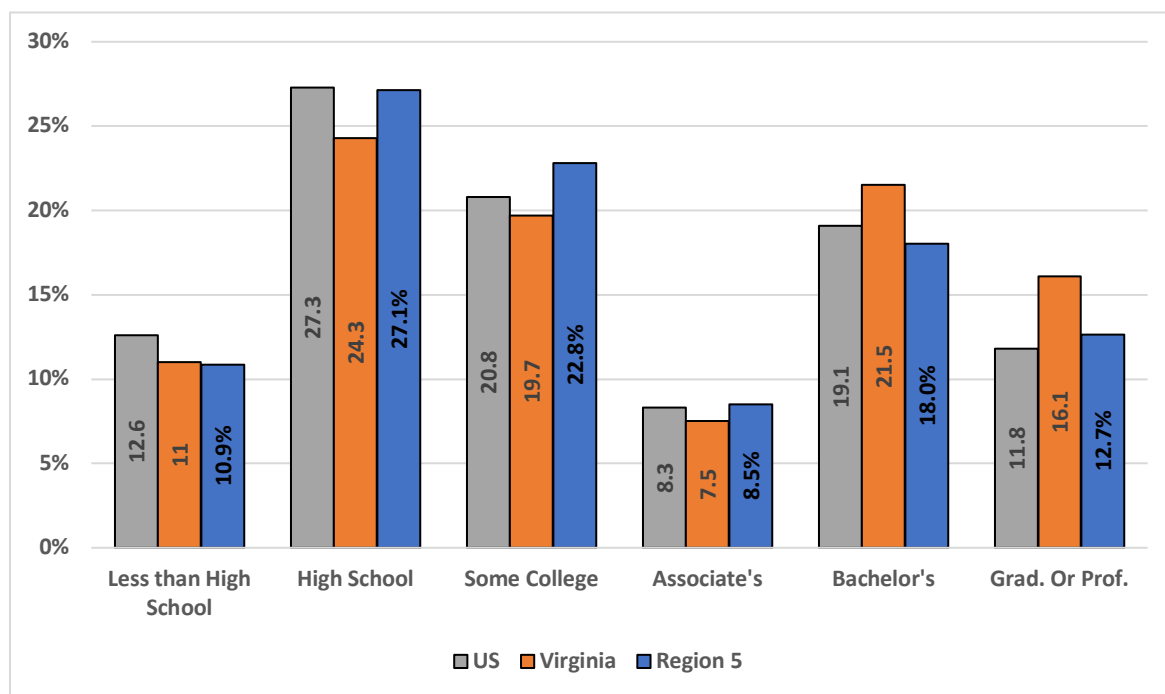
⁹ <http://www.statsamerica.org/ii2/overview.aspx>

term challenge to foster innovation and clusters separate from the traditional foundations of the economy to spark business creation and job creation.

Challenge 4: Region 5 is Not Creating a Workforce for the Next-Generation Knowledge-Based Economy at a Quick Enough Pace.

Workforce development is a challenge. A region must produce and retain skilled workers at all levels of education. Failing that, a region must attract workers from other regions, or else its workforce will fail to grow and adapt to the evolving needs of employers. Figure 17 shows that in 2017, 30.7 percent of adults age 25 and older in Region 5 had at least a 4-year degree. This is only slightly below the national population but lags the Commonwealth.

**Figure 17 - Educational Attainment of Population Aged 25 Plus
United States, Virginia, and Region 5
Year End 2017**



Source: U.S. Census Bureau, 2013 – 2017 American Community Survey and Dragas Center for Economic Analysis and Policy. Region 5 is the average educational attainment of the jurisdictions in the region.

When compared to other metropolitan and micropolitan areas in the U.S., the Hampton Roads MSA ranked 128 out of 388 with regards to the share of the population age 25-plus with at least

a bachelor's degree.¹⁰ The percentage of the population with at least a bachelor's degree increased by 4.2 percentage points from 2007 to 2017. The region experienced a 3.2 percentage point increase in its population share with at least a bachelor's degree for this period. The increase in the population with a bachelor's degree was sufficient to rank the Hampton Roads MSA 83rd out of 388 regions. If the desire is to attract and retain college-educated workers, this is good news for the metropolitan area.

Table 14 illustrates the distribution of education attainment for regions in Virginia. Region 5's education distribution is 'skewed right' with respect to the median level of education in the Commonwealth. More of the population of Region 5 had an Associate's degree, Bachelor's degree, or Graduate or Professional degree than many other regions in Virginia in 2017. Northern Virginia (60.6 percent), Central (39.5 percent), and Hampton Roads (39.2 percent) were the top three regions in terms of the percentage of population age 25 and older with at least an Associate's degree.

**Table 14 - Educational Attainment of Population Aged 25 Plus
United States, Virginia, and GO Virginia Regions**

	Less Than High School	High School Graduate	Associate's Degree	Bachelor's Degree	Graduate or Prof. Degree
United States	12.6%	27.3%	8.3%	19.1%	11.8%
Virginia	11.0%	24.3%	7.5%	21.5%	16.1%
Southwest	20.0%	35.3%	8.8%	9.7%	5.0%
West Central	12.7%	32.3%	9.2%	15.1%	9.8%
Southside	20.1%	35.6%	7.8%	9.7%	5.8%
South Central	15.2%	33.2%	7.6%	14.7%	8.1%
Hampton Roads	10.9%	27.1%	8.5%	18.0%	12.7%
Eastern	11.3%	31.6%	7.6%	16.7%	10.6%
Northern	9.6%	15.3%	5.9%	28.7%	26.0%
Valley	14.7%	34.1%	6.7%	15.0%	10.4%
Central	11.9%	28.9%	6.6%	18.5%	14.4%

Source: U.S. Census Bureau, 2013 – 2017 American Community Survey and Dragas Center for Economic Analysis and Policy. Regional averages are the educational attainment of the jurisdictions in each region.

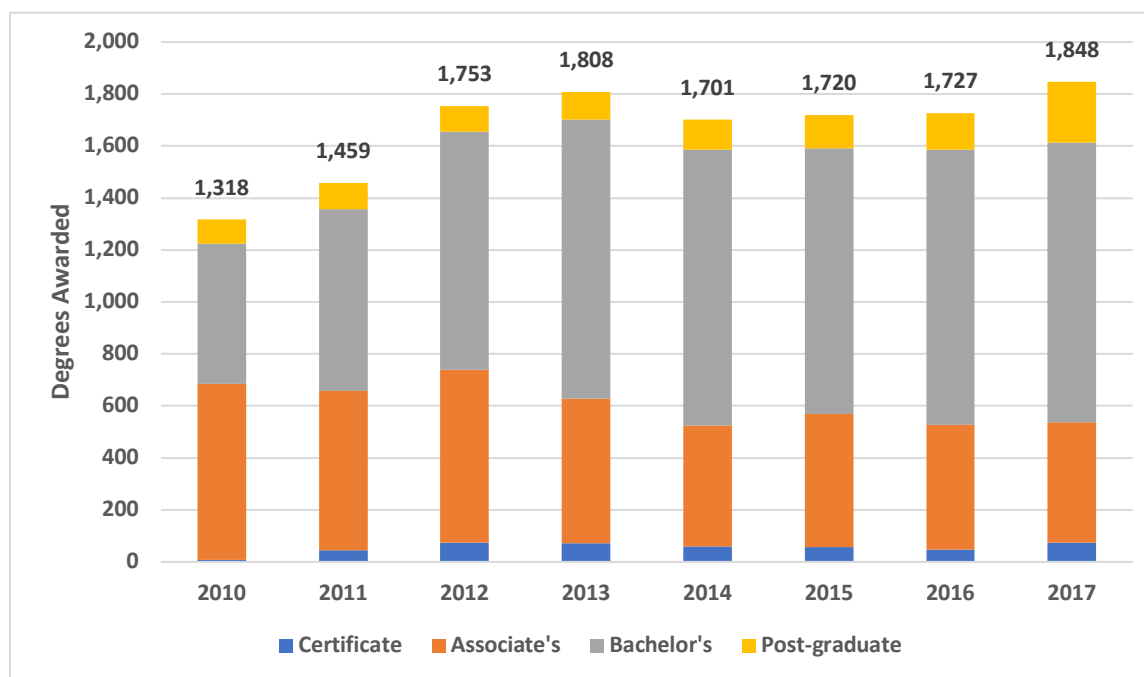
¹⁰ <https://ssti.org/blog/useful-stats-educational-attainment-metropolitan-area-2007-2017>

Within Virginia, Region 5 has the third highest proportion of residents who hold an Associate's degree (8.5 percent). This is a decline from previous surveys of the population, in part because more of the population now hold 4-year and higher degrees. Several of the region's core industry clusters such as advanced manufacturing and ship building and repair rely heavily on skilled workers. Developing a skilled trade workforce relies, in part, on the ability of community colleges to produce graduates in the trades. Maintaining and expanding these programs that enable graduates to enter the workforce with an Associate's degree is a crucial element of any workforce development strategy.

The 2017 Growth and Diversification Plan for Region 5 cautioned regional leaders about the shortage of local degree awards in occupations that we would consider STEM (Science, Technology, Engineering and Mathematics) related. These skills are considered the skills of the future and, while these skills have traditionally been seen as purview of higher education, STEM skills are becoming ubiquitous at all levels of education.

Figure 18 presents the degrees awarded in a STEM subset, computer and math. Awards in Computer and Mathematical Occupations grew by over 40 percent this decade, with an almost 100 percent increase in Bachelor's degrees and an over 150 percent increase in post-graduate degrees. Associate awards, however, fell by almost 32 percent over the period, reflecting a shift towards 4-year and higher degrees. Finally, even though the number of computer and mathematical awards has increased, the region has not kept pace with Virginia. In 2010, the region awarded 22.9 percent of computer and mathematical degrees in the Commonwealth. By 2017, the share had declined to 20.8 percent.

**Figure 18 - Degrees Awarded in Computer and Mathematical Occupations
Hampton Roads Metropolitan Statistical Area, 2010 - 2017**

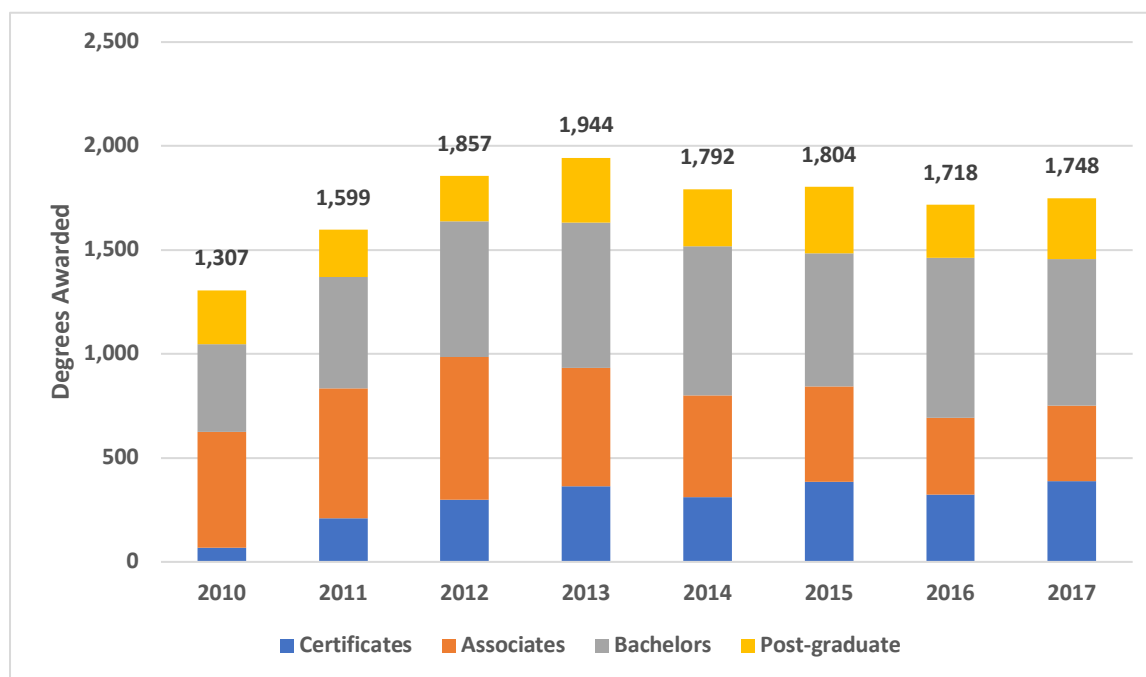


Source: JobsEQ. CIP Code 15-0000.

Another key educational area for the region is Engineering. All of the 6 priority clusters in Region 5 have significant workforce demands in engineering and engineering-related fields. The region's advanced manufacturing cluster's success will, in part, depend on the ability of the region to produce graduates able to work in the cluster. Figure 19 shows that awards peaked at 1,944 awards in 2013 and were 1,748 in 2017. The composition of awards has shifted towards certificates and 4-year plus degrees and away from Associate's degrees. Certificate awards have risen by 471 percent this decade, followed by Bachelor's (66 percent), and post-graduate awards (12 percent). Awards of associate degrees fell by 35 percent this decade. This reflects a continued evolution of the workplace where workers and businesses appear to prefer certificates focused on a specific topic instead of the Associate's degree program. Lastly, as a share of total awards in the Commonwealth, the region's awards rose from 22.8 percent in 2010 to 24.5 percent in 2017.

The region has distinct advantages with a cluster of higher education institutions that are working to forge partnerships with industries. The level of human capital in the region has risen this decade and the number of education awards is near a historical high, however even with these supply increases, gaps remain. Section 6 will provide a more detailed look at cluster occupations that face critical shortages.

**Figure 19 - Engineering and Engineering Technologies and Engineering-Related Fields
Hampton Roads Metropolitan Statistical Area, 2010 - 2017**

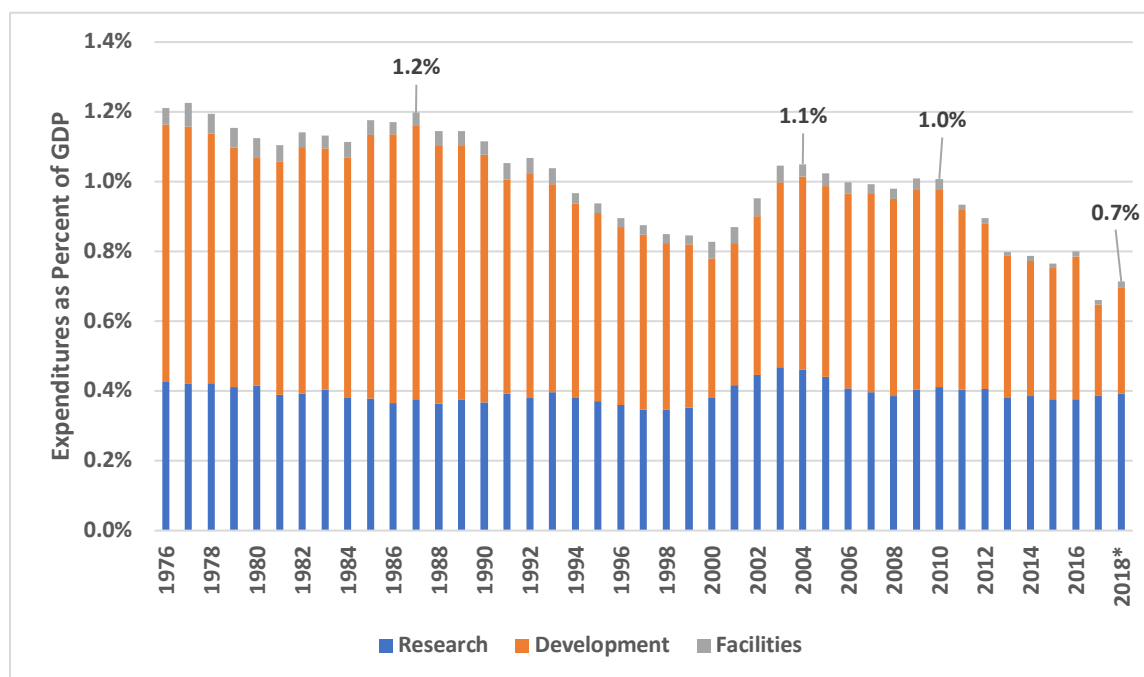


Source: JobsEQ.

Challenge 5: Region 5 Lacks a Deliberate and Coordinated Innovation Strategy

Innovation in Region 5 continues to lag other peer metropolitan areas. Part of the reason could be the substantial decline in real federal research and development expenditures (R&D). Figure 20 shows that federal R&D expenditures have declined as a percent of GDP, from a peak of 1.1 percent in 2004 to 0.7 percent in 2018.

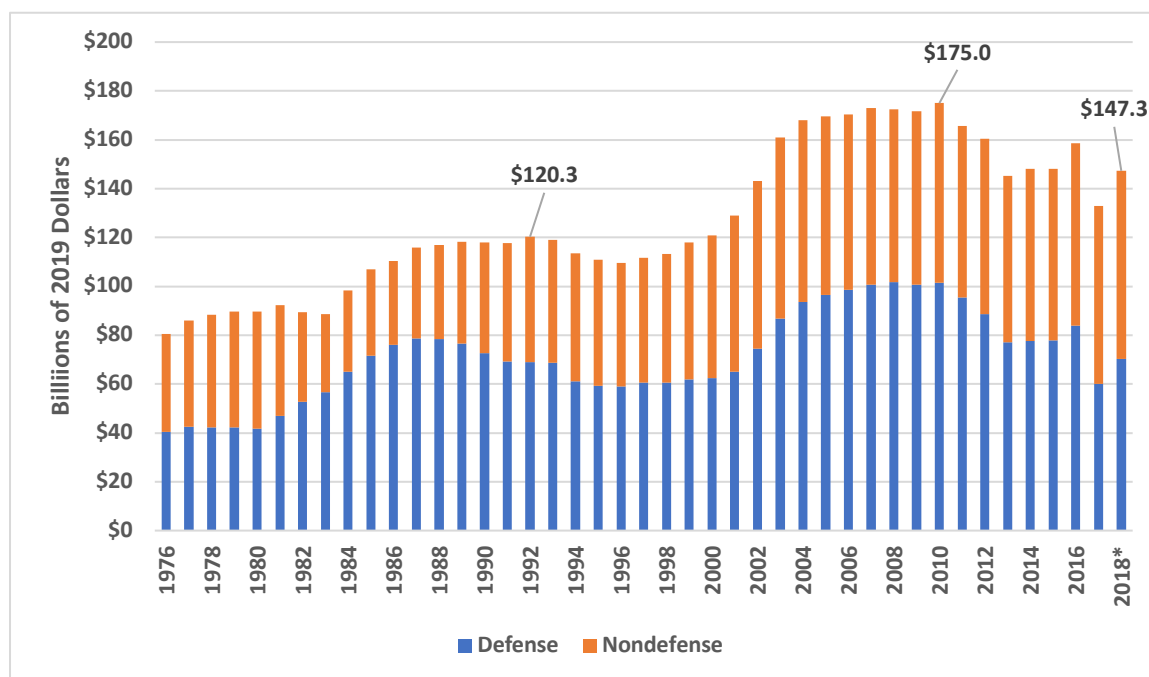
**Figure 20 - Federal Research and Development Expenditures as Percentage of GDP
FY 1976 – FY 2018**



Source: American Association for the Advancement of Science (2019), <https://www.aaas.org/programs/r-d-budget-and-policy/historical-trends-federal-rd>

Given the region's ties to federal spending, specifically defense spending, it is highly probable that changes in federal R&D expenditures influence the pace of innovation and growth in the regional economy. Figure 21 shows that real federal defense R&D expenditures declined 30.8 percent from FY 2008 to FY 2018. For the same period, real non-defense R&D expenditures increased by 8.8 percent.

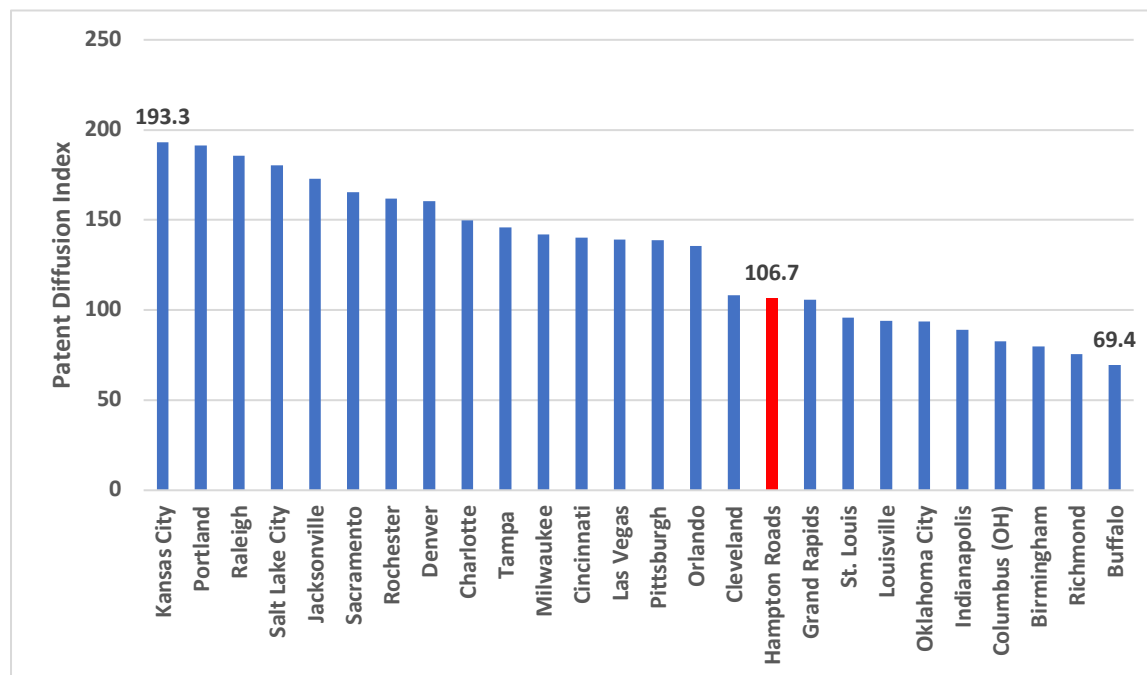
**Figure 21 - Real Federal Defense and Nondefense R&R Expenditures
FY 1976 – FY 2018***



Source: American Association for the Advancement of Science (2019). *Note the federal government changed account for development expenditure recently, see: <https://www.aaas.org/programs/r-d-budget-and-policy/historical-trends-federal-rd>

One measure of a region's innovative activity is the Patent Technology Diffusion Index. The index measures the number of patents in a metropolitan area and the generality of the patents. A region with more patents that are more generalizable will have a higher index than a region with less patents or patents with limited application. Regions with higher index values should have more innovative activity in the future. The Hampton Roads metropolitan area ranks 163rd among metro areas, lower than many of its peer metros. Relatively low patent volume most explains the low index value for the Hampton Roads metro area. Figure 22 displays Hampton Roads MSA's index relative to peer MSAs.

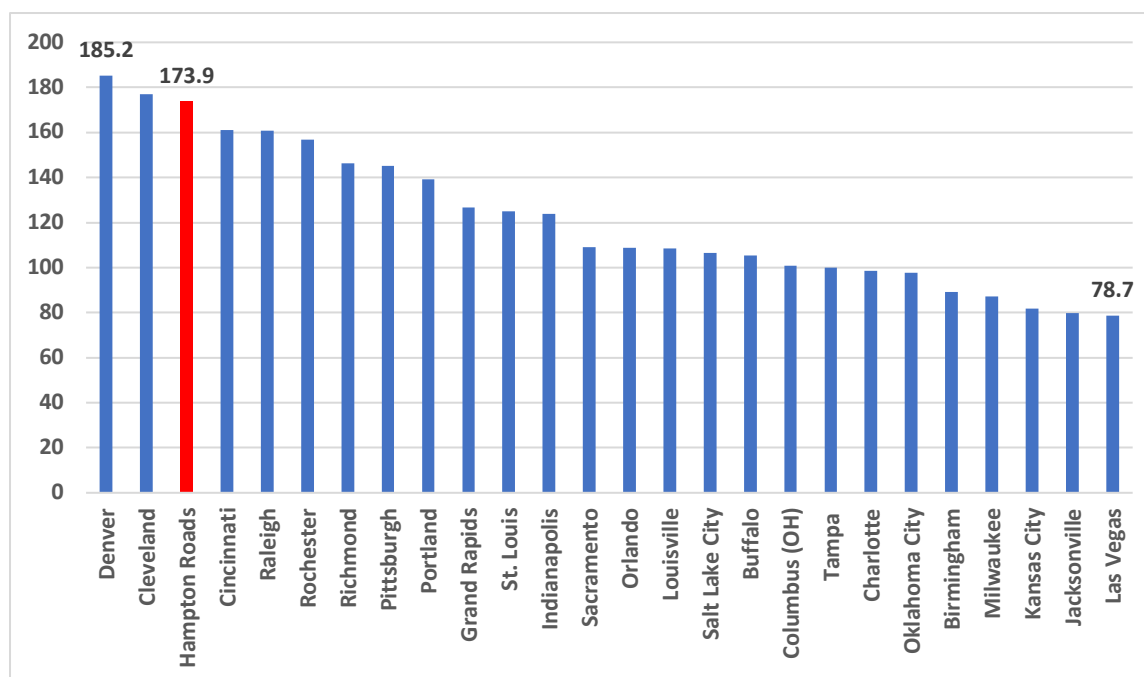
Figure 22 - Patent Technology Diffusion Index by Selected Metropolitan Area



Source: StatsAmerica, <http://www.statsamerica.org/ii2/overview.aspx>

Ideally, university research can foster innovation and economic development. University research is, in general, less driven by profit and thus the results should be more readily disseminated in the local economy. University research can foster formal and informal research, meetings, and the formation of social networks that contribute to the formation and sustainment of an innovative culture. Figure 23 presents the University-Based Knowledge Spillovers index for the Hampton Roads metropolitan area and its peer competitors. The Hampton Roads metropolitan area ranks 35th among metros in the U.S., a relative high ranking. However, care must be taken in that one dimension of the index is the distance of higher education institutions to the region. The region scores high not because of large levels of university R&D spending but because of the geographical concentration of universities in the region with R&D spending. The distance from the College of William and Mary to Hampton University to Old Dominion University and Norfolk State University is relatively small compared to many other metro areas. While these higher education institutions provide an opportunity for innovation spillovers throughout the region, many of the innovation metrics for the region suggest that the knowledge generated by universities is not sparking innovation in the private sector.

Figure 23 - University-Based Knowledge Spillovers Index by Selected Metropolitan Area



Source: StatsAmerica, <http://www.statsamerica.org/ii2/overview.aspx>

Following a lost decade, Region 5 is finally emerging from the shadows of the Great Recession and the sequestration of federal spending. Over the last three years, economic activity has increased, in large part due to increases in federal spending. Employment is rising, unemployment is near historical lows, and establishment levels have rebounded from post-recession lows. Region 5, however, remains reliant on the vagaries of federal policy and with the U.S. economic expansion now in record territory, one must reasonably ask how long the good times will last.

Significant challenges remain for Region 5 in this biennial update. Slowing population growth constrains the growth of the labor force. In some cases, poor economic performance has led to contractions in population, which, in turn, lowers economic activity. In other cases, economic performance is increasing but remains below the state and national average. Finally, the improving economy is starting to put specific workforce strains on the region. So, while the economic conditions of Region 5 appear to be modestly improving, there is still a great deal of work needed to overcome the lost decade.

Section 3: Recent Non-Go Virginia Initiatives in Region 5

Since the inception of the Go Virginia grant program, Region 5 has received grant funding for 7 per-capita projects.

- Hampton Roads Cyber Alliance Program
- Virginia Digital Shipbuilding Program
- The Hampton Roads Unmanned Systems Park
- Hampton Roads Coalition for Talent Development 757 Seed Fund
- 757 Angels
- Accomack/Norhampton Sewer and Sites Study

In addition, Region 5 has seen a number of complimentary, non-Go Virginia initiatives start since 2017. In this section we provide an overview of each of these projects and how they fit into the original Growth and Diversification Plan. Due to space considerations we have only been able to include a small set of projects in this report. However, the Go Virginia Board is likely to recommend that this section is included in each and every biennial update. As a result, the region will be able to create an inventory of additional projects and how they complement the Go Virginia projects funded.

Project Development Process

The following background and project development process is described below.

Reinvent Hampton roads, the support organization for the Region 5 regional Council, formed at the same time the GO Virginia Coalition launched statewide, both with a similar mission to create and grow more, higher paying jobs. Following a study of the Hampton Roads economy conducted by Dr. Stephen Fuller, of George Mason University and Dr. Larry “Chip” Filer of Old Dominion University, two *Hampton Roads Call to Economic Action* events were held on December 13, 2016. Over three hundred participants gathered to better understand the condition of the regional economy and collective challenges and come up with collaborative ways to fundamentally alter the region’s economic profile and performance over time.

This work provided the foundation necessary to identify the strengths and gaps that would be filled by the Virginia Growth and Opportunity initiative. With the active engagement of multiple regional partners and individual champions early in the process, focus would be placed on workforce development, scaling up existing business, building a strong entrepreneurial ecosystem, infrastructure and site readiness. Successful initiatives by Reinvent Hampton roads and our regional partners in these areas are reported in the local media, thereby encouraging additional Go VA applications.

GO Virginia project ideas are encouraged and emerge from presentations to local governments, business and non-profit organizations made by Reinvent Hampton Roads President & CEO Jim Spore as well as the connections and relationships established through Region 5 regional Council members, the RVA/Hampton Roads Collaborative, regional Workforce Councils, Chambers of Commerce, regional and local economic development offices. Groups like 757 Angels and 757 Accelerate are exploring project ideas as called for in the Region 5 Teconomy Report.

Anyone interested in applying for a GO Virginia grant can go to the Reinvent Hampton Roads website for grant guidelines, scoring criteria and access to enhanced capacity building (administrative approval), per capita, and competitive grant applications. Reinvent Hampton Roads staff is available to walk them through the application process and answer any questions.

Application deadlines are scheduled on month prior to a Regional Council meeting. Once an application is received and reviewed by Reinvent Hampton Roads staff, it is shared with the appropriate five to six-member Subject Matter Review Committee (Site Development & Infrastructure, Talent Development and Credentialing, or Entrepreneurial Eco-System, R&D, and Accelerator). If multiple grants are considered and there are limited funds available, an eight-member General Project Review Committee is in place to consider all applications and provide recommendations to the Regional Council for consideration. Grant applicants are invited to pitch their project before the Subject Matter and General Project Review Committees. If an application is not approved by the Regional Council to go before the GO Virginia State Board, or if it is approved the regional level but denied by the State, Reinvent Hampton Roads staff members will work with the applicant to consider other funding options or help them build a stronger program for future GO Virginia funding. No matter the outcome, relationships built in the process continue.

Virginia Institute for Spaceflight and Autonomy

In the 2019 General Assembly session, Old Dominion University received funding to establish the Virginia Institute for Spaceflight and Autonomy (VISA). VISA will be based at Wallops Island to focus directly on commercialization of translational research and to provide direct support for the growing entrepreneurial, commercial, government, and academic innovation ecosystem around satellites, autonomous vehicles, sensors, and data analytics. VISA will work in close partnership with Virginia universities to more effectively advance and commercialize important emerging technologies related to: (1) design and prototyping of autonomous vehicles, sensors, and satellite payloads; (2) command, control, communications, and computational technologies for space-based and unmanned systems; and (3) data engineering for space-based and unmanned asset data. The sum of these activities will be translational technologies entering the commercial marketplace that provide improved access to space-based and unmanned asset data.

Thomas Jefferson National Lab and the Electron Ion Collider (EIC)

Perhaps the most unique economic opportunity for Region 5 over the next decade involves the effort by Jefferson Lab to secure the funding to build the Electron Ion Collider at their current Newport News facility. In 2015, the Nuclear Science Advisory Committee recommended that an EIC be built in the United States. Two national labs (Brookhaven in New York and Jefferson Lab) are developing proposals to host the EIC. The science and R&D behind the construction of an accelerator of this type will, itself, produce interesting insights and possible commercializable technology, but as with the development of CERN's Large Hadron Collider (LHC) it is difficult to fully predict the innovations and scientific breakthroughs that an EIC may bring. However, we do know that the experiments within EIC will require significant advances in computing power, data analytics, and data visualization. A decision on the project is anticipated in 2020.

Maritime Industrial Base Ecosystem (MIBE)

With the March 2019 release of the Navy's "Long-Range Plan for Maintenance and Modernization of Naval Vessels for Fiscal Year 2020" and its concurrent near-term maintenance availability forecast for Hampton Roads, this region has an opportunity to expand its economy by helping ensure a 355-ship naval fleet that is ready, relevant, and sustainable. In seizing this opportunity, MIBE's goal is to secure Hampton Roads' status as a national center of excellence for shipbuilding and repair with unmatched capacity. MIBE will realize this opportunity via a trained, dynamic workforce, modern techniques, expansive supplier base, and focus on quality and schedule. This ecosystem's rich industrial base features companies large and small, academic resources, workforce visionaries, federal labs, labor purveyors, and local government promoters of innovation; these are the maritime stakeholder categories from which the MIBE collaborative has been fashioned to seize mission-driven economic opportunity. MIBE will assist the maritime supply-base in adopting modern production technologies and supply-chain management techniques as well as materially expand the availability of qualified tier 2-3 suppliers. Dedicated partnerships with Navy leadership – NAVSEA, Fleet Forces Command, and Military Sealift Command – will be developed to ensure shared, not duplicated, resources and open communication. Regional universities will open doors into lucrative defense R&D pipelines and will collaborate with the new "Navy University" to develop curriculum and tools to explore emergent technologies prioritized by the Secretary of Defense, such as machine learning, additive manufacturing, and augmented reality.

The Reorganization of the Hampton Roads Economic Development Alliance

Ambitious economic development in Hampton Roads requires a strong regionally focused lead entity. Hampton Roads' respective localities, private sector businesses, academic institutions and non-profits have all agreed that the Hampton Roads Economic Development Alliance (HREDA) should serve as the lead economic development organization and single point of contact for outside investors. As a result, the board of HREDA and the local economic development organizations (EDOs) drafted a new model for economic development in the

region. HREDA's previous mission was focused, almost exclusively, on business attraction. The new HREDA will contribute to economic vitality by providing assistance on several priorities: Workforce and Talent, Entrepreneurship, Clusters and Innovation, Infrastructure, Expansion and Retention, Foreign Investment, Sites and Real Estate, and Business Attraction. This new mission includes a new funding model where the public sector and private sector equally share in supporting HREDA. The commitment by regional partners to supporting a strong, vibrant HREDA will be a key to economic development in Region 5.

Hampton Roads Regional Connector Ring

Originally identified as a possible Go Virginia project, local governments under the coordination of the Hampton Roads Planning District Commission funded the development of a high-speed fiber ring connecting localities and major economic anchors. The project will be developed in three phases beginning in 2020 and the localities are in the process of creating a regional broadband authority to manage the network.

The Regional Branding Initiative

A major initiative is underway to professionally analyze and develop recommendations on the ways to better position, market and brand the region. This initiative is a broad-based partnership including the Chamber of Commerce, Reinvent Hampton Roads, and the HRPDC, and should conclude by end of 2019.

The Port of Virginia Expansion, Terminal Modernization, and Channel Improvement

Major improvements, capacity expansion, and the deepening/widening of the channel are either recently completed, underway, or planned at the Port of Virginia. These comprehensive and long-range improvements will dramatically strengthen this major pillar of the regional and statewide economy. In addition to the physical improvements, the ongoing implementation of the recommendations contained in the Port of Virginia Opportunity Analysis are ongoing to leverage the Port's capacity to attract additional economic opportunity to the region and Commonwealth.

The Regional Site Inventory and Certification Project

Without available sites that are ready for development, the region cannot hope to be successful in locating new or expanded businesses that will bring additional high-paying jobs to foster improved regional prosperity. In order to address the issue of adequate site availability, a collaborative initiative was formed between the Hampton Roads Planning District Commission, the Hampton Roads Economic Development Alliance, and Reinvent Hampton Roads. A site inventory was completed in cooperation with the local economic development agencies to identify sites containing 100+ acres with zoning that would allow industrial/commercial development. A second phase of the project is underway to focus on smaller sites (25 to 99 acres). In order to objectively analyze the inventoried sites and be able to enter them in the Virginia Economic Development Partnership listing, funding was contributed by the Port of Go Virginia Region 5 Biennial Update

Virginia, Virginia Natural Gas, Dominion Resources and Reinvent Hampton Roads to retain professional consulting services to certify the sites. This certification process is underway and will be completed by this fall. Once certification is completed, the sites will be prioritized based upon the likely development yield and cost to develop. Our intent is to leverage the Regional Infrastructure Facilities Authority created by the Go VA funded Unmanned Systems Park projected located in York County. Under this mechanism, site improvement costs necessary to develop higher priority sites could be voluntarily shared between any of our regional jurisdictions. Once development occurs, tax proceeds would also be shared among participating localities. This collaborative approach has the potential to greatly encourage localities to partner rather than compete for regional economic development.

The Regional Roadway Construction Package

The Region is underway on perhaps the largest package of roadway construction projects anywhere in the United States. These improvements to the Interstate system total well over \$5B, including new construction, reconstruction, or rehabilitation and will be completed by 2025. The magnitude and fast pace of these investments in improved mobility will help unlock Hampton Roads and contribute to the region's economic vitality and quality of life.

The Hampton Roads Talent Coalition

This partnership, described in more detail in Section 5, will carry forward the broad-based collaboration on workforce gaps and needs; the analysis of which was funded by the Hampton Roads Community Foundation, to comprehensively address workforce talent pipelines to meet business' need for a skilled workforce to meet current and future needs.

The OpenSeas Maritime Technology Hub

Old Dominion University (ODU), the Virginia Institute of Marine Science (VIMS) and the College of William and Mary have partnered to create the OpenSeas Technology Innovation Hub. The Hub will serve as a catalyst and convener for innovative concepts related to all aspects of living and working on and near the water and it will be heavily focused on three industry clusters – maritime, shipping and logistics; aquaculture and fisheries; and flood mitigation and resilience.

Section 4: A Review of the Region's 6 Priority Clusters

The original 2017 Growth and Diversification Plan for Region 5 established 6 priority clusters:

1. Port Operations, Logistics and Warehousing
2. Advanced Manufacturing
3. Cyber Security, Data Analytics and Mod-Sim
4. Shipbuilding and Ship Repair
5. Water Technologies
6. Unmanned Systems and Aerospace

These six clusters remain a priority for Region 5 in this biennial update. Indeed, three of the four Go Virginia per-capita grants awarded to-date by Region 5 fall into three of these categories. The two projects anchored by ODU create workforce strategies in Cyber Security and Digital Shipbuilding. The unmanned systems park project led by York County and the Virginia Peninsula Chamber Foundation creates a facility for research and testing of unmanned systems.

For the purposes of this update, the regional council has no additional clusters to add. However, there were three clusters mentioned in the original plan by Region 5 that held some promise. Business and Professional Services, Life Science and Tourism and Hospitality were considered in 2017 but eliminated from the final set of six clusters.

There is ongoing discussion about adding life science as a cluster to Region 5. Since the original plan was submitted, there has been a notable increase in life science activity. However, the region has an uphill climb to become a major player in the life science field. National Institutes of Health awards are often used as a measure of a region's activity in life science. Why is this the case? Several of the grant programs run through NIH are specifically targeted at developing technologies for market. For the 2018 fiscal year, Region 5 received 3 total awards all by The College of William and Mary. By comparison, Virginia Commonwealth University (located in Region 4) had 230 awards alone in fiscal 2018 totaling over \$82 million.

The challenge to become a major player in life science is steep. However, Region 5 does have some niche opportunities in health and health services that should be explored. Virginia Beach has begun an initiative to locate and grow life science companies in the city and 757 Angels is seeing a marked increase in the number of life science related companies seeking early stage funding. Also, the Commonwealth has retained a consultant to study a possible partnership among Eastern Virginia Medical School (EVMS), Old Dominion University, University of Virginia and Sentara. The findings from that study should enhance the life science cluster as well.

Tourism and hospitality is another cluster that receives a great deal of regional attention. This cluster is considered one of the three main pillars of the Region 5 economy (along with military and the port). So, why is it not included as a priority cluster? The issue is average wage in the industry. Go Virginia has an unwavering goal of creating jobs with wages above the regional median. A majority of the occupations that support tourism pay below median wage, so it would be challenging to get support for a Go Virginia initiative in this cluster.

Business and Professional Services is a vital cluster to the area. In fact, this cluster contains the largest employment of any of the clusters. The reason for its omission, originally, is that most of the occupations in this cluster are actually supporting the financial and legal needs of the priority clusters. All of the data suggests this is still the case. The region will continue to consider opportunities for growth in business services that support the priority clusters. Occupations like maritime law, maritime insurance, cyber insurance and resilience engineering are good examples.

Section 5: Examining Workforce Gaps in the Priority Clusters

In late 2018, The Hampton Roads Workforce Council retained the services of the Council for Adult and Experiential Learning (CAEL) and Avalanche Consulting to produce a talent alignment strategy. As part of their scope, the consultants agreed to use Go Virginia Region 5 as the geographic study region (instead of Hampton Roads, or the Workforce region) and the consultants agreed to examine industrial clusters that closely (though not perfectly) matched the priority clusters in the original growth and diversification plan. The final report ***“The Hampton Roads Talent Alignment Strategy Initiative”*** was released on June 25th and the results of the gap analysis are presented in this section. The workforce gaps presented here represent gaps between Region 5 demand and Region 5 supply. So, we are measuring the ability of local programs to satisfy the local demand. Large shortages must be made up by increasing the flow of workers through the existing local pipeline or by importing talent from other regions.

It is important to note that not all of the findings from the Hampton Roads Workforce Council report are relevant to this Go Virginia plan update. The *Hampton Roads Talent Alignment Strategy Initiative* report examined workforce gaps for occupations at any level of pay. Go Virginia has an explicit mission to create jobs that pay above the mean wage in a region. Therefore, the occupation gaps presented in this report are only those for significant occupation employment in a key cluster where the mean wage of the occupation exceeds Region 5’s overall industry mean wage of \$46,015.

Table 15 presents the most critical shortages in each cluster by minor group occupation.¹¹ For each cluster, we identify the specific occupations within the minor occupation group that have severe shortages or shortages. The only occupations listed are those that employ 200 or more workers within the cluster, thus we claim the shortage is critical.

As you can see from the table, the occupation areas often span multiple clusters making shortages particularly important to address. Engineering is the most critical shortage. Every cluster but Cyber has specific engineering shortages. Ship engineers, marine engineers, electrical engineers and aerospace engineers are the specific types needed across multiple clusters. Electrical engineers and environmental engineers are also at a shortage in the region.

Business occupations (specifically executives and accountants) represent a current shortage in four of the six clusters. Many of the other business occupations supporting the clusters are either in balance or surplus which is good news.

¹¹ Minor group occupation is defined as the 3-digit Standard Occupational Classification (SOC) occupation name obtained from the United States Bureau of Labor Statistics.

Advanced Manufacturing and Ship Repair and Shipbuilding face production occupation shortages, particularly in production supervisors and general machinists. The shortage in production supervisors is not surprising. For several years, human resource professionals working at firms in these clusters have been raising this concern. While many of the younger skilled workers at these firms are proficient in their trade, employers have been worried that these workers are not capable of moving into supervisory roles as the baby-boomers retire. Filling this demand over the next five years is crucial to the growth of these two clusters.

Finally, the cyber cluster currently faces three shortages in computer occupations – network systems analysts, security analysts, and software developers. Thankfully, in all three occupations the current shortages are smaller than projected shortages as recent as 2 years ago.

The last row of Table 15 provides shortage estimates for each of the occupations. These estimates reflect the amount of local demand for the occupations that is not being filled by local educational and certification programs. The gaps presented in Table 15 cover occupations with requirements across the educational spectrum. Production occupations face the largest shortage at 3,652. This is not surprising as the Region 5 economy is dominated by manufacturing, transportation and logistics. Most of this shortage is in occupations requiring less than a bachelor's degree. The next largest gap is in engineering occupations at 1,095. Unlike the occupations with gaps in production, the engineering gaps are composed of occupations that require bachelor's and advanced degrees.

Table 15 - Critical Occupation Gaps by Cluster

Severe Shortage and Shortage

Minor Occupations

	Engineering Occupations	Computer Occupations	Management Occupations	Business Occupations	Production Occupations
Cluster					
Port	Ship Engineer Marine Engineer Aerospace Engineer		Supply Chain Analysts		
Advanced Manufacturing	Electrical Engineers Drafters/Engineering Techs				Production Supervisors General Machinist
Ship Repair and Shipbuilding	Electrical Engineers Ship Engineer			Executives Accountants	Production Supervisors General Machinists
Cyber Security, Data Analytics and Mod-Sim		Network Systems Analysts Security Analysts Software Developers		Executives Accountants	
Water Technologies	Environmental Engineer			Accountants	
Unmanned Systems and Aerospace	Aerospace Engineer			Executives	
Estimated Shortage*	1,095	307	182	617	3,652

Sources: "The Hampton Roads Talent Alignment Strategy Initiative", JobsEQ and Dragas Center for Economic Analysis and Policy.

* Estimated Shortage is calculated as the amount of local demand for the occupation that is not being filled by local education programs.

Region 5 has some critical workforce gaps to address in the coming years. The talent alignment report produced by CAEL and Avalanche Consulting showed the majority of the severe were contained in middle-skill or low-skill occupations and mostly contained to advanced manufacturing and port operations, logistics and warehousing.

The shortages in middle-skill occupations are important, but this report focused on some of the critical shortages that exist in upper-skill, greater than mean-wage occupations. Broadly speaking, the results of Table 15 illustrate a general weakness in Region 5's ability to produce STEM oriented workers. This is not a new result. As illustrated by Figures 18 and 19 in the previous section, Region 5 has consistently struggled to produce STEM-oriented workers at a rapid enough rate. The region must fix this issue if it is to keep pace with the growth rates of its peers.

Section 6: Possible Strategies to Address Region 5's Economic Challenges

Non- GO Virginia Strategies

There are a number of possible strategies to consider in the near term for Region 5. Many of the possible projects are likely to be offshoots of the non-Go Virginia initiatives mentioned in Section 3. On June 26th, members of the Region 5 council held a brainstorming session to discuss possible projects that could be suitable for Go Virginia proposals. Projects like MIBE present wonderful opportunities for Go Virginia funding as they can leverage sizable federal match money and a set of already engaged corporate partners. In addition to augmenting the MIBE initiative, the group discussed submitting a proposal under the Regional Entrepreneurship Initiative (REI) program. Region 5 will use the REI grant to establish the framework for a coordinated and collaborative regional entrepreneurial ecosystem. This initiative directly addresses Economic Challenge 5.

Mega-Region Collaborative with Richmond

Region 5 is very interested in partnering with other regions on initiatives and Region 4 is a likely option. The RVA-Hampton Roads Megaregion Collaborative, which is focused on enhancing economic development and competitiveness in the RVA and Hampton Roads Regions, has been accelerated by GO Virginia. The 80 plus business and higher education leaders comprising the Collaborative believe that there are approximately 15 key areas in which they can work together to accomplish more than either region can do on its own. Some joint projects include:

- Campus RVA/HR – modeled after Campus Philly the Campus RVA/HR initiative would focus on retaining high quality talent exiting from the colleges and universities located between Richmond and Virginia Beach.
- I-64 Science and Technology Corridor – This initiative will create workforce development programs, innovation programs and commercialization opportunities in science and technology anchors along route 64 from Richmond to Virginia Beach. Some anchors include Virginia Commonwealth University, Old Dominion University, William and Mary, Jefferson Lab, NASA Langley and the proposed VABeach Bio Research Park.

Regional Industrial Facilities Authority Utilization

One very promising strategy to address Region 5's economic challenges is the result of other initiatives recently undertaken. Through a partnership between reinvent Hampton Roads, the

Hampton Roads Planning District Commission, the Hampton Roads Economic Development Alliance, Dominion Energy, and Virginia Natural Gas , a site inventory and certification project was funded and undertaken for the region. This process initially analyzed large economic development sites, defined as 100+ acres in size. Of the sites identified, none was certified as Tier 4 or 5 under the State's site readiness ranking system. Specific improvements have been identified for each site to advance the site to at least a Tier 4 designation. The region has now partnered with VEDP to inventory and certify sites in the 25 to 99-acre size. This work should be completed in September of 2019.

One important strategy now under consideration is the utilization of RIFA to assist in funding needed studies and necessary improvements in order to truly create an inventory of sites with readiness rankings of Tier 4 or 5. This can be quickly accomplished through the possible expansion of the RIFA that was created as part of the previously funded GO Virginia Grant for the Unmanned Systems Park on the Peninsula. Significantly, not only the costs to increase site readiness could be shared; but revenues generated as well upon the development of the certified economic development sites. This would represent a game changer for the region in terms of collaboration and economic development.

Section 7: Concluding Remarks

This report serves as Region 5's biennial update to its initial Growth and Diversification Plan. Overall, Region 5 has seen improvement in its base economic conditions over the last two years, but it is too soon to determine if this is a long-term trend. GDP growth appears to have finally rebounded. Region 5 saw GDP growth of 1.0% in 2017 and the Dragas Center at Old Dominion University is estimating 2018 GDP growth at 2.2% and forecasting 2019 GDP growth at 2.4%. Employment growth is still not above 1% at an annual average for the 2000-2018 time period, but annual growth exceeded 1% in both 2017 and 2018. Finally, per capita income has grown at an annual average of 1% since 2000. This is all welcome news.

While Region 5's conditions have improved, so have many of the other regions in the Commonwealth. So, Region 5 still sits solidly in the middle of the pack on many measures when compared to the other regions. In addition, the region is losing population. Most alarming is the loss of population in the 20-34 age range. Only two other regions in the Commonwealth experienced a loss in this age cohort between 2016 and 2017 – Southwest Virginia (Bristol/Galax) and Southside Virginia (Danville/Martinsville). Also, young firm creation, though improving, is still lagging. In general, economic dynamism in Region 5 continues to be a challenge.

A number of new initiatives have been commenced over the last two years. We presented 9 such initiatives in Section 3. Most of these new initiatives, if not all, should yield long-term positive impacts for the regional economy in spite of not having immediate returns. Many of these initiatives also strengthen critical infrastructure (road projects, fiber ring and HREDA reorganization) needed to attract and retain the type of high-growth firms and talented individuals the region covets. As a result of both improving data conditions and smartly crafted new initiatives, we anticipate Region 5's economy should continue to perform at levels well above the earlier part of the decade.

Section 4 discussed the Region 5's priority clusters. The original clusters are reaffirmed for this biennial update. Life sciences was discussed as a possible additional cluster, but currently the region does not have enough of the required ingredients to compete on a global scale in life science as it can in the original priority clusters. However, the regional council will continue to monitor the progress of this cluster overall and, also, the progress of certain niche areas that might emerge.

Section 5 provided a look at the state of the region's workforce in its priority clusters. The analysis illustrates that the region is critically short in traditional STEM workers. The volume of current engineering talent will not be able support growth of the priority clusters. Significant gaps also exist in software developers, network security analysts and supply chain analysts.

Some business and executive occupations are also facing shortages. These findings reflect the urgency of addressing Challenge 4 from the original plan.

Region 5, though improving in a number of metrics, continues to lag the growth of its peers in the Commonwealth and the United States. Recent initiatives, both Go Virginia funded and non-Go Virginia funded, illustrate a renewed commitment by regional leaders to tackling the anemic growth that has plagued the region since 2010. In closing, we refer back to some of the action items proposed in the original growth and diversification plan that remain germane:

- Enhance coordination of innovation programs
- Implement regional marketing initiative focused on generating a Hampton Roads brand
- Expand capacity for industrial land development
- Focus on advanced manufacturing as an “innovation keystone”
- Facilitate the creation of innovation districts
- Expand export assistance programs focused on region’s core strengths
- Address higher-education skill gaps

Efforts are underway to address a number of the action items above, but some still need action. Deliberate investments in workforce training, STEM education, and innovation are essential if Region 5 is to maintain or even accelerate its current growth rate.