Regional Entrepreneurial Assessment Project:

Briefing Report

Region 6: Mary Ball Washington Region

January 2018

TECONOMY PARTNERS LLC

Table of Contents

I. Project Overview
II. Project Key Steps
III. Framework for Assessment
IV. Situational Assessment
V. Identification of Potential Priority Actions

Appendices:

- Appendix A: Listing of Working Group Members
- Appendix B: Data Trends on Entrepreneurial Development
- Appendix C: Regional Asset Inventory
- Appendix D: Competitive Benchmarking
- Appendix E: Benchmark Case Study Profiles

Overview

The purpose of this briefing report is to provide a high-level baseline assessment of entrepreneurial development and identification of potential priority actions in GO Virginia Region 6 – the Mary Ball Washington Region.

TEConomy Partners, LLC was engaged by the GO Virginia Statewide Board to provide each GO Virginia region an independent and objective assessment of its entrepreneurial development position, to facilitate a situational assessment of the region's entrepreneurial ecosystem, and to help identify with local leaders priority actions to help strengthen the ecosystem.

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Setting the Context: Importance of Entrepreneurial Development for Regional Growth

- In 2017, there were 1,086 surviving traded sector startups formed since 2007 in Region 6.
- 6,090 jobs in 2017 were found in these 1,086 surviving startups
- By comparison, over the 2007-2017 period, total traded sector industry employment grew by 5,202 jobs in Region 6.
- Traded sector startups account for only 1:2 traded sector companies, but 1.2:1 net new jobs.

Project Work Plan

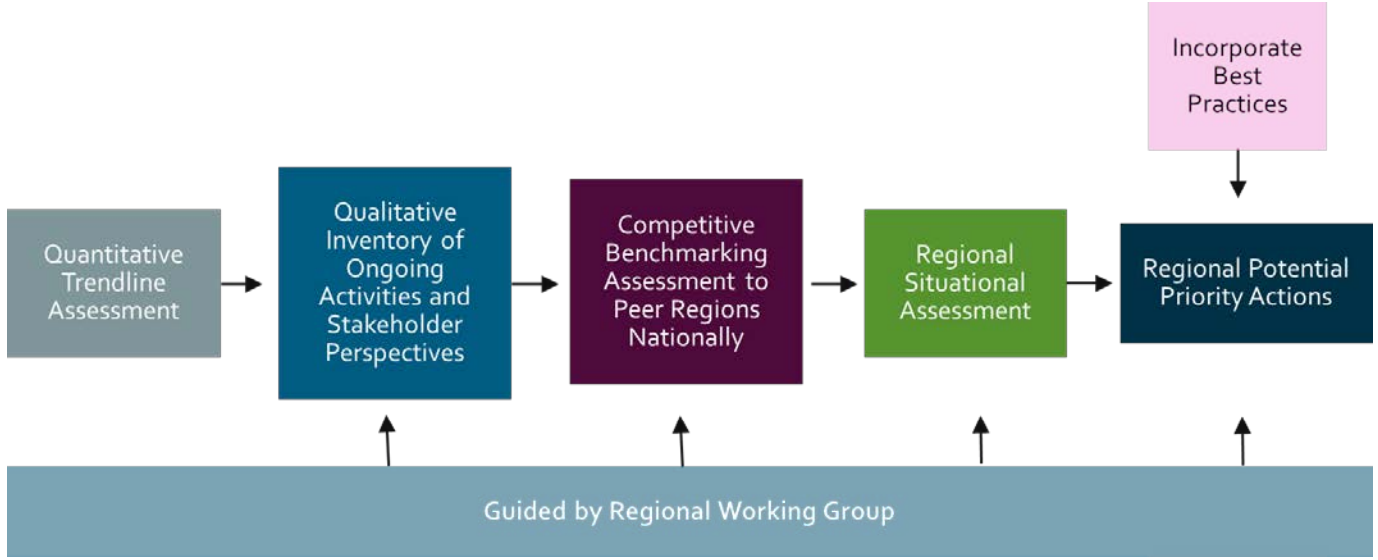
The work plan for preparing this Region 6 entrepreneurial development assessment involved examining:

- Recent data trends in entrepreneurial development
- Ongoing entrepreneurial activities and stakeholder perspectives
- Competitive position to peer regions nationally

These analyses were then utilized to develop a situational assessment of gaps and weaknesses to address and strengths and opportunities to build upon.

Based on the situational assessment and informed by best practices nationally, a set of potential priority actions has been identified for further development by GO Virginia Region 6 to catalyze the development of a robust innovation ecosystem.

Overview of Work Plan for GO Virginia's project:



See Appendix A for listing of Working Group members from Region 6

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Strategic Framework: Focus on Entrepreneurial Development Stages Across Traded Sector Industries

Stages of Entrepreneurial Development

Entrepreneurship is a process involving an interconnected set of development stages supported by public and private resources and services that generates successful new startup businesses to drive regional economic growth. If a region is underperforming in any stage of entrepreneurial development, then it will not realize its full potential in advanced industry development.

	Ideation	Commercial Viability	Market Entry	Growth & Scalability
Activities at Each Stage	Idea development/ invention, possibly involving lean startup approaches for identifying end users, market assessment and (if appropriate) IP creation	Customer discovery, new product development, proof-of-concept testing, prototype development, and validation/market testing	New firms that finalize commercial products, add key team members, execute business plans, marketing plans, manufacturing plans, develop supply-chains, and generate early revenues	Critical mass of firms that generate operating capital to expand markets, scale manufacturing, re-examine team member mix, generate new employment, and begin new product development through virtuous cycle supporting vibrant industry clusters
Type of Assistance to Entrepreneurs Needed	Guidance/coaching on gathering insights for business concept development	Domain specific market knowledge on differentiation, positioning, timing to complete and validate a full business model	Execution of business plans, investor outreach, product launch and business development for first customers	Building management team, positioning for IPO, entry into new markets and expanding market presence
Likely Sources of Risk Capital	Sweat equity; friends and family	Proof-of-concept; SBIR; accelerator angel investment, pre-seed	Angel investors; Formal VC investments including seed, Series A and Series B.	Later rounds of venture capital funding; mezzanine/SBIC; SBA (7)a loans

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Focus on Entrepreneurial Development in Traded Sector Industries

Of particular importance to GO Virginia is focusing on those new start-ups in traded sector industry activities that serve customers and markets beyond their local communities, and as a result, can drive regional economic growth. It includes industries such as: manufacturing; professional, scientific and technical services; information technology; finance and insurance; transportation and warehousing; mining; agriculture and food processing; and tourism related industries

US Cluster Mapping Project describes the critical importance of a strong base of traded industry sectors :

"[Traded industry clusters] are free to choose their location of operation (unless the location of natural resources drives where they can be) and are highly concentrated in a few regions, tending to only appear in regions that afford specific competitive advantages.

Since traded clusters compete in cross-regional markets, they are exposed to competition from other regions…Traded clusters are the "engines" of regional economies; without strong traded clusters it is virtually impossible for a region to reach high levels of overall economic performance."

Assessment of Ideation in Region 6

Overall Assessment:

Overall level of startup activity (slide 22) is similar to the state average, but uneven across the region. Good deal of community interest in entrepreneurship, startup activity, and commercialization. Institutions of higher education are leading initiatives to develop the entrepreneurial pipeline and provide support to entrepreneurs. Many other actors playing formal and informal roles to connect and support founders.

Strengths and Opportunities:

- **Growing population and growth in educated workforce.** Growth in Region 6's working-age population (5%) over the past 5 years outpaced that of VA (1%) and the U.S. (3%), driven by in-migration, including foreign migration, bringing new ideas and dynamism to the region. The share of the working-age population with a bachelor's degree or higher (24%) grew 17% over the last 5 years compared to VA (10% growth) and the U.S. (12%).
- **Programs to improve entrepreneurial pipeline**. UMW's StartUp program provides experiential startup training to high school, community college, and UMW students.
- **Convening spaces**. UMW EagleWorks Incubator and Germanna's FredCAT provide mix of office space, prototyping space, and programming for entrepreneurs and startups.
- **Diversity in type of startup activity.** Startup activity is occurring across many different industries, e.g., business services, R&D, engineering & technical services, manufacturing, transportation, health care services, natural resources & finished products, etc.

Gaps and Weaknesses:

- Need more attention, assessment, and industry engagement with R&D institutions, e.g., NSWC Dahlgren, VIMS, etc., around commercialization.

Assessment of Commercial Viability in Region 6

Overall Assessment:

Local growth and high-growth companies are being launched in sectors aligned to regional industry strengths. However, the 10-year survival rate of trade sector companies (26.5%) is lower than the state average (31.4%). (This survival rate is for the share of 2007 new companies still in business in 2017.)

Strengths and Opportunities:

- **Concentration of employment in startup companies aligns to industry strengths.** The GWRC has a high concentration of startup employment in R&D, Engineering, & Technical Services and Manufacturing. The Northern Neck and Middle Peninsula have high concentrations of startup employment in Agriculture & Food Processing and Natural Resources & Finished Products. Health Services and Life Sciences startups also have high employment concentrations in the Middle Peninsula, while the Northern Neck has a high concentration in Manufacturing.
- **UMW EagleWorks Incubator and the UMW Center for Economic Development** provide a range of mentoring, business services, and programs to support startup companies and their founders. CEW is working with the statewide SBDC-affiliated, GMU Innovation Commercialization Assistance Program to provide lean startup training.
- **Looking more narrowly at startups based on technology commercialization, Region 6 has performed well on one measure, SBIR success.** On a per capita basis, Region 6 small companies outperform the national average (Region 6 averages $11 SBIR dollars per person compared to $8 nationally), but lag the state average ($15). There is strong defense contractor representation in Region 6 and Virginia among SBIR awardees.

Gaps and Weaknesses:

- **Traded sector 10-year startup survival rate (26.5%) lower than the state average (31.4%).** This survival rate is for the share of 2007 new traded sector companies still in business in 2017.
- **Uneven level of economic development and entrepreneurial development across the Region** can impact diversity of startup activity and trajectory of startup companies.
- **SBIR awards are highly concentrated.** Three companies accounted for three-quarters of total SBIR dollars from 2010-2017, and none were startups (< than 10 years old).

Assessment of Market Entry in Region 6

Overall Assessment:

Region 6's new business formation rate tracks the state average fairly closely (e.g., both above 9% in 2015; 8% vs 9% state average in 2017), although startup activity is uneven across Region 6.

Strengths and Opportunities:

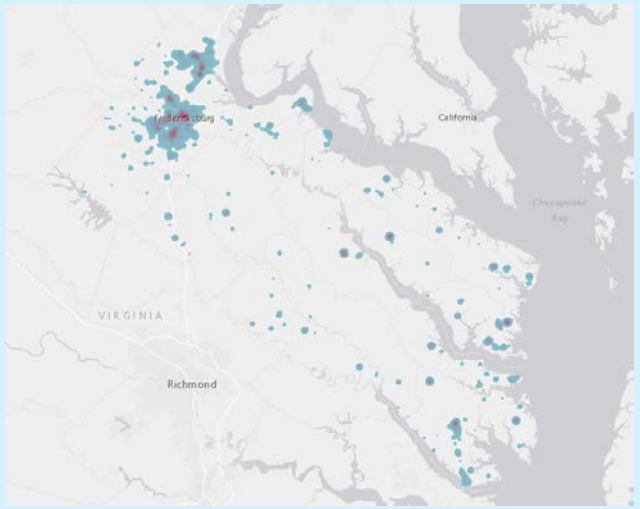
- **Relatively high startup activity.** Region 6's new business formation rate tracks the state average fairly closely (e.g., both above 9% in 2015; 8% vs 9% state average in 2017).
- **Diversity in type of startup activity.** Traded sector startup activity is occurring across many different industries, e.g., business services, R&D, engineering & technical services, manufacturing, transportation, health care services, natural resources & finished products, etc.
- Startup support from UMW Center for Economic Development programs (including BlueEagle Incubator), but also main street associations and others.
- More assessment is needed, but initial stakeholder interviews with founders and BlueEagle Incubator suggest that startups self-finance the launch of traded sector services companies and build with customer revenue and government contracts. Unknown how manufacturing, agricultural, and other product companies finance new product launch.
- Continuum of capital exists with new micro loan programs, SBA loans, SBIR funding, some local angel investors, and VC funds in Richmond, Northern Virginia, and Hampton Roads. UMW Center for Economic Development can direct startups to these sources.

Gaps and Weaknesses:

- Currently, the UMW Center for Economic Development is the most visible point of contact for startups seeking mentoring, capital, or other assistance, and CEW's ability to scale to meet increasing demand is constrained.

Region 6 Surviving Startups and Their Employment Levels by 2017

Major Industry Cluster	Number of Start-ups Surviving by 2017	Start-up Employment Levels, 2017
Agriculture & Food Processing	101	371
Business Services	514	2,067
Energy, Natural Resources, & Finished Products	57	572
Engineering, R&D, Testing & Technical Services	94	744
Financial & Insurance Services	127	391
Health Care Services	36	814
Information Technology & Communications Services	74	560
Life Sciences	34	258
Manufacturing	72	603
Ship Building, Aerospace, & Defense	3	8
Transportation, Distribution and Logistics	128	625



Assessment of Growth & Scalability in Region 6

Overall Assessment:

Region 6 has a lower share of traded sector employment in startups 0-5 years (6.6% vs 7.1%) and a higher share of employment in startups 6-10 years (8.8% vs 7.3%) compared to the state average. Region 6 had eight Inc 5000 companies which is lower than other mid-sized regions (peers have universities with Colleges of Engineering). There is an opportunity to increase traded sector startup activity and growth with more industry engagement and mentoring around existing startup programs.

Strengths and Opportunities:

- **Higher share of traded sector employment in startups 6-10 years compared to state average.** In Region 6, 8.8% of traded sector employment was in startups 6-10 years of age compared to 7.3% at the state level.
- **Moderate number of Inc. 5000 companies for a region without a College of Engineering.** Compared to other mid-sized regions, such as Dayton, OH; Greenville, SC; and Raleigh, NC, the number of Inc. 5000-ranked companies (high three-year average revenue growth) was lower in Region 6 (8 companies compared to 13 in the benchmark region in 2017). However, Region 6 lacks a university with a College of Engineering.
- A couple of programs, such as the SBDC-affiliated, GMU Innovation Commercialization Assistance Program and BlueEagle Incubator are focused on supporting high-growth potential companies.

Gaps and Weaknesses:

- **Share of traded sector employment in startups 0-5 years of age lower than state average.** In Region 6, 6.6% of traded sector employment was in startups 0-5 years compared to 7.1% at the state level.
- **High-growth companies concentrated in traded industry sectors tied to Federal government contracting**. From 2007-17, Business Services (77 high-growth companies) was the most represented, followed by IT Services (26 companies), R&D, Engineering, and Technical Services (23 companies), and Transportation & Logistics (22 companies).
- **Reported venture capital activity is minimal**. Only 12 deals reported by PitchBook from 2010-2017. Six deals were in one smart grid company. However, venture capital is only one type of capital in the capital continuum.

High-Growth Startups by Traded Sector Industry Compared to Total Surviving Startups, 2017

Major Industry Cluster	Number of Start-ups Surviving by 2017	Number of High Growth Start-ups in 2017**
Agriculture & Food Processing	101	6
Business Services	514	77
Energy, Natural Resources, & Finished Products	57	14
Engineering, R&D, Testing & Technical Services	94	23
Financial & Insurance Services	127	7
Health Care Services	36	8
Information Technology & Communications Services	74	26
Life Sciences	34	10
Manufacturing	72	16
Ship Building, Aerospace, & Defense	3	2
Transportation, Distribution and Logistics	128	22

Potential Priority Actions Identified for Region 6

- Develop entrepreneurial pipeline
- Improve and expand “high-growth” startup programming
- Improve and expand “local-growth” startup programming
- Develop continuum of capital
- Focus on technology commercialization and industry engagement with regional R&D institutions
- Concept of a “Regional Entrepreneurial Quarterback”

Priority Action 1: Develop entrepreneurial pipeline

Rationale:

- Region 6 is a diverse region with uneven levels of economic development and startup activity across its planning districts
- Awareness of business creation as one career option and the skills needed to bring a product or service to market is an important part of 21st century education
- Whether a student later founds a company or becomes an employee, this business acumen and critical thinking are valuable to companies

Possible Activities:

- Offer startup training for students tailored to high school, community college, and university students
- Expand student internships with startups beginning with community college and university students
- Convene events each semester, such as startup challenges or CEO talks

Illustrative Best Practice Examples:

- UMW StartUp Program: UMW has launched a program for high school, community college, and UMW students; Region 6 should assess program outcomes and how it can be scaled and incorporate local founders
- Iowa has a popular Student Internship Program that places students in the state's target industries with small and medium-sized companies

Priority Action 2: Improve and expand "high-growth" startup programming

Rationale:

- The Region 6 data show that high-growth startups, which include Inc 5000 companies that have rapidly scaled to $10M to $25M a year, have had a big employment creation impact on the region.
- "High-growth" startups have different requirements than "local-growth" startups in terms of marketing and business development, business model for delivery of products or services, and capital requirements—although for defense contractors, large 5-year government contracts can be this scaling capital.

Possible Activities:

- Define "high-growth" startup and identify the required resources for this group of companies (which will differ from "local-growth" companies)
- Build on existing programs by expanding the number of mentors and involving angels
- Expand regional, state, and national networks and networking events

Illustrative Best Practice Examples:

- The members of the Northern Virginia Technology Council, CIT and MACH37, and the cybersecurity angel and VC community are an example of a strong regional network supporting startups in a particular industry vertical.
- Knoxville's Local Access to Executives Program is an example of a regional entrepreneurship center working to identify specific corporate technical needs and innovation champions within these companies, on the one hand, and startups with products or services that meet these needs, on the other, as a way of improving customer discovery and access to mentors for startups and access to innovation for established companies

Priority Action 3: Improve and expand "local-growth" startup programming

Rationale:

- "Local-growth" companies include professional services companies (e.g., law firms, accountants, medical and dental offices, etc.), restaurants, specialty retail, artists and artisans, etc.
- Many towns and cities in Region 6 have invested to revitalize their downtowns, and many new businesses have opened in these downtowns contributing to the dynamism and vibrancy of these areas.

Possible Activities:

- Deepen and expand peer-to-peer networks and programming to build community. Existing examples include Main Street organizations, CEW veteran-owned businesses network, and women-owned businesses network
- Host meetups meetups, workshops, and events at different regional venues to highlight resources and cross-fertilize networks
- Identify where to send people who have a business idea, but no company vs. a company with initial customers vs. a high-growth potential company trying to scale

Illustrative Best Practice Examples:

- Chattanooga's CO.LAB regional entrepreneurship center began as part of a downtown revisioning effort to bring more artists, restaurants, and other small businesses to the downtown. The provision of business assistance to these companies helped give this initiative traction.
- All of LaunchTN's regional partners provide different tiers of programming to meet the needs of the entrepreneur/company where he/she is. This could be a half-day training, a one-week training, or a semester-long cohort.

Priority Action 4: Develop capital continuum

Rationale:

- Companies need different types of capital depending on what they are trying to accomplish—grants for R&D where the technical risk is still high, loans for growth once a product is in the market on a pilot scale, equity for rapid scale up.
- Developing different types of capital locally and improving the process for investing this capital involves a learning curve.

Possible Activities:

- Leverage organizations working with "local growth" companies to direct good deal flow toward micro loans programs
- Use CEOs of successful startups as review committee for micro loans—these reviewers could be future investors in private fund (must mitigate conflict of interest)
- Engage financial advisors in networking events, host talks by CEOs of high-growth companies and by representatives of angel groups who can speak to lessons learned and impact of starting their funds

Illustrative Best Practice Examples:

- EpiCenter Memphis, a regional entrepreneurship center, works with a regional credit union to direct high-quality deal flow to the credit union's micro loan program. These startups have a product in the market, but lack the track record and assets typically required to obtain a loan. Because EpiCenter has worked with these startups on their business strategy and knows the founders, the repayment rate for the EpiCenter Memphis portfolio of companies is higher than the typical repayment rate of the credit union's micro loan portfolio.

Priority Action 5: Focus on technology commercialization and engagement with regional R&D institutions

Rationale:

- Approximately half of innovations (i.e., new products or services introduced into the market) stem from intellectual property that originated outside the company.
- However, technology commercialization from R&D organizations is difficult, because researchers don't necessarily have any business understanding of industry needs (outside of agency mission) and companies don't have the breadth and depth of understanding of the type of R&D being conducted.

Possible Activities:

- Encourage the formation of technology councils through outreach to both companies and research institutions (NSWC Dahlgren, W&M VIMS, Langley, UMW)
- Bring regional startup programming to research institutions and engage entrepreneurial researchers in technology-based startup networking events
- Make technology commercialization part of the "high-growth" startups strategic initiative

Illustrative Best Practice Examples:

- The best practices for improved technology commercialization involve two key factors: tech transfer office talent and active outreach to researchers within the R&D institution and active engagement by industry, entrepreneurs, and venture development organizations in an on-going way with the tech transfer office and researchers at the R&D institutions

Proposed GO Virginia Action: Establish Regional Quarterbacks for Entrepreneurial Development in Each GO Virginia Region

Specific Activities:

- Identify opportunities and needs for regional entrepreneurial development within traded sector industries
- Ensure an implementation capacity on priority actions
- Provide a "front door" in each region for entrepreneurs to receive coordinated services among service providers

Service Delivery Approach:

- Performance-based grants developed in consultation with each region to address priorities
- In each region, an advisory committee will be created to oversee the efforts of the regional quarterbacks
- Potential for multi-regional applications
- VRIC proposal articulates additional entrepreneurial activities that need to be coordinated with the regional GO Virginia efforts

Budget Rationale:

- Award $200k-$300k per region to fund a full-time professional to serve as the regional quarterback. Funding could yet be made available in FY 2019.
- The regional quarterback would be tasked with advancing a regional strategic plan and prioritizing strategic investments, with the input from regional entrepreneurial ecosystem stakeholders, under the auspices of the GO VA Regional Boards.
- Once a regional prioritization investment plan is developed, further funding would be available in FY 2020 and thereafter to fill the gaps identified, including funding for efforts such as: EIRs, incubators, accelerators, mentor networks, etc.

Comparable Best Practice Model: *Launch Tennessee*

- Supports a network of Entrepreneur Centers, located in six cities across the state that provide entrepreneurs access to a mix of support services, including: wayfinding for entrepreneurs, boot camps, mentorship, co-working space, and initial pre-seed grants.
- In 2016, Launch Tennessee made grants to its Entrepreneur Centers of $200,000 to $375,000 for each center. These centers serve a much smaller area than GO Virginia regions.

Appendix A: Listing of Working Group Members

Working Group: Participants at Region 6 Meeting on November 13, 2018 focused on Startups/Innovation/ Commercialization

- Brian Baker, UMW Center for Economic Development
- Neal Barber, Community Futures
- Kelly Copley, Stafford County ED
- Kate Gibson, George Washington Regional Commission
- Chris Hodge, NSWC Dahlgren
- Lewie Lawrence, Middle Peninsula PDC
- Melinda May, Featherstone CPA
- Kim McClellan, Fredericksburg Area Association of Realtors
- Linda Millsaps, George Washington Regional Commission
- Nick Minor, Fredericksburg Regional Alliance
- Barbara Taylor
- Kimberly Young, University of Mary Washington
- Janet Gullickson, Germanna Community College
- Jeanne Wesley, Germanna Community College

Appendix B: Quantitative Trendlines on Entrepreneurial Development

Initial Analysis of Entrepreneurial Dynamics in Your Region's Traded Industry Sectors

Key Measures:

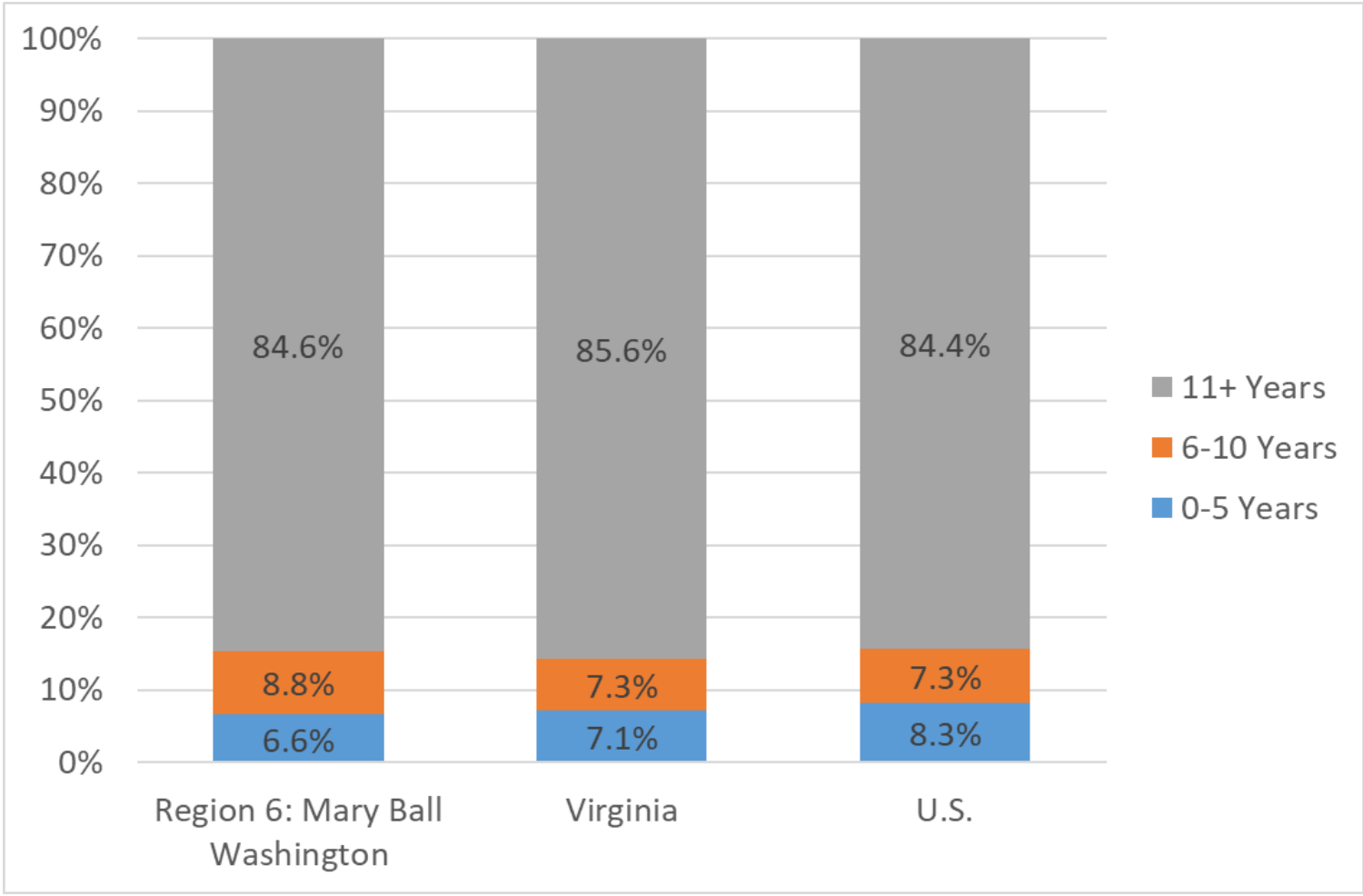
- Job distribution by age of firm
- Job creation by age of firm
- Business formation rates of start-ups
- Survival rates of startup companies
- Examining key elements of "net" employment growth
- The contribution of high-growth startups compared to all startups

Note on Data Sources:

- Two data sources used to provide a full depiction of entrepreneurial dynamics:
- ***The Quarterly Workforce Indicators (QWI) from U.S. Census*** is a new longitudinal database with detailed data related to the job creation and other characteristics of firms, including by age groupings.
    - ***Most Detailed Level of Geographic Coverage***: County
    - ***Coverage***: Covers over 95% of U.S. private sector jobs (does not cover ag jobs, self-employment)
    - ***Grouping of Employment by Age of Firms***: 0-1 Years; 2-3 Years; 4-5 Years; 6-10 Years; 11+ Years
    - ***Industry Coverage***: 2-digit industry, which can define at a high-level traded sector industries
    - But QWI does not provide intelligence at the firm level
    - All data is on a quarterly basis
- **The Business Dynamics Research Consortium (BDRC) database** is a time-series dataset that catalogues individual establishments by location, employment, sales, and industry from 1997 to 2017. The BDRC It is maintained by the University of Wisconsin
    - Coverage: It compiles multiple data sets to track performance and growth for more than 144 million individual businesses across the United States.
    - Provides extensive firm level data
    - Able to identify firm by address
    - Detailed industry coverage

Startups 6-10 years in the Mary Ball Washington region account for a higher share of traded sector employment (8.8%) compared to Virginia (7.3%) and the U.S. (7.3%), but startups 0-5 years account for a lower share.

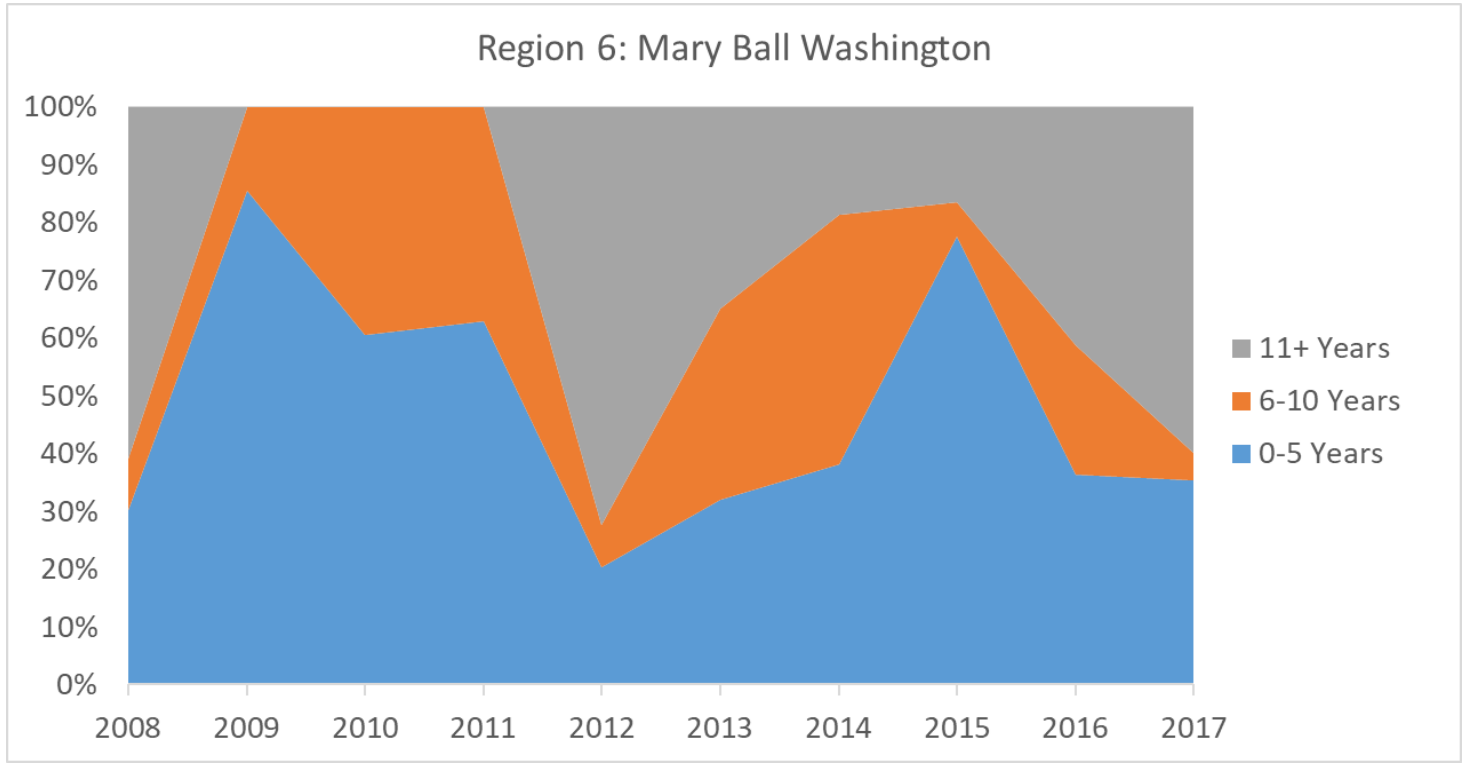
Traded Sector Employment by Firm Age as a Percentage of Total Employment, 2008 Q1 through 2017 Q2

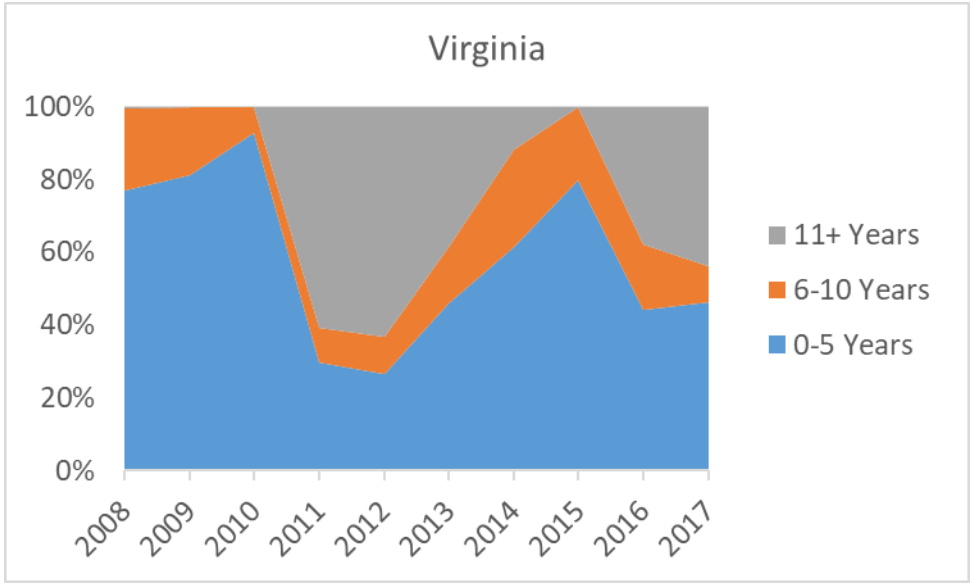


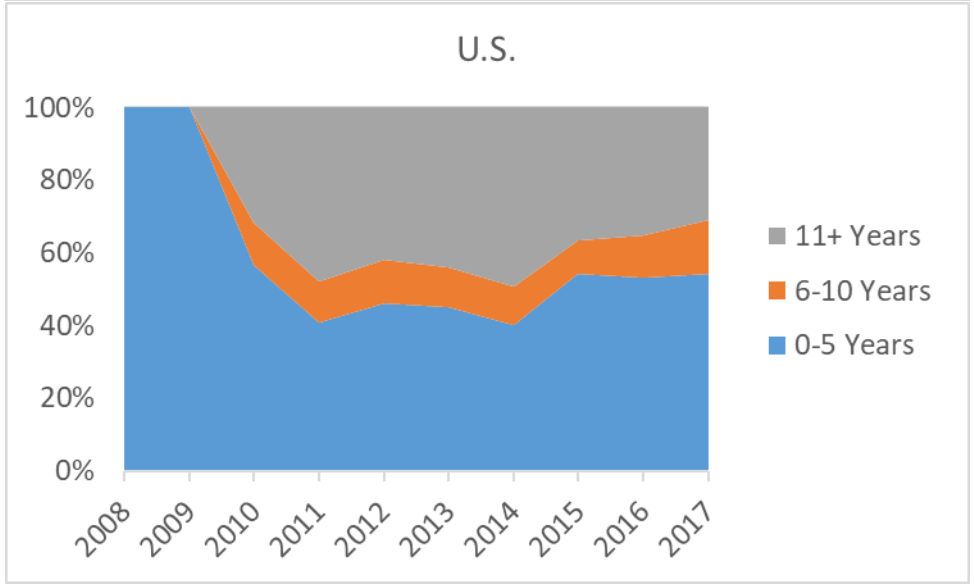
Source: U.S. Census Bureau Quarterly Workforce Indicators dataset.

Net job growth in Greater Fredericksburg region driven by 11+ years and 0-5 year firms

Traded Sector Net Job Change by Firm Age, 2008 Q1 through 2017 Q2



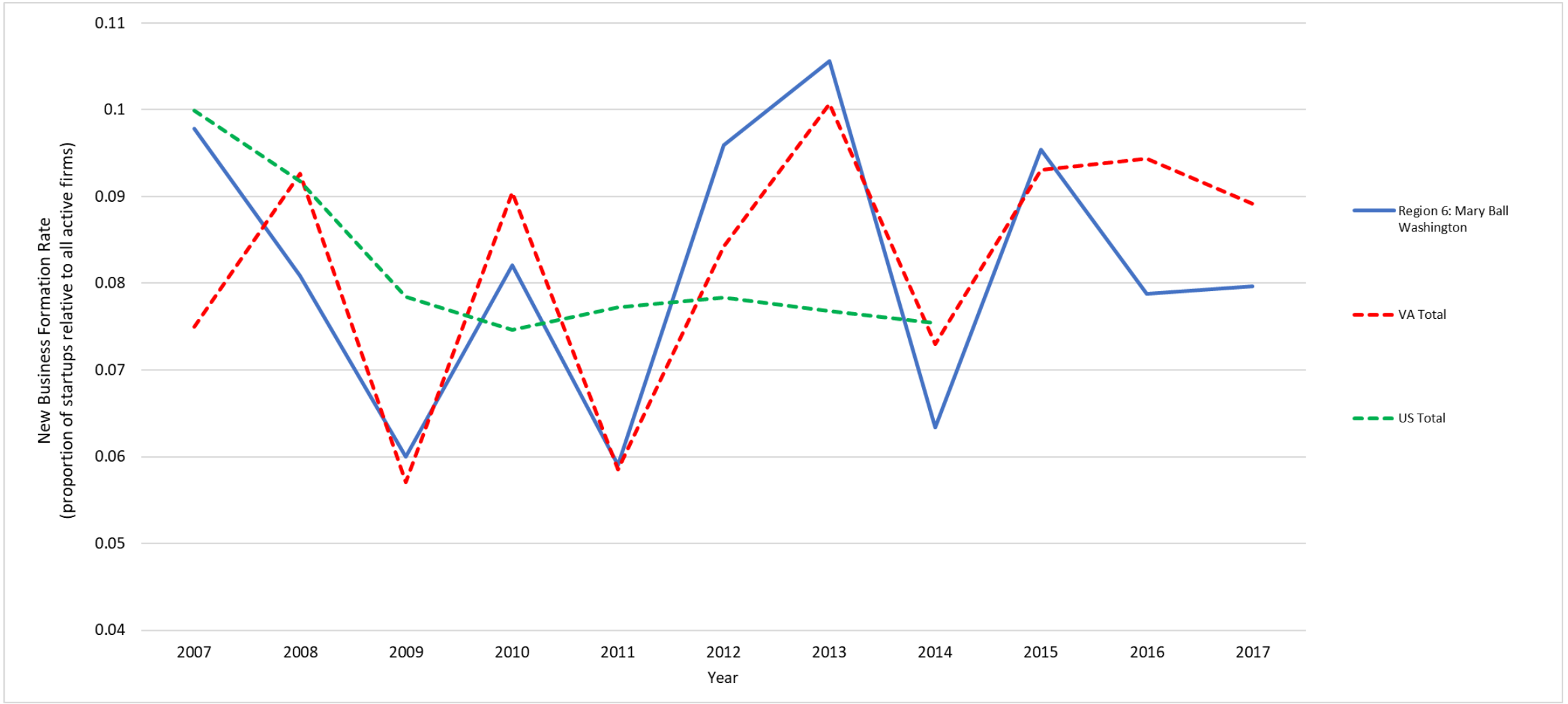




Source: U.S. Census Bureau Quarterly Workforce Indicators dataset.

Mary Ball Washington new business formation rate tracks Virginia's and is in the 6% to 10% range

New Business Formation Rates: Mary Ball Washington, Virginia, U.S., 2007-2017



Source: Business Dynamics Research Consortium database for Greater Fredericksburg and Virginia; U.S. Longitudinal Business Database for U.S.
*U.S. new business formation rates latest available is 2014

Survival Rates and Employment Generated by Traded Sector Startups, by Cohort by Year

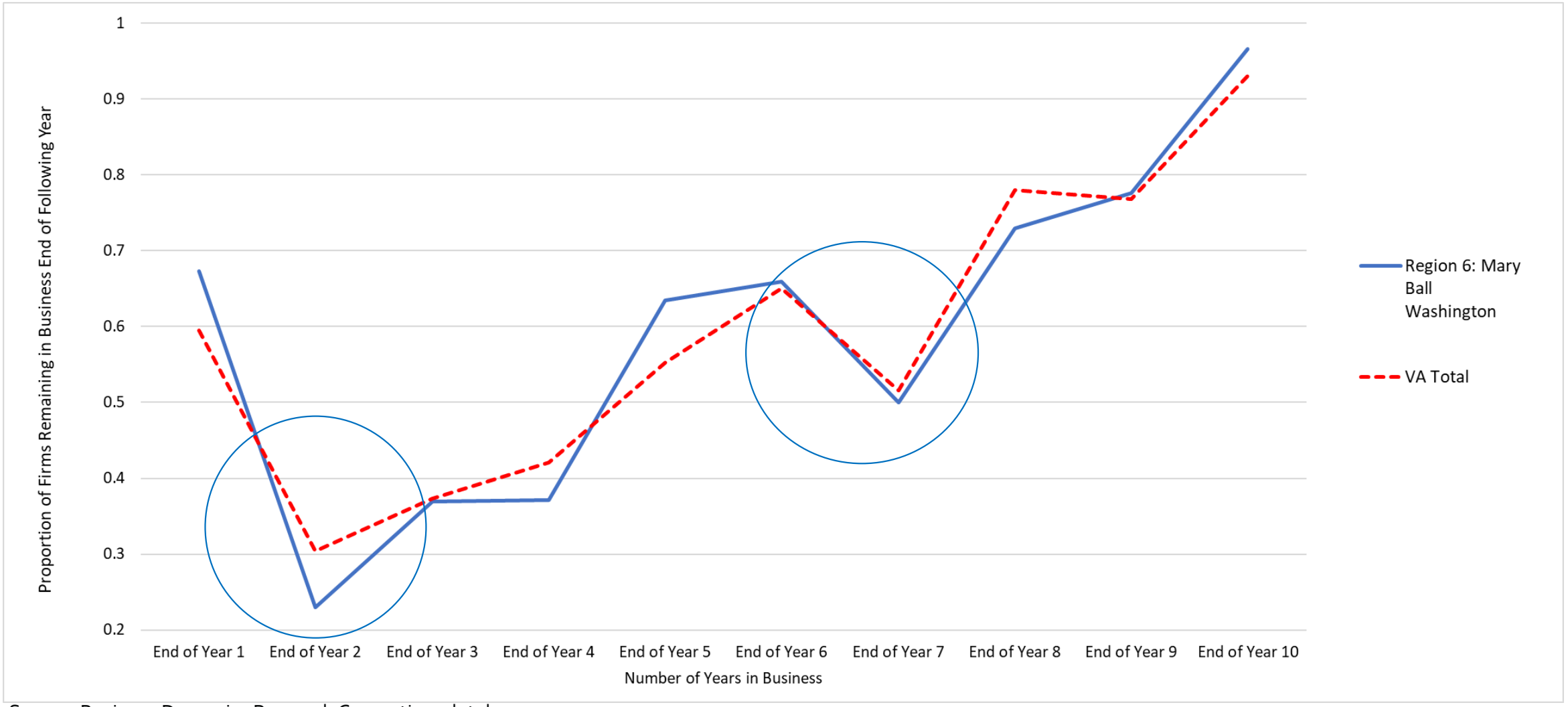
In 2010, 256 traded sector companies were launched in the Mary Ball Washington region; 89 were still active in 2017 (34.8% survival rate), and these 89 companies have created 574 jobs

Founding Year of Startup Cohort*	Number of Startups in Traded Sector Industries	Number of Startups Surviving by 2017	Survival Rate by 2017	Start-up Employment Levels 2017
2007	245	65	26.5%	483
2008	190	56	29.5%	441
2009	135	45	33.3%	296
2010	256	89	34.8%	574
2011	113	43	38.0%	261
2012	233	110	47.2%	679
2013	300	149	49.7%	604
2014	164	91	55.5%	434
2015	213	152	71.4%	876
2016	150	107	71.3%	494
2017	179	179	100%	948

Source: Business Dynamics Research Consortium database
Note: *Composed of all new non-branch firms with first recorded employment activity in a given year

Startup survival rates decline dramatically in year 2, and then improve over time, except for a second dip in year 7

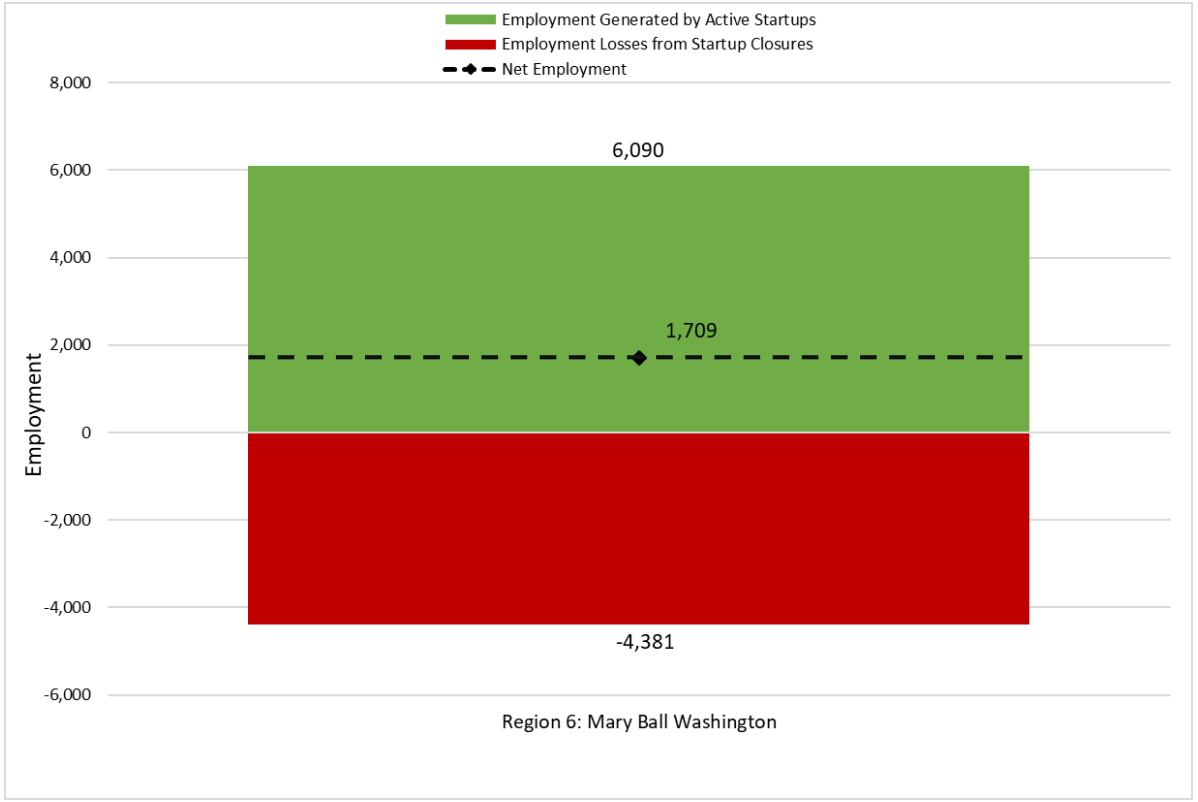
Year-over-Year Survival Rate Trends in Traded Sector Startups

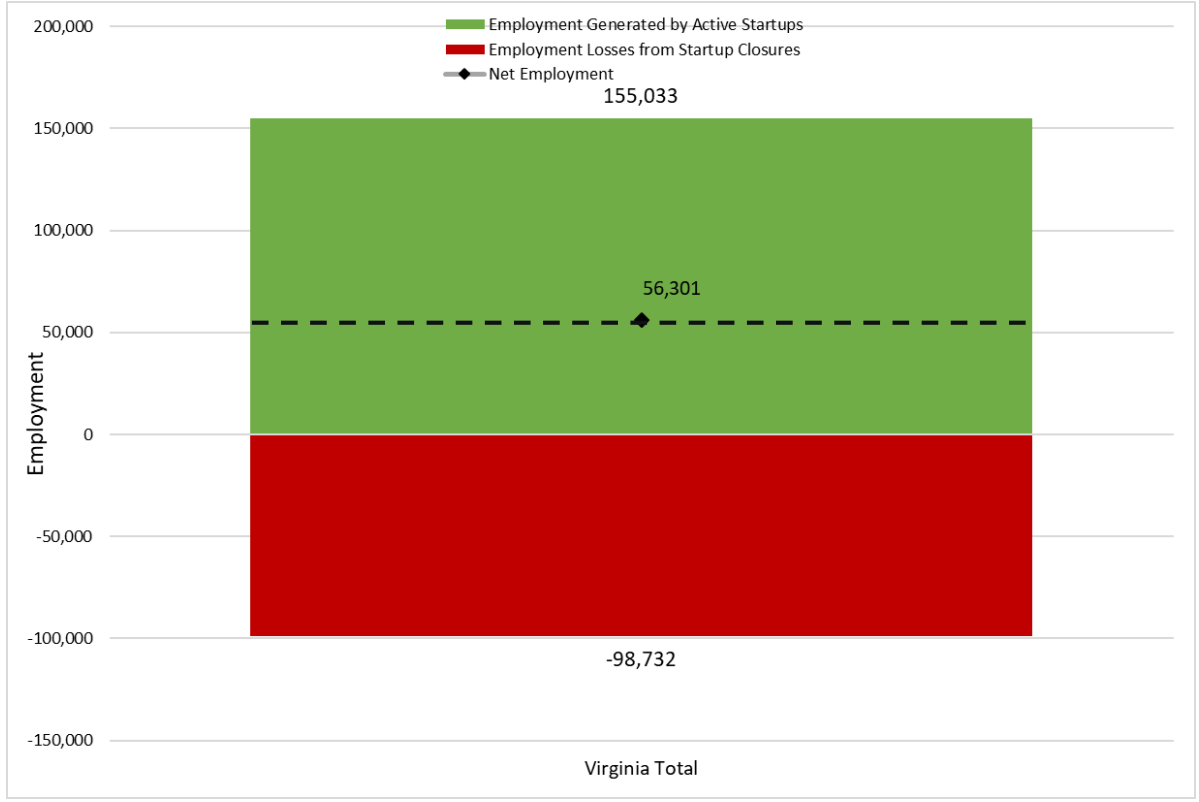


Source: Business Dynamics Research Consortium database
Note: *Startups defined as having firm age <10 years as of 2017

Net employment creation by surviving traded sector startups greater than losses from failures

Net Employment Impact Generated by Traded Sector Startups in the Mary Ball Washington region and Virginia: net employment in Virginia slightly higher



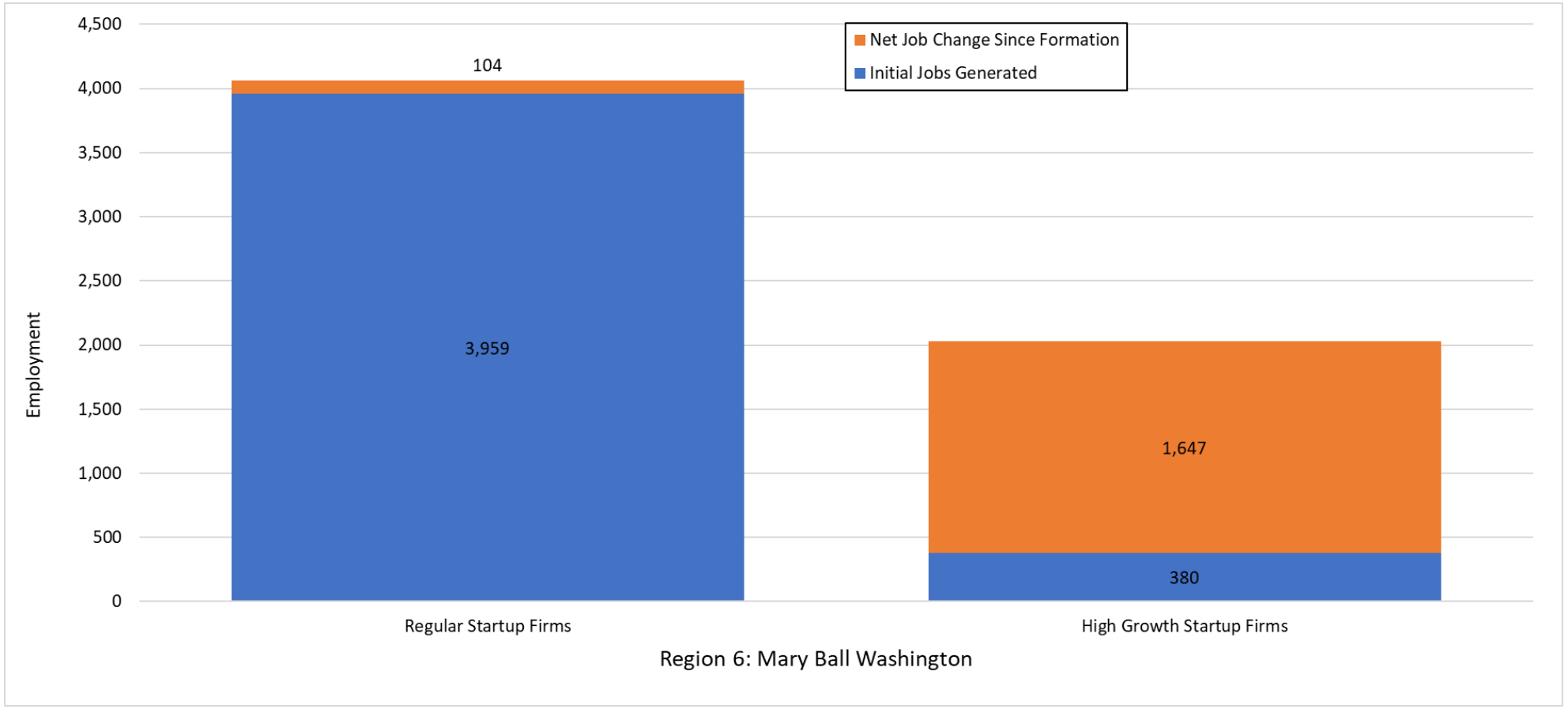


Source: Business Dynamics Research Consortium database.
Note: Startups are defined as companies <10 years as of 2017

Disproportionate share of lasting net job creation observed from high-growth** traded sector startups

Initial and Net Employment Growth Generated by Current Traded Sector Startups in Mary Ball Washington Region: Firms that are < 10 years in 2017

	Total VA Regular Startup Firms	Total VA High Growth Startup Firms
Initial Jobs Generated	124,266	10,474
Net Job Growth Since Formation	-959	52,944



Source: Business Dynamics Research Consortium database

**Startups defined as having firm age <10 years as of 2017, high growth startups defined as >25% annualized employment growth over lifetime of business

Mary Ball Washington Region: Startup employment highly concentrated in four industry sectors

Region 6 Priority Clusters from 2017 Growth and Diversification Plan:

- **Professional, Scientific and Technical Services**
- **Information / Data Centers**
- **Forestry / Wood Products / Paper Manufacturing**
- **Seafood Processing / Aquaculture / Commercial Fishing**
- **Logistics / Distribution**

Major Industry Cluster	Number of Startups in Cluster	Number of Start-ups Surviving by 2017	Number of High Growth Start-ups in Cluster**	Start-up Employment Levels, 2017	Start-ups Industry Cluster Employment Concentration Index*
Agriculture & Food Processing	169	101	6	371	1.04
Business Services	994	514	77	2,067	0.71
Energy, Natural Resources, & Finished Products	110	57	14	572	**1.40**
Engineering, R&D, Testing & Technical Services	136	94	23	744	**1.17**
Financial & Insurance Services	278	127	7	391	0.60
Health Care Services	50	36	8	814	**1.20**
Information Technology & Communications Services	128	74	26	560	0.60
Life Sciences	70	34	10	258	1.03
Manufacturing	127	72	16	603	**1.29**
Ship Building, Aerospace, & Defense	7	3	2	8	0.10
Transportation, Distribution and Logistics	285	128	22	625	0.92
Other Traded Sectors	875	394	69	2,361	0.69

*Startups Employment Concentration Index represents specialization of startup activity in certain industry clusters given overall state trends, >1.2 indicates highly specialized concentration of startups in a particular industry sector. **Defined as >25% annualized employment growth over lifetime of business

GWRC: Startup employment is highly concentrated in two industry clusters, 2017

Major Industry Cluster	Number of Startups in Cluster	Number of Start-ups Surviving by 2017	Number of High Growth Start-ups in Cluster**	Start-up Employment Levels, 2017	Start-ups Industry Cluster Employment Concentration Index*
Agriculture & Food Processing	77	45	3	371	0.64
Business Services	687	365	63	2,067	0.74
Energy, Natural Resources, & Finished Products	63	30	10	572	0.99
Engineering, R&D, Testing & Technical Services	99	70	23	744	**1.48**
Financial & Insurance Services	193	88	4	391	0.61
Health Care Services	35	25	5	814	1.12
Information Technology & Communications Services	99	58	21	560	0.70
Life Sciences	47	27	6	258	0.88
Manufacturing	81	46	12	603	**1.42**
Ship Building, Aerospace, & Defense	4	1	1	8	0.05
Transportation, Distribution and Logistics	339	155	28	625	0.77

*Startups Employment Concentration Index represents specialization of startup activity in certain industry clusters given overall state trends, >1.2 indicates highly specialized concentration of startups in a particular industry sector. **Defined as >25% annualized employment growth over lifetime of business

Northern Neck PDC: Startup employment highly concentrated in three industry clusters, 2017

Major Industry Cluster	Number of Startups in Cluster	Number of Start-ups Surviving by 2017	Number of High Growth Start-ups in Cluster**	Start-up Employment Levels, 2017	Start-ups Industry Cluster Employment Concentration Index*
Agriculture & Food Processing	38	24	3	106	**2.80**
Business Services	124	62	6	266	0.86
Energy, Natural Resources, & Finished Products	18	10	2	121	**2.78**
Engineering, R&D, Testing & Technical Services	17	9	0	26	0.38
Financial & Insurance Services	32	14	2	39	0.56
Health Care Services	5	3	0	27	0.38
Information Technology & Communications Services	22	12	1	76	0.77
Life Sciences	7	3	1	12	0.45
Manufacturing	20	14	1	69	**1.39**
Ship Building, Aerospace, & Defense	1	1	0	1	0.12
Transportation, Distribution and Logistics	70	24	1	132	0.86

*Startups Employment Concentration Index represents specialization of startup activity in certain industry clusters given overall state trends, >1.2 indicates highly specialized concentration of startups in a particular industry sector. **Defined as >25% annualized employment growth over lifetime of business

Middle Peninsula PDC: Startup employment highly concentrated in four industry clusters, 2017

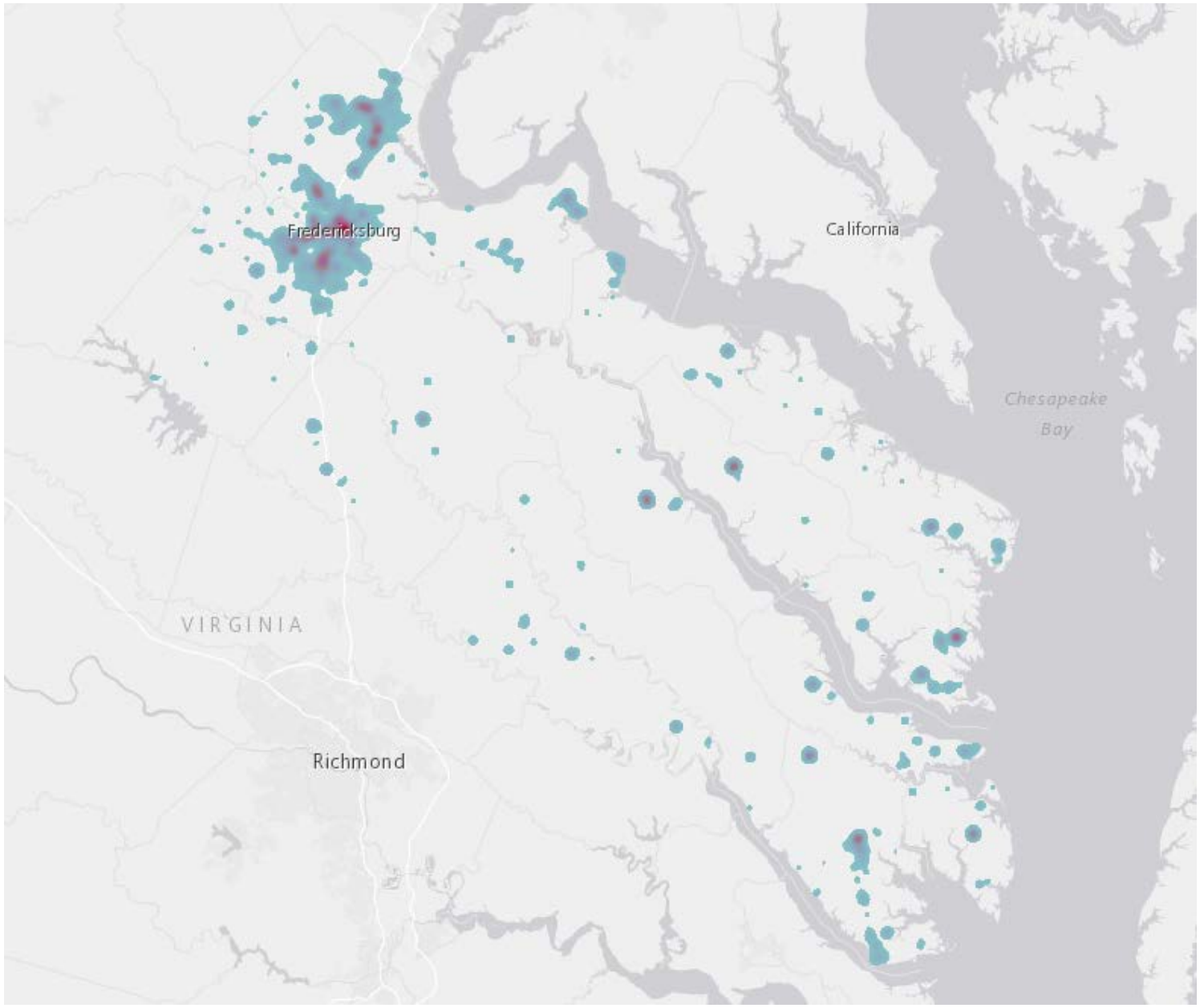
Major Industry Cluster	Number of Startups in Cluster	Number of Start-ups Surviving by 2017	Number of High Growth Start-ups in Cluster**	Start-up Employment Levels, 2017	Start-ups Industry Cluster Employment Concentration Index*
Agriculture & Food Processing	54	32	0	101	**1.62**
Business Services	183	87	8	254	0.50
Energy, Natural Resources, & Finished Products	29	17	2	160	**2.23**
Engineering, R&D, Testing & Technical Services	20	15	0	43	0.39
Financial & Insurance Services	53	25	1	66	0.58
Health Care Services	10	8	3	244	**2.06**
Information Technology & Communications Services	7	4	1	17	0.10
Life Sciences	16	4	3	87	**1.97**
Manufacturing	26	12	3	56	0.68
Ship Building, Aerospace, & Defense	2	1	1	4	0.30
Transportation, Distribution and Logistics	90	38	5	192	0.76

*Startups Employment Concentration Index represents specialization of startup activity in certain industry clusters given overall state trends, >1.2 indicates highly specialized concentration of startups in a particular industry sector. **Defined as >25% annualized employment growth over lifetime of business

Geographic Distribution of Traded Sector Startup Activity in Mary Ball Washington Region, 2017

High Regional Startup Activity Levels

Low Regional Startup Activity Levels



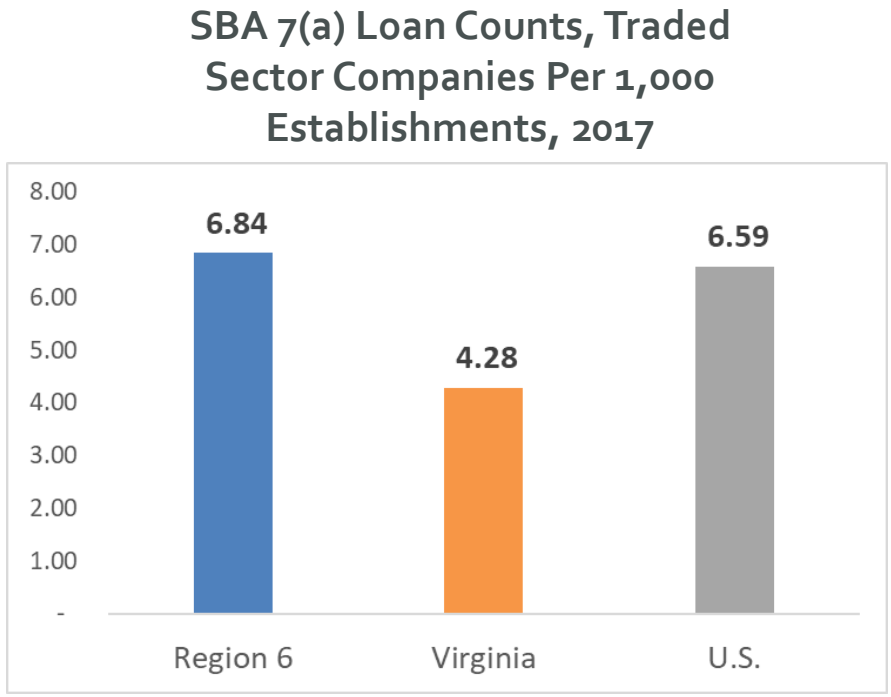
High SBA loan activity in priority industry clusters, such as Manufacturing, Ag and Food Processing, Professional Scientific and Technical Services

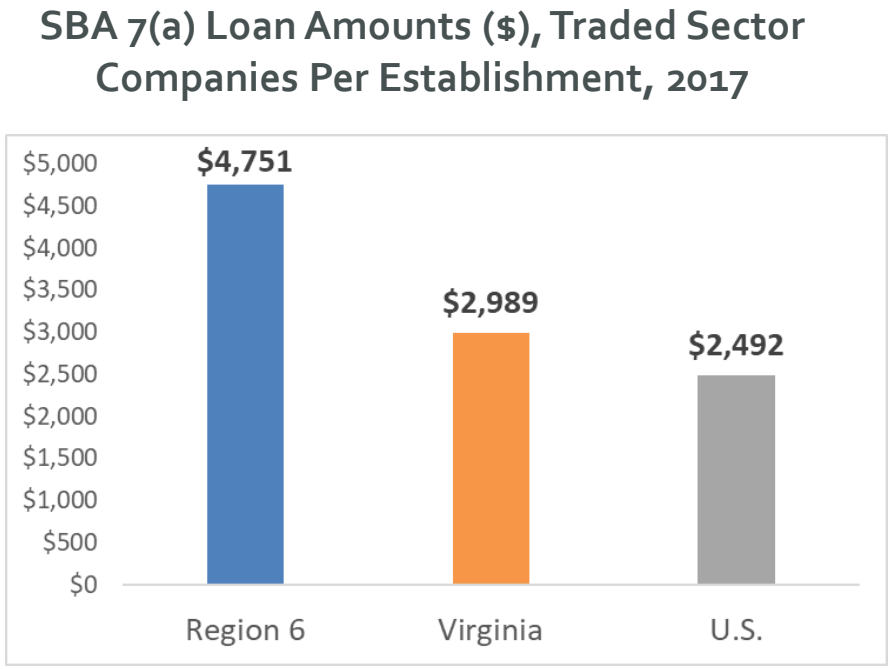
Region 6: SBA 7(a) Loans and Loan Amounts, Cumulative Totals 2010-2018Q2

Industry Clusters	Co's Receiving Loans	Total No. of Loans	Total Loan Amounts ($)	% of Total Loan Amounts
Total, All Traded Sector Industries	**97**	**126**	**$52,879,340**	**100%**
Manufacturing	11	17	$15,347,800	29%
Agriculture & Food Processing	10	15	$12,047,600	23%
Engineering, R&D, Testing & Technical Services	7	10	$6,135,600	12%
Business Services	22	30	$4,886,500	9%
Information Technology & Communications Services	11	12	$2,760,000	5%
Energy, Natural Resources, & Finished Products	7	10	$2,491,900	5%
Transportation, Distribution and Logistics	5	5	$465,000	1%
Life Sciences	2	2	$450,000	1%
Financial & Insurance Services	1	1	$50,000	0%
Ship Building, Aerospace, & Defense	1	1	$50,000	0%
All Other, Non-cluster Industries	20	23	$8,194,940	15%

Source: TEConomy analysis of SBA loan data reports.
*Data for 2018 are through Q2.

In 2017, Mary Ball Washington region small traded sector companies approved for more loans and larger loans relative to VA and the U.S.





Source: TEConomy analysis of SBA loan reports.

Initial Analysis of Broader Innovation Ecosystem Activity Innovation Ecosystem Activities

Key Measures:

- R&D and Commercialization
- Patent Activity of Inventors Residing in Region
- Federal Small Business Innovation Research Awards
- Venture Capital

Assignees of Patents with Mary Ball Washington Region Inventors, 2010-2017

Assignees	# of patents
U.S. Navy	96
U.S. Postal Service	13
KLA-Tencor Corporation (Milpitas, CA)	11
NASA	10
Reid, John H. (Reid Engineering Corp., Fredericksburg, VA)	9
QRC Technologies Inc. (Fredericksburg, VA)	8
Altria Client Services	8
U.S. Army	8
College of William and Mary (VIMS)	8
Printpack Illinois Inc. (Fredericksburg, VA location)	7
Life Technologies Corp. (owned by Thermo Fisher Scientific; manufacturing facility in Middletown, VA)	6
Trimble Navigation Ltd. (Sunnyvale, CA; Herndon, VA location)	5
Manufacturing Technologies Inc.	5

Source: U.S. Patent & Trademark Office data from Thomson Reuters Thomson Innovation patent analysis database.

Total Patent Activity Declining, 2014-2017

Region 6: Greater Fredericksburg	2014	2015	2016	2017	Total
Patent Counts	150	123	118	88	479

Technology Class Area	Number of Patents, 2010-2017
Digital computing or data processing equipment or methods, specially adapted for specific functions	11
Data processing systems specially adapted to administration and management purposes	7
Satellite radio beacon positioning systems; Determining position, velocity or attitude using signals transmitted by such systems	7
Biological treatment of water, waste water, or sewage	7
Mutation or genetic engineering; DNA or RNA concerning genetic engineering, vectors, e.g. plasmids, or their isolation, preparation or purification; Use of hosts therefor	6

Source: U.S. Patent & Trademark Office data from Thomson Reuters Thomson Innovation patent analysis database.

Three companies accounted for three-quarters of SBIR activity; none are startups (< 10 years old)

Small Business Innovation Research Awards, 2010-2017

Region 6: Greater Fredericksburg	2010	2011	2012	2013	2014	2015	2016	2017	Total
# of Companies	4	6	5	5	5	4	5	6	11
Award Counts	7	18	11	12	13	8	9	12	90
Award Amounts ($M)	$1.78	$5.94	$2.29	$5.19	$7.60	$2.77	$5.24	$7.13	$37.95

Source: SBIR award database

- McQ (1985), a remote monitoring and surveillance company received 40 SBIR awards from 2010-17;
- JRM Technologies (1998), a sensor company, received 18 awards;
- SimVentions (2000), a software, systems engineering, and cybersecurity company received 10 SBIR awards; Inc 5000 list in 2014, 2015, 2016 (211 employees, $30M+ revenue)

Greater Fredericksburg Region companies receiving Phase II awards, 2015-2017

Company	Phase II Award Counts	Phase II Award Amounts ($M)
IST Research Corp.	3	$3.51
McQ Inc.	3	$2.50
JRM ENTERPRISES, INC.	2	$2.05
SimVentions, Inc.	2	$1.98
Durbin Group LLC	1	$1.50
Research, Evaluation and Social Solutions, Inc. (REESSI)	1	$1.14
SYNTRONICS	1	$0.49

- Founded in 2008
- Technology platforms for decision-making in challenging operating environments
- Less than 50 employees
- Awarded $48.3M, 5-year Army contract in 2018
- Named to Inc. 5000 list for third consecutive year

Small number of companies and high concentration of deals in one company: smart grid software company with 6 reported deals from 2010-2016

Venture Capital Investment in Mary Ball Washington Region Companies, 2010-2017

Region 6: Mary Ball Washington	2010	2011	2012	2013	2014	2015	2016	2017	Total
# of Companies	1	2	2	2	2		1		6
Deal Counts	2	2	2	3	2		1		12
Investment Totals ($M)	$1.2	$1.6	$2.0	$4.2	$0.4		N/A		$9.3

Source: PitchBook Data, Inc.

Inc 5000 companies (ranked by past 3-years revenue growth) are in the defense contracting space

Inc 5000 Ranked Companies in Mary Ball Washington Region, 2017

Region 6: Mary Ball Washington	Founded	Revenue	Employees	Inc 5000	SBIR	Patents	VC
IntelliWare (Fredericksburg) - cybersecurity	2005	$27M	155	2016 2017	x	x	x
IST Research (Fredericksburg) - software	2008	$7M	44	2015 2016 2017	yes	yes	x
MarathonTS (Kilmarnock) – IT recruitment	2009	$19M	165	2015 2016 2017	x	x	x
ATSI (Fredericksburg) – govt contract management	2011	$12M	65	2015 2016 2017	x	x	x

Appendix C: Inventory and Stakeholder Discussions

Stakeholder Interviews

- Brian Baker, Executive Director, UMW Center for Economic Development
- Jerry Davis, Executive Director, Northern Neck Planning District Commission
- Joe DiStefano, Executive Director, Rappahannock Economic Development Corporation
- Vernon Green, Founder and CEO, GCubed
- Stephanie Heinatz, Founder and Managing Partner, Consociate Media, and Chairwoman, Gloucester Main Street Association Board
- Chris Hodge, Director of Technical Development, NSWC Dahlgren Division
- Lewie Lawrence, Executive Director, Middle Peninsula Planning District Commission
- Mark Luckenbach, Associate Dean for Research, Virginia Institute of Marine Sciences
- Chris Muldrow, Founder and CEO, Rambletype
- Curry Roberts, President, Fredericksburg Regional Alliance
- Susan Spears, Fredericksburg Chamber of Commerce
- Kimberly Young, Executive Director, Continuing and Professional Studies, UMW
- Jeanne Wesley, Vice President, Academic Affairs and Workforce Development, Germanna CC

Entrepreneurial Activities Across Stages of Entrepreneurial Development

Entrepreneurial Activity	Ideation	Commercial Viability	Market Entry	Growth & Scalability
StartUp UMW (targets high school, community college, and UMW students)	✓	✓		
Germanna Community College FredCAT (work space for students and entrepreneurs to come design, prototype and collaborate to support local technology and manufacturing startups)	✓	✓	✓	✓
UMW Center for Economic Development (Government Contracting Assistance Center, SBDC, ICAP, management education, Micro Loan programs)		✓	✓	✓
UMW EagleWorks Business Incubator			✓	✓

Appendix D: Competitive Benchmarking

Benchmarking: *Regions Selected and Comparative Measures*

- **Regions Selected**: TEConomy solicited and received input across the 9 GO Virginia regions on regions they benchmark themselves against, consider useful comparisons

- **Large Technology Hubs**
  - Raleigh/Durham, NC
  - Austin, TX
  - Charlotte, NC
- **Medium-sized regions with urban core and multiple mid-tier research institutions**
  - Birmingham, AL (UAB)
  - Chattanooga, TN – medium-sized, minimal university presence
  - Dayton, OH (Univ. of Dayton; Wright State Univ.)
  - Durham, NC (Duke)
  - Greenville, SC (Clemson Univ.)
  - Nashville, TN – medium-sized, major research university
  - Raleigh, NC (NC State)
- **Rural regions with major research institutions**
  - West Lafayette, IN (Purdue University)
  - Gainesville, FL (Univ. of Florida)
- **Rural region without major research institutions (near Interstate and mfg.-oriented)**
  - Greater Susquehanna, PA (MSA/Micro blend)
  - Cookeville, TN (Micro) – rural, minimal university presence
  - Jackson, TN (Micro) – rural, minimal university presence

*Regional geographies are Metropolitan Statistical Areas (MSAs) if not otherwise specified above.

- **Comparative Measures**: Organized across stages of entrepreneurial development

Ideation
- Highly educated population growth and in-migration
- New firm startup rate
- University R&D
- Patent Activity

Commercial Viability
- SBIR/STTR Activity
- University Technology Transfer & Commercialization

Market Entry
- Employment in Younger, Traded Sector Firms
- Venture Capital Activity

Growth & Scalability
- Presence of High Growth Companies
- Talent dynamics such as population growth of working age population, educational attainment and highly educated population growth and in-migrations
- SBA 7(a) loan activity

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Ideation

Ecosystem Element	Measure	GO VA Region 6	VA	U.S.	Benchmarking Groups: Median Value			
					Large Tech Hubs	Mid-sized Regions	Rural with Major Research Anchor	Rural with No Major Research Anchor
New Firm Startup Rate	Rate of New Firm Formation as a Percent of All Firms, 2014	-	7%	8%	9%	7%	7%	5%
	Percentage Pt. Change, 2010-14	-	0.3	0.2	0.0	-0.1	0.4	-1.0
University R&D	University R&D Expenditures per Capita, 2016	-	$174	$222	$863	$370	$2,800	$62
	Percent Change in Total R&D Expenditures, 2010-16	-	22%	17%	16%	15%	13%	-25%
Patenting (Incls. Industry & University)	Invented Patents per 1,000 Population, 2017	**0.1**	0.3	0.5	2.1	0.4	1.4	0.2
	Percent Change in Total Invented Patents, 2014-17	**-42%**	-33%	7%	16%	9%	20%	6%

Note:
- Large Tech Hubs: Raleigh/Durham, NC; Austin, TX; Charlotte, NC
- Mid-Sized Regions: Birmingham, AL; Chattanooga, TN; Dayton, OH; Durham, NC; Greenville, SC; Nashville, TN; Raleigh, NC
- Rural region with Major Research Anchor: West Lafayette, IN; Gainesville, FL
- Rural region without Major Research Anchor: Greater Susquehanna, PA; Cookeville, TN; Jackson, TN

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Sources: TEConomy analysis of National Science Foundation, Higher Education R&D Survey and US Patent and Trademark Office data and U.S. Census Bureau, Business Dynamics Statistics

Commercial Viability

Ecosystem Element	Measure	GO VA Region 6	VA	U.S.	Benchmarking Groups: Median Value			
					Large Tech Hubs	Mid-sized Regions	Rural with Major Research Anchor	Rural with No Major Research Anchor
SBIR/STTR Awards	SBIR, STTR Award Funding per Capita, Avg. 2014-17	**$11**	$15	$8	$17	$5	$30	$0.30
	SBIR/STTR % Change in Share of Award Funding, Avg. 2010-13 to 2014-17	**0.07%**	-0.56%	-	0.09	0.03	-0.04	0.00
	Number of Phase 1 Awards, 2010-2017	**53**	1,796	17,802	486	44	119	2
	Number of Phase 2 Awards, 2010-2017	**37**	935	10,002	235	33	49	0
University Technology Transfer & Commerciali-zation	Avg. Annual Univ. Start-ups, 2014-16	-	17	911	28	5	21	-
	Avg. Startups Formed per $10M Univ. Research, 2014-16	-	0.15	0.16	0.13	0.10	0.36	-
	Avg. Licenses/Options Executed per $10M Univ. Research, 2014-16	-	1.12	1.14	1.54	1.03	2.87	-

Sources: TEConomy analysis of SBIR.gov data and Association of University Technology Managers, Licensing Activity Survey

Market Entry

Ecosystem Element	Measure	GO VA Region 6	VA	U.S.	Benchmarking Groups: Median Value			
					Large Tech Hubs	Mid-sized Regions	Rural with Major Research Anchor	Rural with No Major Research Anchor
Employment in Younger, Traded Sector Firms	Share of Employment in Traded Sector Firms Ages 0-5, 2017 Q2	**5%**	7%	8%	8%	6%	7%	3%
	Avg. Share of Employment Growth in Firms Ages 0-5, 2013-2017 Q2	**40%**	52%	46%	36%	34%	42%	30%
Venture Capital Investments	VC Investments, 2014-17	**$0.4 M**	$2.6 B	$308 B	$2.3 B	$127 M	$66 M	$0.2 M
	VC Investments per Capita, 2014-17	**$1**	$315	$954	$1,221	$164	$255	$1
	Change in VC Investment, 2010-13 to 2014-17	**-96%**	24%	89%	42%	86%	-13%	2000%
	VC Deals, 2014-17	**3**	1,068	54,030	565	81	74	3
	VC Deals per 100,000 population, 2014-17	**1**	13	17	31	13	30	2
	Change in VC Deals, 2010-13/2014-17	**-67%**	67%	58%	67%	49%	135%	125%
	Share of VC Investments in Angel + Seed + Early Stages, 2014-17	**100%**	51%	41%	36%	79%	65%	100%
	Share of VC Deals in Angel, Seed + Early Stages, 2014-17	**100%**	81%	88%	85%	84%	91%	100%

Sources: TEConomy analysis of U.S. Census Bureau, Quarterly Workforce Indicators data and PitchBook data

Growth & Scalability

Ecosystem Element	Measure	GO VA Region 6	VA	U.S.	Benchmarking Groups: Median Value			
					Large Tech Hubs	Mid-sized Regions	Rural with Major Research Anchor	Rural with No Major Research Anchor
SBA 7(a) Loans	Avg. SBA 7(a) Loans, per 100,000 population, 2010-2017	**2.8**	2.9	4.7	3.6	2.7	2.0	3.2
	Change in SBA 7(a) Loans, 2010-2017	**-13%**	11%	22%	55%	80%	-17%	-20%
	Avg. SBA 7(a) Loan Value, per Capita, 2010-2017	**$7**	$9	$17	$18	$12	$10	$20
	Change in SBA 7(a) Loan Value, 2010-2017	**-85%**	214%	82%	149%	120%	693%	48%
Presence of High-Growth Companies	Number of Companies on the Inc. 5000 List of Fastest Growing US Companies, 2018	**8**	297	-	57	13	3	1
	Change in Companies in Inc. 5000, 2010-18	**0%**	2%	-	15%	13%	83%	-50%

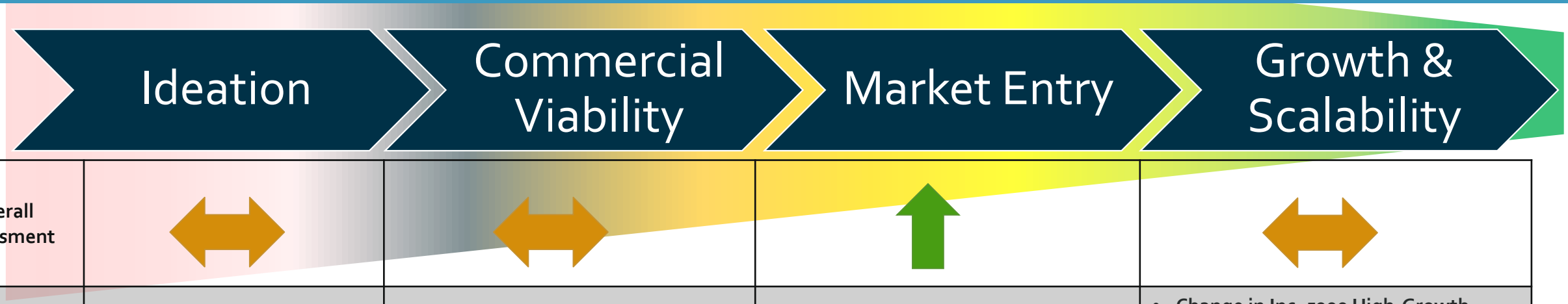
Sources: TEConomy analysis of SBA.gov and Inc 5000 data

Cross-Cutting Ecosystem Element: Talent Dynamics

Ecosystem Element	Measure	GO VA Region 6	VA	U.S.	Benchmarking Groups: Median Value			
					Large Tech Hubs	Mid-sized Regions	Rural with Major Research Anchor	Rural with No Major Research Anchor
Growth in Working Age Population	Growth in Total Working Age Population, 25-64—2012-2017	**5%**	1%	3%	9%	5%	2%	-2%
	Growth in Young Working Age Population, 25-34—2012-2017	**2%**	3%	7%	11%	7%	6%	4%
Educational Attainment	Share of Population Ages 25-64 with a Bachelor's Degree or Higher, 2017	**24%**	28%	23%	31%	23%	21%	15%
	Growth in Highly Educated Workforce (BA+), (25-64, working age) — 2012-2017	**17%**	10%	12%	26%	17%	16%	6%
Highly Educated Migration	Net Migration of Highly Educated Workers (BA+), 2012-17	**4,186**	-14,000	154,411	45,424	2,279	-9,684	-1,402
	Foreign In-Migration (BA+), 2010-17	**4,372**	151,627	3,933,494	38,243	8,782	8,423	587

Sources: TEConomy analysis of U.S. Census Bureau, American Communities Survey

Competitive Benchmarking Assessment



	Ideation	Commercial Viability	Market Entry	Growth & Scalability
Overall Assessment	⟷	⟷	↑	⟷
Well Performing Measures	• **Growth in University R&D** • **Change in Business Formation**	• **SBIR/STTR Activity and Growth**	• **Share and Growth of Jobs in Younger, Traded Firms** • **VC Investment Activity & Growth**	• **Change in Inc. 5000 High-Growth Companies** • **Growth in Young Working Age Population** • **Net Migration of Highly Educated Workers** (interstate)
On Par Measures	• **Rate of New Business Formation** • **Patent Activity*** • **University R&D Expenditures*** *on par with mid-sized regions, well behind Gainesville & West Lafayette	• **University startups: # and per $10m*** • **Licenses/options, per $10 m*** *ahead of mid-sized regions, well behind Gainesville & West Lafayette	• **Share of investment and deals in Angel, Seed and Early Stage VC Investment**	• **SBA 7(a) Loan Activity** • **Number of Inc 5000 High-Growth Companies*** • **Growth in Highly Educated Workforce** (though growing double digits) • **Foreign highly educated in-migration** (though 5,000+) *below mid-sized regions, well ahead of Gainesville & West Lafayette
Lagging Measures	• **Growth in Patent Activity**			• **Change in SBA 7(a) Loan Activity**

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Note: Compared to median values for both mid-sized regions and rural regions with major research anchors

Appendix E: Benchmark Case Study Profiles

Benchmark Case Studies: Wide Number of Tools for Entrepreneurial Development

	Ideation	Commercial Viability	Market Entry	Growth & Scalability
Typical Entrepreneurial Assistance Service Tools				
Tool-Kit Components	• Lean startup bootcamps/pre-accelerator preparation • Mentoring by an EIR/venture advisor • Pitch/Business competitions • University entrepreneurship centers • University technology commercialization scouting	• Accelerators/venture development organizations/incubators • NSF iCorps • Mentoring by EIRs with understanding of specific markets and technologies • Incubator, co-working, maker-spaces	• Mentoring by EIR with serial startup experience • Second stage incubators, research parks, multi-tenant specialized lab facilities	• Growth services involving talent recruitment and development, networking in domain areas and business functions, export assistance • Mentoring by seasoned business executive who grew companies 20x
Typical Risk Capital Catalysts Tools				
Tool-Kit Components	• Commercialization/Technology Transfer Funds • Pitch competition micro-investments	• Proof-of-Concept Funds • SBIR/STTR Matching Grants • Accelerator and Pre-Seed Funding • Refundable R&D and Technology Investment Tax Credits	• Angel Matching/Due Diligence Funds • Angel Investment Tax Credits • Seed Matching Funds	• Fund of Fund Investments (multiple ways to generate funding)

Innovation and Entrepreneurial Development Ecosystem Components

Benchmark Communities				
Austin, TX	← IC² Institute – mentorship, networking, Austin Technology Incubator → UT Kelleher Entrepreneurial Center UT School of Engineering Innovation Center		← South by Southwest Conference & Festivals →	
Birmingham, AL	←Alabama Drug Discovery Alliance →	Velocity Accelerator	Innovation Depot	Focus on IT training: Covalence IT coding boot camp; Innovate Birmingham efforts in IT training for under-employed and unemployed young adults
Charlotte, NC	UNCC 49er Student Foundry ←Network of accelerators (fintech, cleantech, NC Idea → Charlotte Venture Challenge	UNCC NSF i-Corps Site	Packard Place	Innovate Charlotte regional assessments on needs
Chattanooga, TN	← CO.LAB – mentorship, networking, accelerators, connection to capital → ← CO.Starters →	← CO.LAB's Gig Tank, Consumer Goods Accelerators, etc. →		Crowd-sourced financing platforms, such as Kiva; Chattanooga Renaissance Fund (seed fund); and Lamp Post Group (early-stage VC)
Dayton, OH	Wright Brothers Institute (commercialization intermediary)	The Entrepreneurial Center accelerator program	The Entrepreneurial Center mentoring services Accelerant Seed Fund	
Gainesville, FL	UF Entrepreneurship & Innovation Center	← Sid Martin Biotech Incubator & Innovation Hub Incubator → Florida Angel Nexus	← Innovation Square → Florida Opportunity Fund	StartupGNV networking events

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Innovation and Entrepreneurial Development Ecosystem Components

Benchmark Communities

	Ideation	Commercial Demonstration	Market Entry	Growth & Scalability
Greenville, SC		← NEXT program of Greenville Chamber – accelerator, mentoring, incubator and makerspace →		CU-International Center for Automotive Research
Nashville, TN	Vanderbilt Wondry	Vanderbilt NSF i-Corps ← Bunker Labs – Launch Lab, Veterans-in-Residence program, CEOs Circle → ← Nashville Entrepreneurial Center – mentoring, Pre-Flight, In-Flight, Music & Healthcare Accelerators →		
Raleigh-Durham, NC	← Active student bootcamps/pitch competitions/incubation → NC State EIR to Scout for Technologies ← Duke collaboration with privately managed accelerator and incubators →	NC State NSF i-Corps Site ← Research Triangle Park, Centennial Campus, HQ coworking, American Underground & Biolabs → ← Active university alumni angel networks at Duke, NC State & UNC → PoC Funds at NC State, UNC & Duke	← NC Biotech Center → UNC Carolina Research Ventures $10 m "Seed" Fund	
Susquehanna, PA		← Rural Business Innovation network of incubators → Micro-startup grants from Rural Business Innovation	College student internship funding ← Keysone Innovation Zone Transferable Tax Credits for Young Firm Revenue Growth →	
West Lafayette, IN		← Purdue Research Park & Purdue Discovery Park District: Incubators, Multi-tenant facilities, Mixed-Use placemaking → ← Purdue Foundry with EIR mentors → Trask Fund for applied research and PoC Elevate Purdue Foundry "pre-seed" Fund Ag-Celerator "pre-seed" Fund	$12 m Foundry Investment "seed" Fund	

Benchmark Case Study: Austin, TX

Regional Context:	• A major technology hub with one research anchor that until recently was not aggressive on tech transfer/startups and had no medical school • Chamber of Commerce drove progress where government was passive or lagged • Success at attracting semiconductor consortia in 1980s led to increasing ties to Silicon Valley and its investors • Unexpected success of Dell Computer in 1980s/1990s created local wealth and management talent, all used in startup formation
Key Tools:	• **IC2.** Institute started creating entrepreneurial momentum even in a period when university itself lagged • **Austin Technology Incubator.** Probably the most important outcome of IC2. Industry verticals aligned with Chamber targets. • **Dell Medical School.** Chamber succeeded in lobbying state for new med school at UT Austin, and Travis County matched with local tax levy • **Innovation District.** Next logical step after medical school is an integrated medical district, now under way • **SXSW.** Once a music festival, it deliberately broadened to add film and software/interactive, creating additional ties to coastal media & investors • **Kelleher Center at UT McCombs School.** Finally active in entrepreneurship, UT Austin now has a campus hub in the business school • **Cockrell School of Engineering Innovation Center** offers advice and training to faculty and staff, provides small startup grants, and hosts competitions, among other activities.
Successes:	• Chamber has adopted Innovate Austin initiative, and names annual 'A-list' of emerging, growth, and accelerator-stage ventures • Regional Council of Governments CEDS has unusually sophisticated section on entrepreneurship and growth acceleration, recognizing importance of both launch and expansion • ATI itself claims to have helped clients raise $890 million in capital, cumulatively, $200 million in 2016 alone to 19 companies • Across entire region, Chamber claims $869 million in capital to 123 deals in 2016
Challenges:	• Growing a full, research-oriented biomedical capacity has only just begun and remains a major challenge • Withering of semiconductor initiatives leaves status of J.J. Pickle Research Campus uncertain, isolated by expressway from main campus
Best Practice Lessons:	• Austin is the pre-eminent example of successfully mixing arts and technology into a single message on creative economy • SXSW has been as impactful as any high-tech initiative, and made Austin a platform for startups nationally, as well as exposing local startups to the national audience • There are few other mid-sized metros with such close ties to the centers of music and film (LA) and tech (NY and San Francisco)

Benchmark Case Study: Birmingham, AL

Regional Context:	• Mid-sized region with research anchors, including University of Alabama Birmingham ($500+ m annually) and Southern Research Institute (~$70 m annually in contract research funding). • Research anchor focus is strongly on life sciences. • Challenge of having to reinvent itself from being a steel-oriented economy (the "Pittsburgh of the South") to an innovation and knowledge hub.
Key Tools:	• **Applied and translational research focus**: Alabama Drug Discovery Alliance, a collaboration of SR and UAB, leverages significant drug discovery and development research and shared use facilities and moves new therapeutic leads through a structured process of assay development, high-throughput drug screening, lead identification and development, pre-clinical testing and early clinical trials. • **Innovation Depot**, a 140,000 sq. ft. incubator and co-location space, making it one of the largest in the nation. It offers range of space options, including wet lab. The Innovation Depot is far more than a technology incubator, but a home for a variety of entrepreneurial and talent initiatives in collaboration with community stakeholders. • **Velocity**, a relatively new accelerator housed at Innovation Depot, with ability to invest $50,000 in seed funding for each selected startup company. • **IT workforce development** – Multiple efforts in place at different levels for IT coding/software development bootcamps targeting undergraduates and under-employed/unemployed young adults. • **Networking activities**: Tech Birmingham programs include a monthly TechTuesday speaker series, member only networking socials, broader information sharing events, and Keep It Local to create opportunities for local companies to do more business together in IT products and services, among other efforts.
Successes:	• Innovation Depot reports 112 companies assisted with 1,064 jobs and $155 million in sales revenue. Largely tech-oriented companies, but some life sciences. • Establishing networks and connections with other communities to generate investor interest and entrepreneurial teams, including New York and Israel • Many of its graduates are now serving as tenants for a larger innovation district development in Birmingham • Alabama Drug Discovery Alliance in early 2018 had 19 drugs in the development pipeline, leveraging major drug discovery programs in emerging infectious diseases, cystic fibrosis and cancer, engaging major biopharmaceutical companies.
Challenges:	• Advancing broader access to capital across stages of investment • Generating life sciences startups from research anchors
Best Practice Lessons:	• Role of entrepreneurial anchor in creating focus and branding on innovation and entrepreneurship • Advancing a single umbrella for delivery of technology transfer, commercialization and entrepreneurial services • Embedding talent and workforce initiatives with innovation and entrepreneurial anchor activities

Benchmark Case Study: Charlotte, NC

Regional Context:	• Fast growing technology hub with smaller research anchors • Leveraging position in banking center to generate a rising entrepreneurial community.
Key Tools:	• **Innovate Charlotte (formerly Charlotte Regional Fund for Entrepreneurship)**: Established through the 2012 regional plan for "Prosperity for Greater Charlotte," and funded through the region's $2.5 billion community foundation. It was envisioned as a grant funding mechanism to support local non-profits to advance entrepreneurial culture, ecosystem connections, risk capital availability and technical skills. Over the years has taken a more pro-active approach in providing entrepreneurial assessments of the region, holding ideation workshops and recommending specific activities. • **Packard Place**: A redeveloped large auto showroom/building that has been transformed into an entrepreneurial hub housing multiple accelerators (see below) as well as offering fellowships to new startup founders and co-working space. • **Network of accelerators**: Includes one in clean energy (Joules Accelerator), fintech (QC FinTech), and tech (RevTech Labs and NC IDEA) • **Ventureprise**: UNC Charlotte's long-time affiliated incubator founded back in 1986. Long history of engaging entrepreneurial community, though in 2017 reconstituted with a stronger focus on student and faculty startups, with programs such as Ventureprise Launch NSF iCorps for university tech commercialization and 49er Foundry a student incubator. Also manages the NC IDEA offering a lean-startup program similar to its Ventureprise Launch for innovation-driven startups in the community.
Successes:	• Packard Place reports results for its aggregate community of accelerators, coworking spaces, fellows, etc. as generating from 2010-2017, 500 new jobs and $1 billion in venture capital raised. • Ventureprise reports over the 2008-2017 period supporting 46 new clients, with some notable successes such as CSi/Photograds, Verian Technologies, SecureEdge Networks and Saprex, which had successful exits or have moved into their own commercial facilities to accommodate substantial growth.
Challenges:	• Long time period to grow university research anchors to match fast growth of overall entrepreneurial activities and offer a deeper driver of innovation. • Not doing well in growing new research park anchors to complement emergence of technology hub, including slow growth of campuses with Charlotte Research Institute and David H. Murdock Research Institute.
Best Practice Lessons:	• Role of community foundation and community leaders in spurring entrepreneurial development.

Benchmark Case Study: Chattanooga, TN

Regional Context:	• Mid-sized region with limited research anchor. [RYAN, CAN YOU ADD BENCHMARKING INDICATORS?]
Key Tools:	• Company Lab (or CO.LAB) is a non-profit accelerator and one-stop shop for local entrepreneurs founded in 2008. CO.LAB has developed a range of programs and services for both local growth and high-growth companies at different stages of development, including: Way Finding to screen and guide entrepreneurs to services, CO.STARTERS a 9-week program that teaches lean startup methods for business startup; CO.LAB Accelerator, a mentor-driven program for high-growth potential startups; GIG Tank, an accelerator focused on ultra-high bandwidth business applications; Consumer Goods Accelerator, an accelerator focused on outdoor recreation and food/beverage sector. • CO.LAB connects companies to capital, like the Chattanooga Renaissance Fund, and Lamp Post Group focused on seed investments. CO.LAB has also joined the Kiva, crowd-sourced financing platform. • In 2015 a new intermediary organization formed, the Enterprise Center, to more broadly leverage the City's high broadband infrastructure to create a place that develops and tests many applications for urban needs. • Chattanooga foundations and business leaders have historically invested in downtown revitalization efforts, including the riverfront development. CO.LAB spun out of downtown revitalization and visioning exercise supported by local family foundations. Other investments and assets include Chattanooga's gigabit network (10 gbps metro-wide fiber optic network), UTC, the regional university in close proximate to downtown, and the rebranded Innovation District involved mixed use developments.
Successes:	• Significant scale of activities by CO.LAB since its formation back in 2008, including 20+ cohorts and 700+ participants in CO.Starters, 83 companies graduated and $7M+ capital raised from CO.LAB Accelerator, 58 companies graduated and $29M+ capital raised for GIG Tank and 200 consultations a year from Way Finding.
Challenges:	• Lack of capital is viewed as a key constraint to high-growth companies
Best Practice Lessons:	• Demonstration of how to revitalize a community and its downtown through talent retention, placemaking, startup activity, and ecosystem building that supports both "local growth" and high-growth companies • Critical role of local foundations in catalyzing activities and combining placemaking, unique tech infrastructure development and entrepreneurial programming.

Benchmark Case Study: Dayton, OH

Regional Context:	• Mid-sized region anchored by major federal research lab, Air Force Research Labs at Wright Patterson Air Force Base, and University of Dayton with its research institute generating more than $100m in research activities highly aligned with ARL needs, plus Wright State University, with some research programs and an important talent driver for the region. • Challenge of moving beyond federal contract activity to drive new traded sector company growth.
Key Tools:	• **Wright Brothers Institute (WBI)**: A partnership intermediary to facilitate technology transfer from ARL, identify unmet technology needs, further commercialization through collaborative team efforts and engage small technology-based businesses to tap opportunities and partnerships. • **The Entrepreneur Center (TEC):** Serves as the delivery arm of entrepreneurial services supported by the Ohio Third Frontier and operates a traditional incubator with two sites in the region, which is now expanding into offering coworking space and an accelerator program. Also houses a site for WBI.
Successes:	• Wright Brothers Institute reports supporting over 100 innovation-based projects annually, with typically $3 million of commercialization activities and engaging over 1,000 small technology-oriented businesses. • While not among the top performing seed funds in Ohio, the Accelerant seed fund over 2007-2014 invested $17 million, creating 2,995 jobs and retaining 1,274 jobs. This performance though ranks last of the six privately-managed regional seed funds supported with matching funding from Ohio Third Frontier – and since 2013 has received no additional state matching funds.
Challenges:	• Creating more commercially focused technology-based companies.
Best Practice Lessons:	• While advancing industry partnerships with federal labs can be effective, it does not always translate into new commercially-focused technology businesses.

Benchmark Case Study: Gainesville, FL

Regional Context:	• Compact metro in North Central Florida surrounded by rural counties, distant from major population centers, dominated by U Florida, the land grant which also includes a medical school • Master planning is emphasizing infill between historic downtown and the university campus • Innovation & economic development one of six "pillars" of regional CEDS
Key Tools:	• **Sid Martin Biotech**. 40,000 s.f. Incubator created in 1990 with long and well recognized track record, off campus in Progress Corporate Park • **Florida Innovation Hub.** 100,000 s.f. dry incubator at downtown campus, anchoring: • **Innovation Square.** Major live/work innovation district project planned for blocks between campus and downtown Gainesville, 1 major multitenant building already open, both wet and dry space • **Entrepreneurship and Innovation Center.** On-campus hub for student entrepreneurship, including consultancy with real startups and 'hatchery' for student ventures • **Florida Opportunity Fund.** Venture fund established with state's allocation from Treasury SSBCI fund • **Florida Virtual Entrepreneur Center**. State-supported through Florida High Tech Corridor collaboration of the three major research universities. • **StartupGNV (formerly GAIN).** Not-for-profit organization encouraging local startups. • Additional lower-tech incubators including two at smaller institutions like Santa Fe College strongly supported by the Chamber and highlighted in regional strategies • Multiple commercial coworks, makerspaces, etc. • **Florida Angel NEXUS.** Statewide collaborative of regional angel groups and funds • Every county in the region (1ll 12 counties surrounding Alachua) qualify for planning support from the state Rural Economic Development Initiative
Successes:	• Sid Martin claims its companies have attracted cumulatively $500 million in capital ($1.7 billion in funding including revenue and acquisitions), with 80% still in operation 5 years after graduation, and 16 of all biotech companies in-state started there • UF licensing office claims to have started more than 160 companies (about half biomedical, but also technology)
Challenges:	• Relative isolation from state's major business/corporate centers – 70 miles to Jacksonville, 110 to Orlando, 130 to Tampa • Chamber recognizes need to take strategy to a higher level, including better connecting startup creation to targeted industry clusters, and reducing outward brain drain
Best Practice Lessons:	• Through patient nearly 30-year investment in Sid Martin Biotech, UF has moved beyond "Gatorade" to genuine standing in biotech world

Benchmark Case Study: Greenville, AL

Regional Context:	• Mid-sized region anchored by presence of university research anchors in the region and a growing academic hospital creating a new medical school in collaboration with local universities.

Key Tools:	• **New innovation center campuses outside of the main Clemson University campus with focus on specific technologies, including:**
	  • **Clemson University International Center for Automotive Research (CU-ICAR), Greenville:** Significant public-private partnership between growing automotive industry, Clemson University and the state to create a new R&D center of excellence in automotive technologies close to the industry cluster and about 45 minutes from the Clemson campus . Includes creation of a new graduate program in automotive technologies at the site that involves multi-disciplinary approach involving electronics, computing and advanced materials, supported by recruitment of eminent scholars. Home to company research centers, including BMW IT Research Center and Koyo Bearing R&D Center, plus offers a 60,000 sq ft Center for Emerging Technologies.
	  • **Clemson University Biomedical Engineering Innovation Campus, Greenville:** A 30,000 sq. ft. lab located within a facility at the Greenville Health System campus, which is a spearhead to advance collaborations with a new academic medical center development taking place.
	  • **Clemson University Innovation Campus and Technology Park, Anderson, SC:** Eight miles from the main Clemson campus. Home to university's Advanced Materials Research Lab, environmental labs and computing center; Duke Energy Innovation Center; and industry funded National Brick Research Center
	• **Rise of mix of accelerator, incubator and maker-spaces in Greenville region:** Led by the NEXT program of the Greenville Chamber, brings a strong focus on entrepreneurial and innovation-focused small businesses, with three different facilities, including one targeted for advanced manufacturing, mentoring programs, events and other ecosystem development efforts.

Successes:	• $250 million public-private partnerships in CU-ICAR has generated 770 jobs and another 720 jobs announced, plus major surrounding projects including 1,100-acre mixed use development with an expected population of 10,000, location of Hubbell Lighting Corporation headquarters, among other industry and health system investments. • NEXT Innovation Center reports assisting 102 companies, attracting $23 million in new capital in 2017 and 261 new jobs paying on average $69,443.
Challenges:	• Linking major public-private innovation center developments with entrepreneurial activity.
Best Practice Lessons:	• Creating new anchor research and innovation centers around industry clusters through university, industry and state partnerships

Benchmark Case Study: Nashville, TN

Regional Context:	• Mid-sized region anchored by a major research university, strong music scene and leading healthcare companies

Key Tools:	• The Nashville Entrepreneur Center a non-profit offering a range of fee-based services and memberships spanning coworking, networking, incubation and intensive mentoring/acceleration services:
	  • Co-Working space and Community access
	  • Pre-Flight program for entrepreneurs to advance business ideas
	  • In-Flight program for early-stage startups with up to three employees and $150,000 in revenue
	  • Accelerators focused on music industry and healthcare industry verticals that accept startups nationwide
	• Vanderbilt is an NSF i-Corps site and has graduated 17 teams; Vanderbilt's Wond'ry, the university innovation center, is aimed at developing an institutional innovation culture for faculty and students, and includes programs like Innovation Garage (industry-university collaboration on disruptive solutions), entrepreneurship courses, a makerspace, pitch events, and EIRs
	• Bunker Labs

Successes:	• Branding from major LaunchTN entrepreneurial event, 36/86, is helping to create buzz for Nashville's entrepreneurial community, which is not strong in VC funding, overall net employment from young companies nor university tech transfer, but is attracting significant net in-migration and is generating significant numbers of high growth companies.
Challenges:	• Very diffuse entrepreneurial community, with need to create stronger presence of innovation in the region, including more placemaking
Best Practice Lessons:	• Importance of having a one-stop entity for entrepreneurship

Benchmark Case Study: Raleigh-Durham, NC

Regional Context:	• Mid-sized region anchored by major research universities with strong focus on innovation programs and place-making.

Key Tools:	• **NCBiotech Center:** Long-standing, dedicated program to growing life sciences in the region and across the state, including advancing research excellence, investing directly in emerging companies, ensuring trained workforce and advancing networking and peer groups in life sciences.
	• **Major placemaking for technology with Research Triangle Park (RTP) and Centennial Campus at NC State**. RTP is one of the oldest and largest research parks in the U.S., but has been largely home to larger corporations, including a strong emphasis on biopharmaceutical. It is now reinventing itself with a new town center to offer more amenities and opportunities for emerging companies, plus single use facilities are being converted into multitenant facilities for start-ups and emerging companies, such as Alexandria Real Estate's new Agtech facility that used to be a Syngenta R&D facility.. Centennial Campus at NC State has been a leader on establishing innovation districts, leveraging the university as an anchor and creating close relationships between faculty, students and company tenants, while offering mixed use developments including housing.
	• **Role of universities in commercialization.**
	  ◦ NC State is a national leader, with over 20 startups annually, dedicated funding through its Chancellor's Innovation Fund for proof-of-concept, a full-time site for NSF i-Corps, an Executive in Residence program to scout for technologies at university research labs, bootcamps and business plan competitions, strong entrepreneurial programs within its colleges and strong alumni networking of its start-ups (Wolfpack Investor Network).
	  ◦ UNC in 2010 launched a stronger focus on commercialization and entrepreneurship, including commercialization training launched through an EDA i6 grant, on-campus incubators, a downtown coworking space, proof-of-concept funding (Kickstart Venture Services), alumni investor network (Carolina Angel Network) and a $10 million seed-stage investment fund created by the university's endowment known as Carolina Research Ventures Fund.
	  ◦ Duke University has also embraced entrepreneurship with fellowship program, startup challenge, an incubation fund and a prototyping facility for students, and in its technology transfer efforts participation in the Coulter program, active alumni angel network and partnerships with private sector incubators and accelerators (MedBlue incubator, Biomarker Factory and Center for Advanced Hindsight).
	• Non-university physical developments, including coworking and incubator spaces, such as HQ coworking with three facilities in Raleigh and American Underground and BioLabs in Durham

Successes:	• Raleigh Durham is a top region for venture investment in high-potential innovation-driven companies, with over $1 billion in venture funding to 173 companies, able to attract VC investment from East and West coasts, as well as having a strong base of SBIR backed companies.
Challenges:	• Linking major public-private innovation center developments with entrepreneurial activity.
Best Practice Lessons:	• University engagement in commercialization and innovation is key driver for the region. Builds on brand of being a major complex for university research and talent.

Benchmark Case Study: Susquehanna, PA

Regional Context:	• Rural region with no university research anchors, but presence of non-research oriented colleges and universities.

Key Tools:	• Presence of a Keystone Innovation Zone designation, one of 29 in the state, offering transferable tax-credits of up to $100,000 based on growth in revenues to young companies under 8 years old, operating in innovation-led sectors and located in designated areas near colleges and universities.
	• Rural Business Innovation serves as hub for entrepreneurship including:
	  • Network of incubators located near local colleges and universities
	  • Business technical assistance for accessing financing
	  • Micro-startup grants of up to $5,000
	  • Student internships of up to $2,000 per semester
	  • Coordinator of local KIZ involving outreach and engagement with local businesses

Successes:	• Diversified range of approximately 30 companies served across manufacturing, IT, and bio-health through incubators, internships, micro-loans and KIZ tax benefits • Eleven companies received KIZ benefits in 2017 generating nearly $1 million in new sales and receiving $444,000 in transferable tax credits.
Challenges:	• Sustaining a rural economy by having new and small businesses generate job opportunities
Best Practice Lessons:	• Demonstrates role that an entrepreneurial focused entity can have across a rural region partnering with local institutions • Shows that a targeted tax credit oriented towards young growing businesses in traded industry sectors can be effective in rural communities.

Benchmark Case Study: West Lafayette, IN

Regional Context:	• Rural region with major research anchor
Key Tools:	• Purdue's university driven research park developments. The Purdue Research Park, a 725-acre site on formerly university ag-related lands approximately 8.5 miles from main campus. Now home to 160 tenants. Home to a 105,000 sq. ft. university incubator and coworking space, which was developed with private contributions and bond funding from a state tax-increment financing program to create business incubators that offers $5 million in bonding per incubator. Discovery Park District, a 400-acre mixed-use development immediately west of the main campus. It is the location for many of the university's commercialization and entrepreneurial development initiatives housed in the Burton Morgan Center for Entrepreneurship. • Purdue's Foundry is an accelerator-type program to help Purdue-affiliated entrepreneurs create startups offering access to EIR mentors as well as an umbrella for a range of entrepreneurial and commercialization initiatives including: Trask Fund for applied research and proof-of-concept funding of university inventions; an NSF iCorp site; a range of venture financing assistance, including a $12 m Foundry Investment Fund, a pre-seed Elevate Purdue Foundry fund receiving state support, Purdue Startup Fund, Purdue Angels and pre-seed Ag-Celerator funding.
Successes:	Since the founding of the Purdue Foundry in 2013, there have been 165 startups created that generated more than $270 million in funding and 200-plus new jobs.
Challenges:	• Growing a broader and sustainable innovation ecosystem for the region that sees local startups stay rooted in the region as well as attract other growth-oriented companies.
Best Practice Lessons:	• A major research anchor can both attract existing industry operations to locate nearby as well as create the tools to generate new startups from research inventions, and faculty and student ideas.

Innovating Tomorrow's Economic Landscape

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