

Regional Entrepreneurial Assessment Project:

Final Briefing Report

Region 4: Grow Capital Jobs Region

December 2018

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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 4 – Grow Capital Jobs 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.

Setting the Context: Importance of Entrepreneurial Development for Regional Growth

- In 2017, there were 2,919 surviving traded sector startups formed since 2007 in Region 4
- 20,643 jobs in 2017 were found in these 2,919 surviving startups
- By comparison, over the 2007-2017 period, total traded sector industry employment grew by 14,423 jobs in Region 4.
- So without entrepreneurial growth, Region 4 would have had a decline in its traded sector industry employment

Project Work Plan

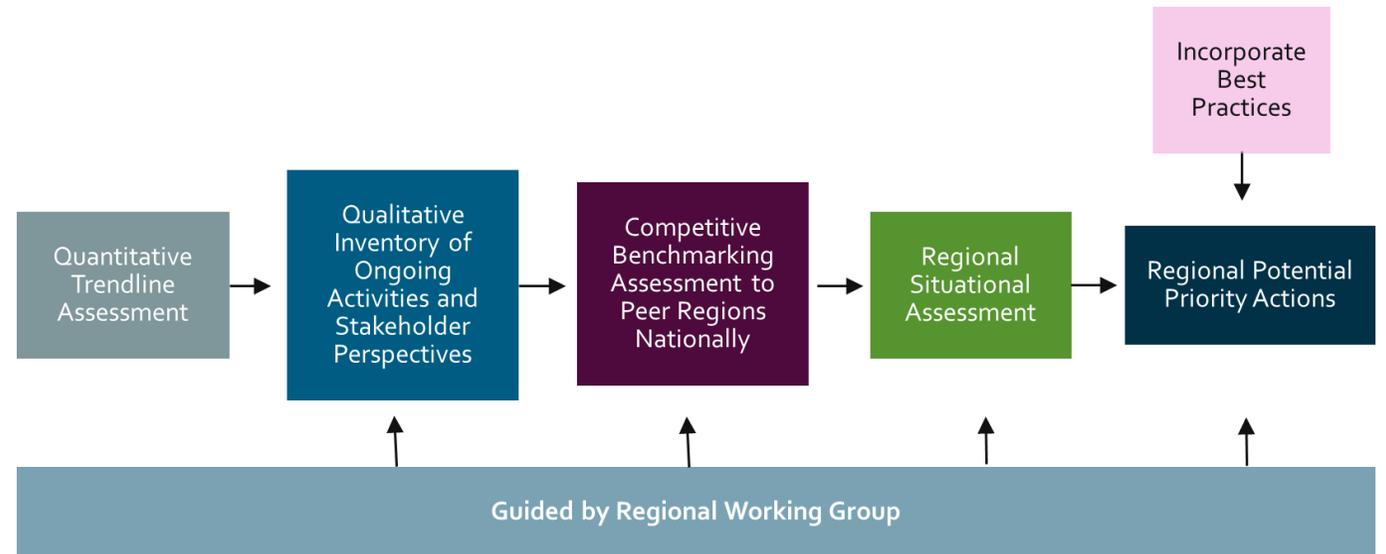
The work plan for preparing this Region 4 entrepreneurial development assessment involved examining:

- 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 4 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 4

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.



Activities at Each Stage	Ideation	Commercial Viability	Market Entry	Growth & Scalability
	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

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; and agriculture and food processing 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 4

Overall Assessment:

Mixed results to date, but significant opportunities for advancing new program activities.

Strengths and Opportunities:

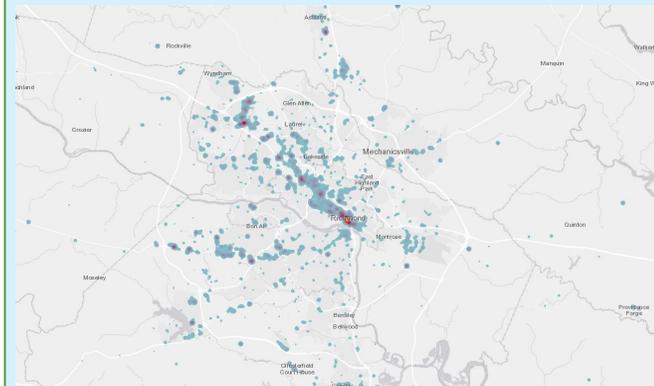
- **Competitive in overall levels of business formation** with peer regions through 2014 (most recent data available nationally),
- **Geographic footprint of traded sector startups heavily concentrated in Greater Richmond MSA**—roughly 90% of the startups and jobs-from startups.
- **Diversity in startup activities across traded sector industry clusters**, including each of the priority clusters identified by Region 4’s 2017 Growth and Diversification Plan
- **Region has active technology transfer and commercialization efforts**, outpacing the nation in terms of the number of disclosures and startups formed
- **A growing focus on supporting the entrepreneurial ecosystem within the Region** through the efforts of organizations such as Activation Capital, VCU Ventures, Lighthouse Labs, NRV, Startup Virginia, and numerous maker-spaces

Gaps and Weaknesses:

- **Significant volatility in business startups from year-to-year**, with a range from 506 startups (2017) to 1,036 startups (2013) in just the past five years.
- **Gains in university R&D has been relatively flat over the period**, but has seen an uptick in the two most recent years. 71% of R&D found in life sciences over 2010-2016 period

Region 4 has diversity in base of startups across traded sector industry clusters but are primarily located in the Greater Richmond area

Major Industry Cluster*** (those relating to regional priority clusters bold faced)	Number of Start-ups Since 2007 Surviving by 2017	Start-up Employment Levels, 2017
Agriculture & Food Processing	153	862
Business Services	2,051	10,520
Energy, Nat Resources, & Finished Products	102	1,321
Engineering, R&D, Testing & Services	200	2,874
Financial & Insurance Services	535	2,472
Health Care Services	128	3,202
IT & Communications Services	187	1,759
Life Sciences	109	756
Manufacturing	184	1,744
Transportation, Distribution & Logistics	695	4,988



Assessment of Commercial Viability in Region 4

Overall Assessment:

Specific strength in university research commercialization for life sciences that can be expanded to other fields, plus opportunity to better position base of innovative companies found in region for success in commercializing products.

Strengths and Opportunities:

- **University technology transfer performing above national average** in key metrics of disclosures and startups, normalized by size of research base. Significant opportunities to be gained with VCUs streamlined T&Cs. Still room for improvement compared to the top performing regions.
- **Pre-seed funding** (accelerators and incubators) and angel investment **stands out in the region**
- **Significant efforts have been added to the “toolbox” for supporting technology commercialization targeted to emerging companies across the region.**
 - Well-established accelerator- Lighthouse Labs
 - VCU Ventures efforts, although need to expand and enhance efforts to other fields beyond dominant activity in life sciences

Gaps and Weaknesses:

- **Research commercialization efforts are hindered** by insufficient levels of proof-of-concept funding and serial entrepreneur networks.
- **Very limited level of SBIR awards granted to companies within the region,** with numerous years recording single digit awards.

Region’s Efforts in Increasing Commercial Viability

Lighthouse Labs - Non-profit mentor-driven startup acceleration program connecting founders with mentors, investors, support services, working space, and lean startup education to move from idea to high-growth venture in 3 months. Provides each startup with \$20K in equity-free financing. Only seed stage high-growth accelerator providing capital in Central Virginia.

VCU Ventures is Virginia Commonwealth University’s office for supporting faculty and staff startup companies. Programs include:

- **Start-up Navigators** - interested faculty members are assigned a “navigator” to help navigate the internal start-up process.
- **The Venture Lab** - programs specifically designed to support start-up companies around specific types of technologies. Participants are selected to go through a pre-acceleration program administered by RVA founders and investors. This program is designed to help to develop, evaluate and test business models.

Assessment of Market Entry in Region 4

Overall Assessment:

Mixed results to date, held back primarily by lack of risk capital.

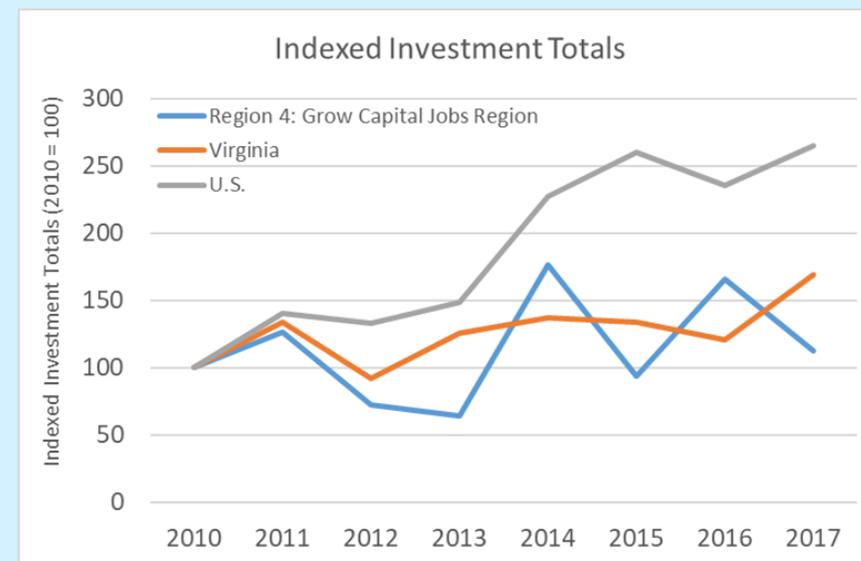
Strengths and Opportunities:

- Employment in Younger, Traded Sector Firms on par with mid-sized regions
- Numerous incubator and coworking spaces targeted to entrepreneurs found within the region.

Gaps and Weaknesses:

- **High failure rate in year 2** transition may point to lack of support (both financial and services) for early-stage companies.
- **Dip in survival between years 7 and 8** may point to lack of later stage risk capital and C-suite talent
- **Seed, early, and later stage funding represents a small portion of the number of deals** compared to state and nation
- **Lack of lead early stage investors for high-potential startups needing formal venture capital investments beyond \$1-\$2 million from angel investor rounds.** When startups require larger Series A and B rounds, they are vulnerable to being relocated to be more proximate to investors since there is no lead investor at early stages of venture funding located in the region.

Venture Capital Growth in Region 4 has mirrored the state and lags behind the growth of the nation.



Assessment of Growth & Scalability in Region 4

Overall Assessment:

Uneven performance with significant opportunities to foster more retention and expansion of startups in the region.

Strengths and Opportunities:

- **Right ingredients in region to grow startup companies.** Stakeholders see a strong confluence of talent, amenities and ecosystem – especially in the Richmond region – to support entrepreneurial development.
- **Growth from startup companies important for many emerging industry clusters in the region,** including life sciences and engineering/R&D services. Plus, important in well-performing traditional industry of business services, financial and insurance services.
- **Presence of new Amazon facility** will provide benefits in terms of perception of larger region as well as serve as a provider of a broader base of talent – both C-suite talent that will move into the region due to new opportunities as well as technology talent

Gaps and Weaknesses:

- Despite growth of highly educated workforce and positive in-migration from outside of Virginia, **concerns voiced by stakeholders of talent shortages to scale-up startups, despite in-migration.**
- **Lack of networking of entrepreneurs and more formalized efforts to identify startup and emerging company needs outside of Richmond.**

Contribution of Entrepreneurial Development to Traded Sector Industry Cluster Growth

Industry Cluster	Economic Development Position in Region	Contribution of Entrepreneurship
Agriculture & Food Processing	Emerging Strength	Modest
Business Services	Current Strength	Very Significant
Energy, Natural Resources, & Finished Products	Sizable/Declining	Very Significant
Engineering, R&D, Testing & Technical Services	Emerging Opportunity	Very Significant
Financial & Insurance Services	Current Strength	Significant
Health Care Services	Sizable/Growing	Very Significant
Information Technology & Communications Services	Sizable/Growing	Very Significant
Life Sciences	Emerging Strength	Significant
Manufacturing	Sizable/Declining	Very Significant
Transportation, Distribution and Logistics	Sizable/Growing	Very Significant

Potential Priority Actions Identified for Entrepreneurial Development in Region 4

- Develop stronger ideation and commercial viability programming targeting traded sector startups.
- Develop a Serial Entrepreneurs Network
- Catalyze wider range of risk capital in the region
- Engage regional corporate stakeholders in the advancement of commercialization, startups, and talent connections
- Leverage the Concept of a State-Supported “Regional Entrepreneurial Quarterback” to further elevate/enhance Activation Capital

Potential Priority Action: Develop stronger ideation and commercial viability programming targeting traded sector opportunities

Rationale:

- Take better advantage of region's strong base of talent and innovation activities to raise and sustain new business formation
- Limited ideation outreach currently in the region to broader base of non-university potential traded sector entrepreneurs
- Opportunity to support small innovation businesses that receive or seek SBIR awards
- Opportunity to enhance and expand VCU's Start-up Navigators and Venture Lab programs to reach more faculty in non-life science areas to help diversify portfolio
- Need for increased amount of funding dedicated to Proof-of-Concept Funds

Possible Activities:

- Create an ongoing regional capacity to offer an ideation program for potential entrepreneurs similar to VCU's Start-up Navigators and Venture Lab efforts and/or further expand this model outside the university
- Enhance and expand VCU's Start-up Navigators and Venture Lab programs to reach more faculty in non-life science areas to help diversify portfolio
- Create additional Proof-of-Concept Funds and pre-seed/seed funds to support increased deal flow, and also create SBIR Assistance Program to help with grant writing and administration
- Sponsor entrepreneurs-in-residence fellows in targeted sectors relevant to Region 4 to work with identified regional entrepreneurial startup teams that successfully complete initial phases of ideation program and demonstrate high-growth potential

Illustrative Best Practice Examples:

- Chattanooga, TN: Co.Starters 9 week lean startup program followed by Co.Lab Accelerator mentoring program for high-growth potential startups
- Oklahoma: i2e Venture Assessment Program designed to help entrepreneurs investigate product/market fit of a new business concept through a five week program of workshops and individual feedback and direction with follow-on recommendations on next steps needed to advance business concept
- Raleigh-Durham: Blackstone Entrepreneurs Network North Carolina that provides expert venture coaching through a veteran group of EIRs

Potential Priority Action: Develop a Serial Entrepreneurs Network

Rationale:

- Difficulty in securing C-level talent that can drive scalable growth
- Issue compounded by a lack of organized/accessible network of serial entrepreneurs with the business expertise/acumen to guide startup companies
- As a result of the current lack of serial entrepreneurs, it is vitally important to develop a network of seasoned mentors who will provide assistance to promising innovative companies, helping them access key customers and markets, as well as provide guidance that will, in turn, make them more attractive to the risk capital community. As noted in the data, the region's loss of companies in year 5 to 7 may be caused in part by firms moving elsewhere in search of managerial caliber candidates.

Possible Activities:

- Create Entrepreneurs-in-Residence Program designed to ensure consistent, significant, value-added assistance to high-growth companies that are fundable but lack C-level talent
- EIRs would provide assistance with forming a business team of managers to assist with market research, technical evaluations, regulatory issues, etc.
- In-depth counseling and advice to prepare the entrepreneur to present investment-grade plans to investors.
- Envisioned that the EIRs would be comprised of serial entrepreneurs looking for their next opportunity, and that ideally the individual would ultimately exit the program by joining a local startup. In addition, they may choose to be active investors in the deal flow of the region.

Illustrative Best Practice Examples:

- Ohio Third Frontier Entrepreneurial Signature Program: JumpStart, one of six Ohio ESPs, provides Entrepreneurs-in-Residence to the most innovative and promising entrepreneurs across Northeast Ohio. Value-added services include providing assistance with forming a business team of managers to assist with market research and identification of potential clients; providing subject matter experts to assist with technical evaluations; regulatory issues, and commercialization assistance; as well as providing in-depth counseling and advice to prepare the entrepreneur to present investment-grade plans to investors.

Potential Priority Action: Catalyze wider range of risk capital in the region

Rationale:

Region 4 needs to build upon its initial sources of risk capital to offer larger tranches of growth capital for its successful base of startup companies as they seek to scale up.

Given the diverse base of startups across traded sector industries in Region 4, it is important to have investment vehicles that can invest in multiple industries in addition to increasing funding for life science opportunities.

Possible Activities:

- **Form a region or multi-regional seed fund** able to bridge angel investors and more formal venture capital, with ability to lead syndication at seed stage and participate in follow-on early stage rounds
- **Consider establishing a Small Business Investment Company to provide working capital financing for scaling-up traded sector startups that are generating revenues.** Under the SBIC model, private investors participate as limited partners of the SBIC and their investments are matched by the federal Small Business Administration \$2 to \$1. SBIC investments are structured as either debt, equity or a combination of both.
- **Organize angel investors and support through management funds for due diligence. Address need for increased funding of statewide angel investment tax credit.** There is a \$5 million cap in available credits each year, after which credits are prorated, which makes its benefit level uncertain for investors.
- **Create additional Proof-of-Concept Funds** to support increased deal flow, and also create SBIR Assistance Program to help with grant writing and administration. Also, leverage state Small Business Investment Grant program and R&D tax credit program.

Illustrative Best Practice Examples:

- Chattanooga, TN: Two seed funds are active in the region, Chattanooga Renaissance Fund and Lamp Post Group.
- Ohio Third Frontier: 34 pre-seed or seed funds established across regions of Ohio, capitalized at approximately \$6-\$7 million on average, with matching state investments.

Potential Priority Action: Engage regional corporate stakeholders in the advancement of commercialization, startups, and talent connections

Rationale:

- Many traditional traded sector industry clusters declining and emerging clusters either under-performing national growth or not having strong contributions from startup activity
- Limited connectivity between corporate innovation and startup community, which in turn limits the opportunities to develop first customers within the region
- Need to address talent retention in the region not just for entrepreneurial talent, but for scaling up startup and existing businesses
- Strengthen regional capabilities in working with startup and existing businesses in commercial viability of new product development

Possible Activities:

- Facilitate bringing together entrepreneurs and innovation-oriented existing businesses from around the region in specific industry clusters to form corporate innovation networks. Among networking activities could be:
 - Technology and market intelligence workshops
 - Peer to peer networks across CEOs, CTOs
 - Investor forums/pitch competitions
- Develop supply chain linkages/first customer efforts between startup community and corporate partners seeking innovative solutions to their most pressing needs
- Leverage corporate engagement through CCAM and CCAL to develop connections with small and medium sized firms throughout region
- Establish a talent outreach program that supports experiential learning projects and internships with students in relevant courses/degree programs through collaborations with faculty
- Develop an initiative that enables entrepreneurs throughout the region to access the learning platforms and expertise available in metro Richmond

Illustrative Best Practice Examples:

- Chattanooga, TN: Focused on targeted industry innovation networks through ongoing accelerator programming including ultra-high bandwidth business applications, consumer goods, outdoor recreation and food/beverage.
- Greenville, SC: Focused on regional opportunity with strong presence of foreign auto makers to establish International Center for Automotive Research that represents significant public/private partnership and involves a Center for Emerging Technologies. Plus, strong focus on entrepreneurial programs for advanced manufacturing through Chamber's entrepreneurial program efforts.
- Raleigh-Durham: NCBioTech Center, a long-established resource supporting growth of life sciences with a historical focus on the Raleigh-Durham region. Has formed interest groups in specialized life sciences areas to pursue new opportunities and collaborative efforts, which has led to spin-off resources such as in forest biotechnology.

Leverage GO Virginia's desire to establish a Regional Quarterback for Entrepreneurial Development in each region by further elevating/enhancing Activation Capital's efforts and outreach

Specific Activities:

- Identify opportunities and needs for regional entrepreneurial development within traded sector industries
- Ensure an implementation capacity on priority actions
- Enable 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:

- The regional quarterback would be tasked with advancing a regional strategic plan and prioritizing strategic investments as well as marketing and branding efforts, with the input from regional entrepreneurial ecosystem stakeholders, under the auspices of the GOVA Regional Boards.
 - Once a regional prioritization investment plan is developed, 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.
 - Strengthen the efforts of Activation Capital and build additional capacity within the organization – do not compete against it with a “new entity”.
-

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:
Regional Council 4
Task Force on
Startups/Innovation/
Commercialization

- Wilson Flohr
- Serena Barry
- Ann Isbell
- Carrie Roth
- Dennis Morris
- Moses Foster
- Bob Holsworth
- Mark Hourigan

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

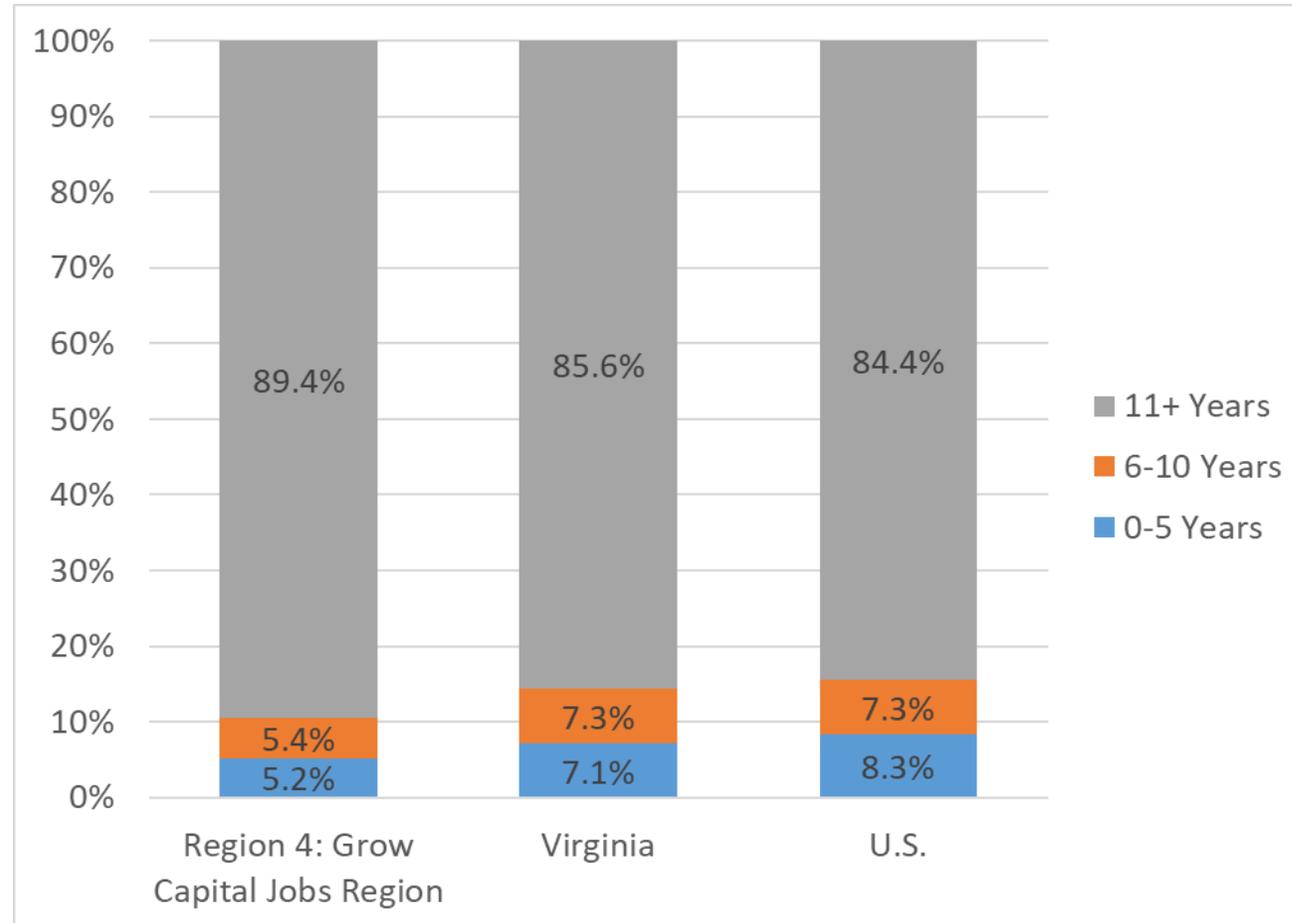
Note on Data Sources:

- 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 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

Regional Employment Distribution by Age of Firm for Traded Sector Industries

- Majority of employment base is contained within older firms, mirroring wider state and national trends

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

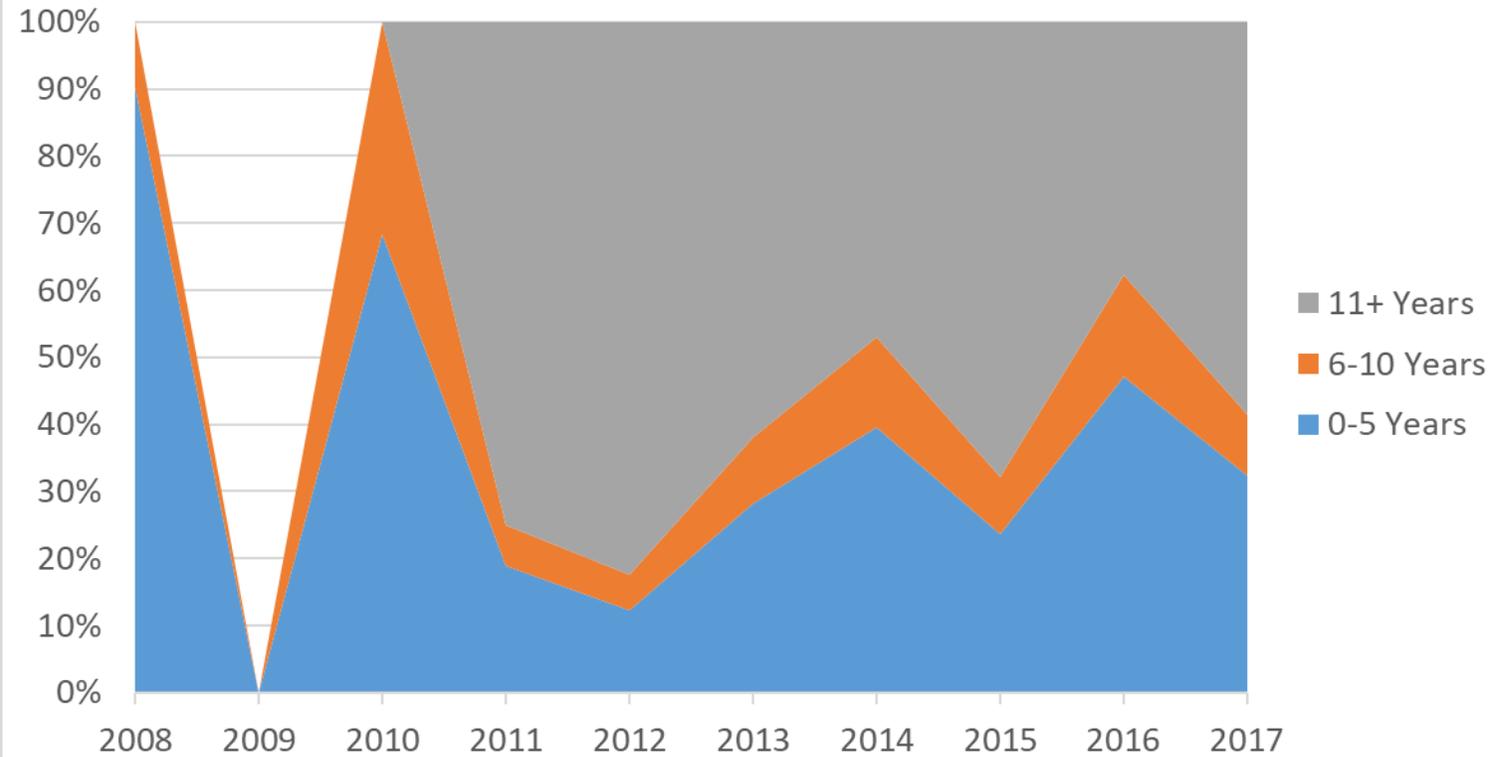


Source: U.S. Census Bureau Quarterly Workforce Indicators dataset.

Trends in Net Job Growth Generation by Age of Firm for Traded Sector Industries: Young start-ups are not driving net job change as they are in other regions of Virginia

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

Region 4: Grow Capital Jobs Region

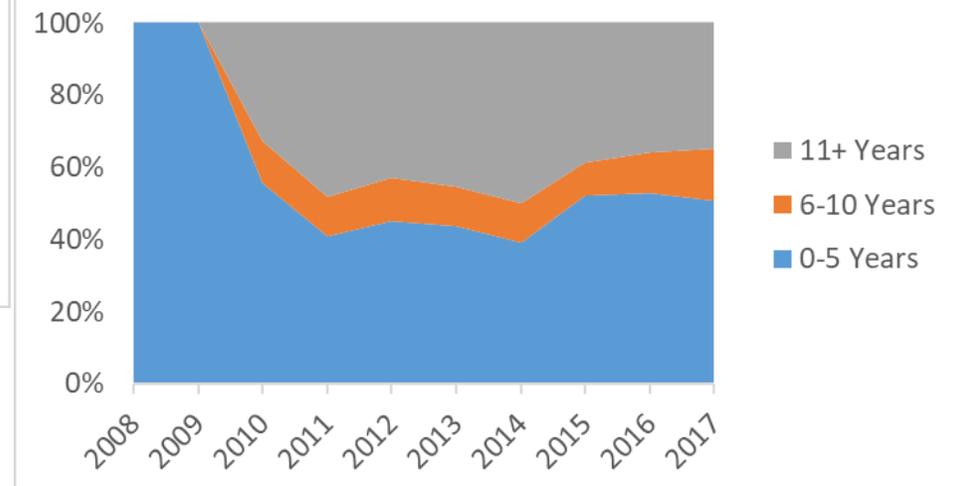


Source: U.S. Census Bureau Quarterly Workforce Indicators dataset.

Virginia



U.S.



BDRC Profile of Startup Activity Trends in Region

Founding Year of Startup Cohort*	Number of Startups in Traded Sector Industries	Number of Startups Surviving by 2017	Start-up Employment Levels 2017
2007	595	178	1,370
2008	609	205	1,907
2009	359	125	970
2010	721	265	1,818
2011	491	162	853
2012	539	241	1,886
2013	1,036	456	3,889
2014	628	366	2,607
2015	695	483	2,661
2016	613	438	2,682
2017	506	506	2,591

*Composed of all new non-branch firms with first recorded employment activity in a given year

Overall New Business Formation Rates for Region Based on BDRC Firm Level Data

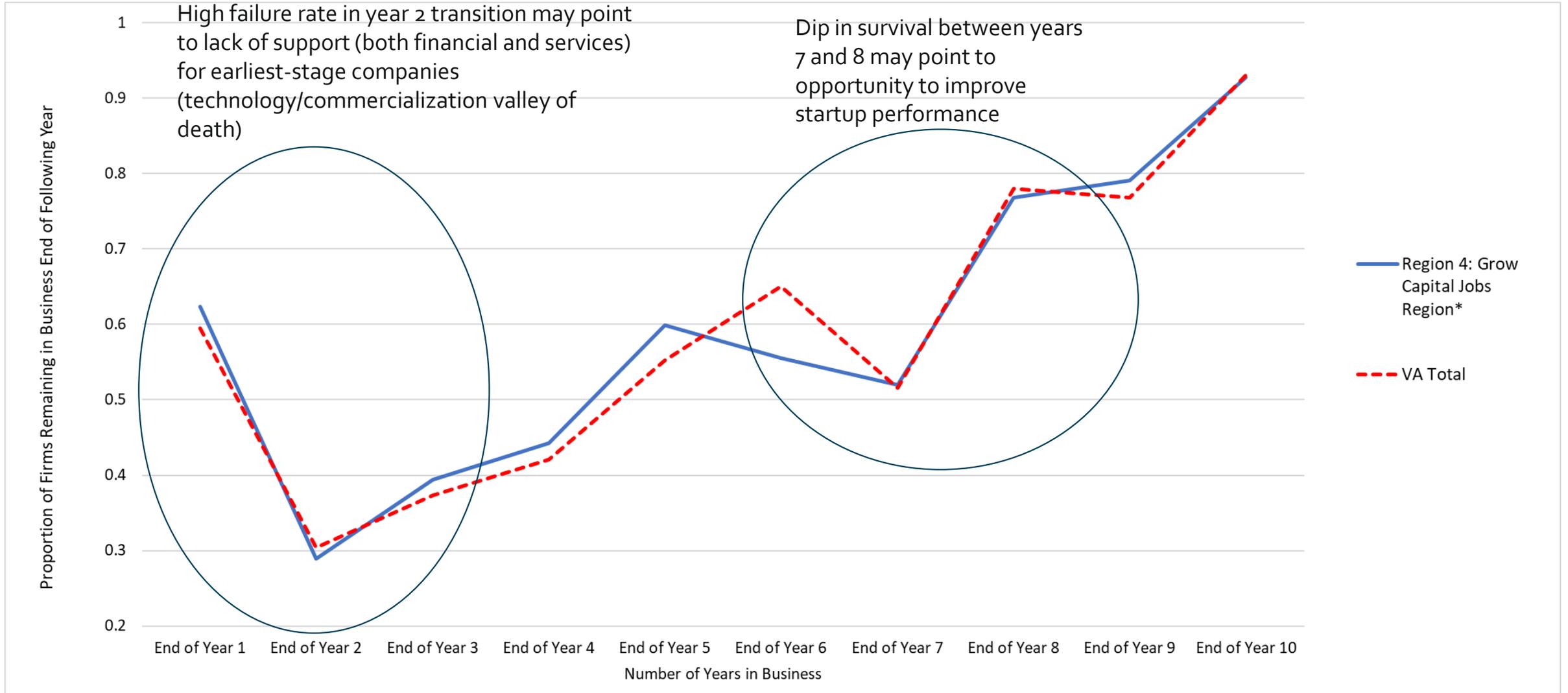
- Trends in overall new business formation rates for region closely mirror overall state activity patterns, but has seen greater declines in recent years



*US new business formation rates available to 2014 via US Longitudinal Business Database

Year over Year Survival Rate Trends in Regional Traded Sector Startups

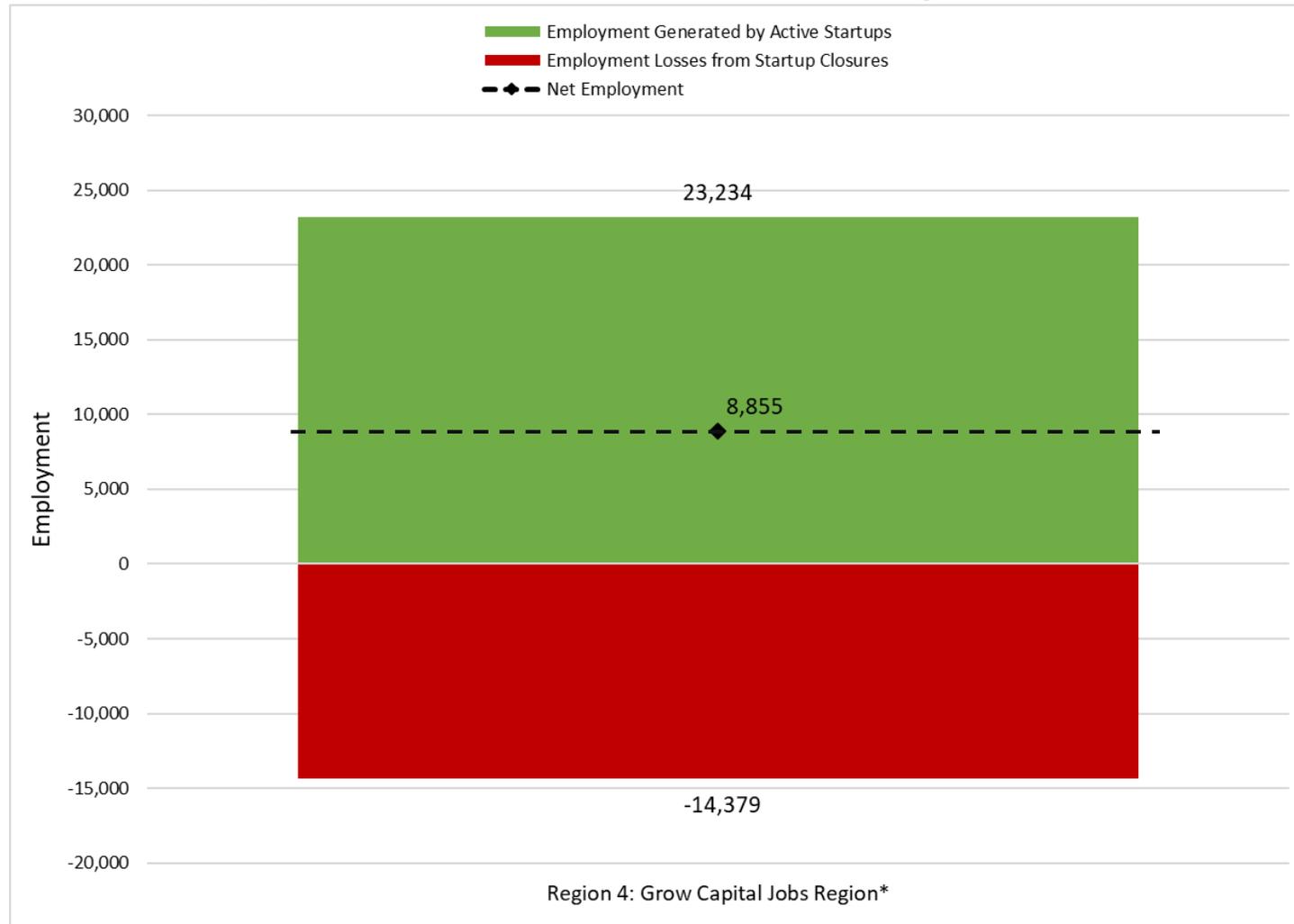
Cumulative 10-year startup cohort survival rates for region are 52.8% compared to a VA statewide rate 53.5%



*Startups defined as having firm age <10 years as of 2017

Net Employment Impacts Generated by Traded Sector Startup Firms in VA

- Significant churn within startups, though net employment gains from those surviving startup firms outpaces employment loss from failures across region



	Total Virginia Startups, 2008 (Q2)-2017(Q2)
Employment Generated by Active Startups	155,033
Employment Losses from Startup Closures	-98,732
Net Employment	56,301
Region 4 Share of Statewide Net Employment	15.7%

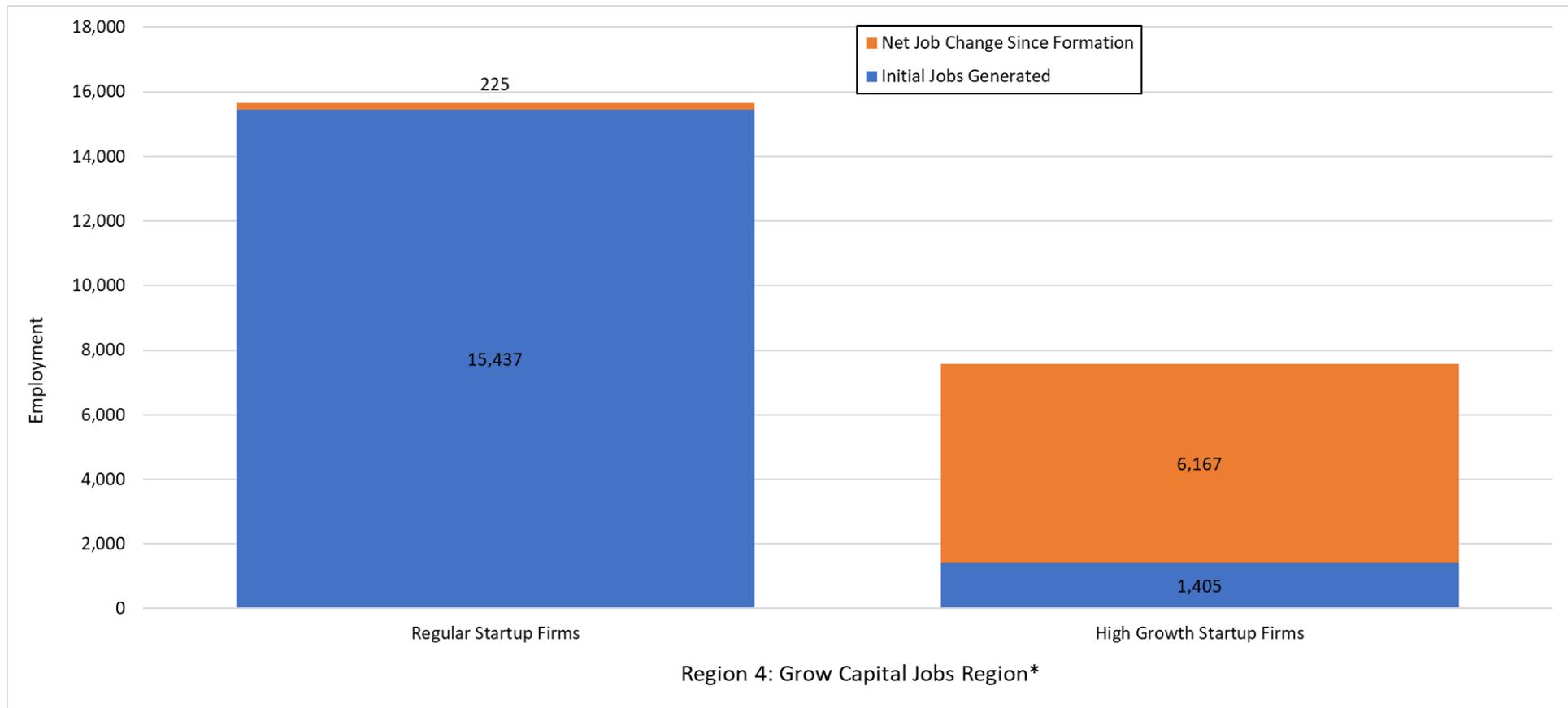
*Indicates GO Virginia regions with research universities

**Startups defined as having firm age <10 years as of 2017

Employment Growth Impacts Generated by Current Traded Sector Startup Firms in Region

- Key to long term success is high growth startups – disproportionate share of lasting gains in employment observed from cohort of startups exhibiting high annualized growth rates

	Total VA Regular Startup Firms	Total VA High Growth Startup Firms
Initial Jobs Generated	104,889	9,058
Net Job Growth Since Formation	506	40,781
Region 4 Share of Statewide Net Job Growth Since Formation		15.1%



*Indicates GO Virginia regions with research universities

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

Profile of Startup Activity Within Key Regional Industry Clusters

Region 4 Priority Clusters from 2017 Growth and Diversification Plan:

- BioScience/ Life Sciences
- Energy
- Financial Services
- Logistics, Warehousing, and Distribution
- Defense and Security
- Creative Services
- Information Technology and Communications

Major Industry Cluster*** (those relating to regional priority clusters bold faced)	Number of Startups in Cluster, 2007-2017	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	264	153	14	862	0.76
Business Services	3,768	2,051	331	10,520	1.13
Energy, Natural Resources, & Finished Products	197	102	35	1,321	1.01
Engineering, R&D, Testing & Technical Services	327	200	43	2,874	1.42
Financial & Insurance Services	1,125	535	78	2,472	1.19
Health Care Services	195	128	38	3,202	1.48
Information Technology & Communications Services	343	187	50	1,759	0.59
Life Sciences	226	109	24	756	0.94
Manufacturing	368	184	38	1,744	1.17
Ship Building, Aerospace, & Defense	4	3	0	19	0.08
Transportation, Distribution and Logistics	1,421	695	150	4,988	1.09

*Represents a measure of specialization in startup activity in certain industry clusters given overall state trends, >1.2 indicates highly specialized concentration of startup generation in industry area

**Defined as >25% annualized employment growth over lifetime of business

***Note: some industry cluster definitions include a mix of traded and untraded industry sectors

Contribution of Entrepreneurial Development to Leading Industry Clusters

Role of entrepreneurial activity is significant across leading industry clusters:

- Among industry clusters that are “current strengths” or are “sizeable and growing”, entrepreneurial activity is a driving factor of the cluster’s continued development in the region
- Very important in emerging industries within region, including life sciences and engineering/R&D services
- Within clusters that are sizeable but declining, startups were the only firms to see growth during the period.

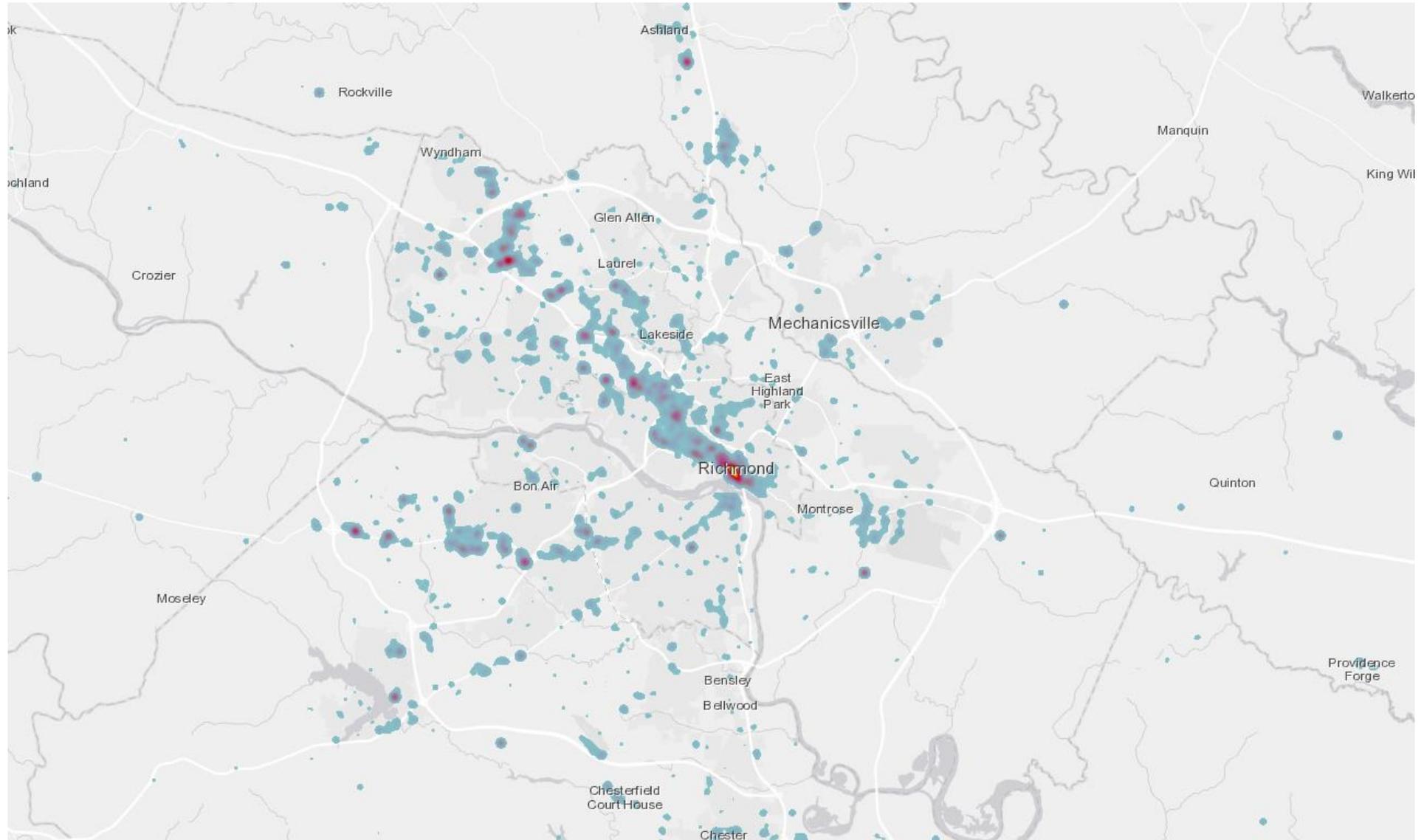
Industry Cluster	Economic Development Position in Region	Contribution of Entrepreneurship	Data Analysis						
			2017 Employment	2017 Location Quotient	Regional 2007-2017 Percentage Job Growth	U.S. 2007-2017 Percentage Job Growth	Net Job Growth, All Companies, 2007-2017	Net Job Growth, Startups, 2007-2017	Share Start-ups of All Net Job Growth, 2007-2017
Agriculture & Food Processing	Emerging Strength	Modest	6,597	0.49	51.8%	10.7%	2,250	862	38%
Business Services	Current Strength	Very Significant	51,814	1.53	13.4%	9.1%	6,127	10520	172%
Energy, Natural Resources, & Finished Products	Sizable/Declining	Very Significant	11,537	1.05	-22.5%	-13.3%	-3,344	1321	>100%
Engineering, R&D, Testing & Technical Services	Emerging Opportunity	Very Significant	6,364	0.84	3.7%	6.5%	226	2874	1270%
Financial & Insurance Services	Current Strength	Significant	27,948	2.02	13.0%	-4.1%	3,210	2472	77%
Health Care Services	Sizable/Growing	Very Significant	23,852	1.09	41.5%	12.5%	6,991	3202	46%
Information Technology & Communications Services	Sizable/Growing	Very Significant	8,915	0.70	13.5%	50.8%	1,060	1759	166%
Life Sciences	Emerging Strength	Significant	5,462	0.84	24.5%	9.7%	1,075	756	70%
Manufacturing	Sizable/Declining	Very Significant	18,931	0.56	-25.5%	-13.5%	-6,463	1744	>100%
Transportation, Distribution and Logistics	Sizable/Growing	Very Significant	30,230	1.02	11.6%	8.7%	3,153	4988	158%

Geographic Distribution of Traded Sector Startup Activity in Region 4

High Regional
Startup Activity
Levels



Low Regional
Startup Activity
Levels



Closer Look at Subregional Entrepreneurial Activities

The Richmond Planning Commission Subregion dominates in number of startups, jobs created, and high growth startups in the region, with the Crater Planning Commission Subregion representing approximately 10% of the entrepreneurial activity.

Subregions	2017 Number of Startups since 2007 in existence	2017 Employment from Startups since 2007	Number of High Growth Startups Since 2007 with 10+ Employees	Industry Clusters with Multiple High Growth Companies of 10+ Employees
Richmond Planning Commission*	6,175	21,218	146	Business Services; IT & Communications Services; Manufacturing; TDL; Life Sciences
Crater Planning Commission**	617	2,016	16	
Region Total	6,792	23,234	162	

* Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan counties; Richmond City

** Charles City, Dinwiddie, Greensville, Prince George, Surry, Sussex counties; Colonial Heights City, Emporia City, Hopewell City, Petersburg City

Key Measures:

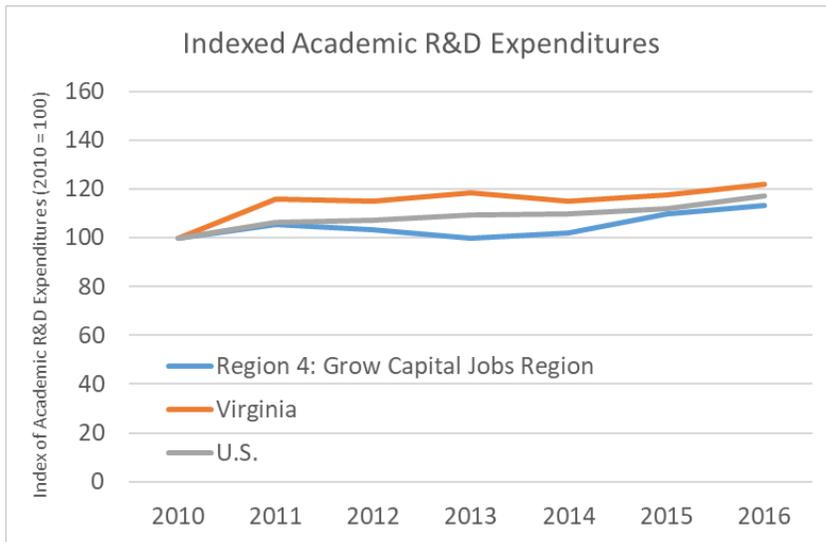
- R&D and Commercialization
- Patent Activity of Inventors Residing in Region
- Venture Capital
- Federal Small Business Innovation Research Awards

R&D Expenditures and Commercialization

- Gains in university R&D have been relatively flat over the period, but has seen an uptick in the two most recent years
- 71% of R&D found in life sciences over 2010-2016 period
- Region has active technology transfer and commercialization efforts, outpacing the nation in terms of the number of disclosures and startups formed

Academic R&D Expenditures (Millions)

Region 4: Grow Capital Jobs Region	2010	2011	2012	2013	2014	2015	2016
Virginia Commonwealth University	\$197.7	\$207.8	\$201.4	\$196.0	\$201.9	\$218.9	\$226.0
Other Institutions	\$11.5	\$12.6	\$14.6	\$12.9	\$12.0	\$10.9	\$11.2



Sources: National Science Foundation (NSF) Higher Education Research and Development (HERD) Survey

University Technology Transfer Metrics Per \$10M in Research Expenditures, Avg. 2010-16

Region	Virginia Commonwealth University	U.S. Average, All Research Universities
Disclosures	5.14	3.72
Licenses/Options Executed	0.64	1.04
Startups Formed	0.14	0.13

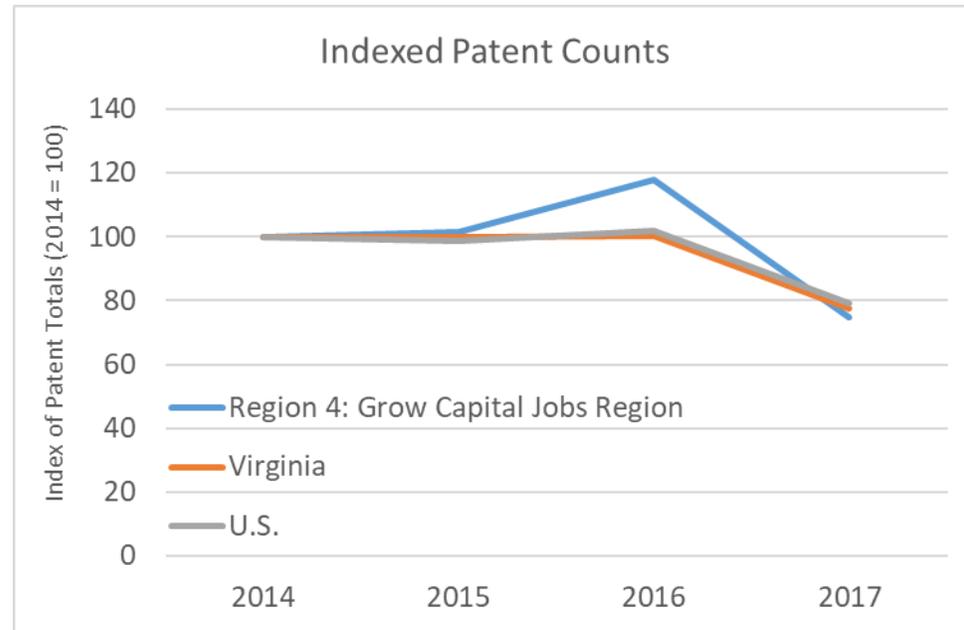
Sources: Association of University Technology Managers (AUTM) Licensing Activity Survey

Patent Activity Across Industry and Research Institutions

- Significant level of patent activity each year, although a significant decline in 2017. Will want to ensure that this does not become a trend
- Interestingly, various finance applications dominate the top patenting areas But significant activity in biopharmaceuticals and life sciences as well.

Total Patents, 2014-17

Region 4: Grow Capital Jobs	2014	2015	2016	2017
Patent Counts	635	645	748	475



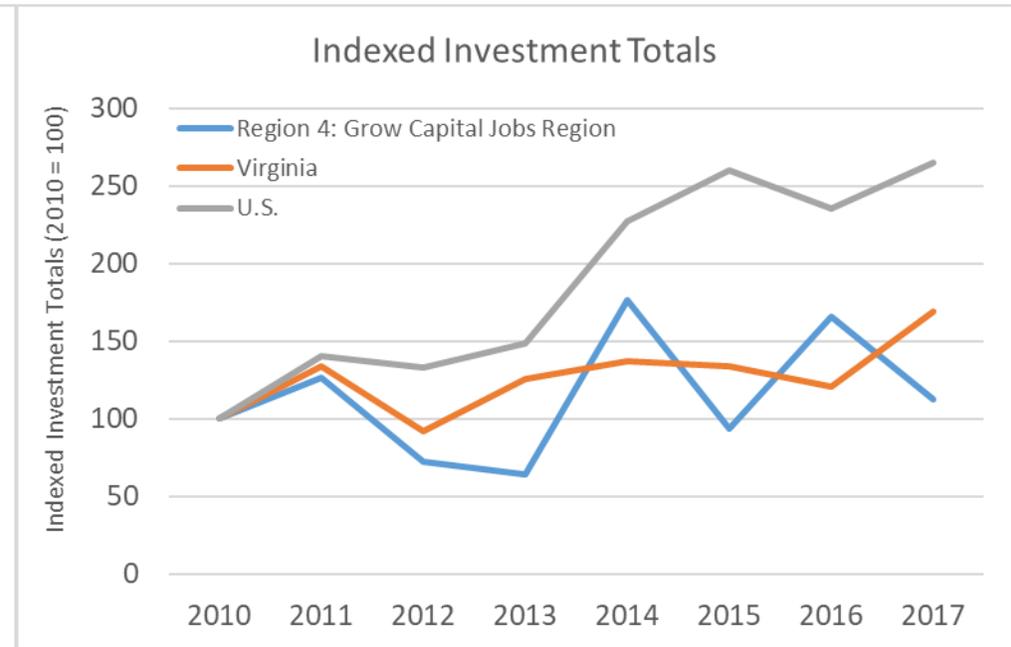
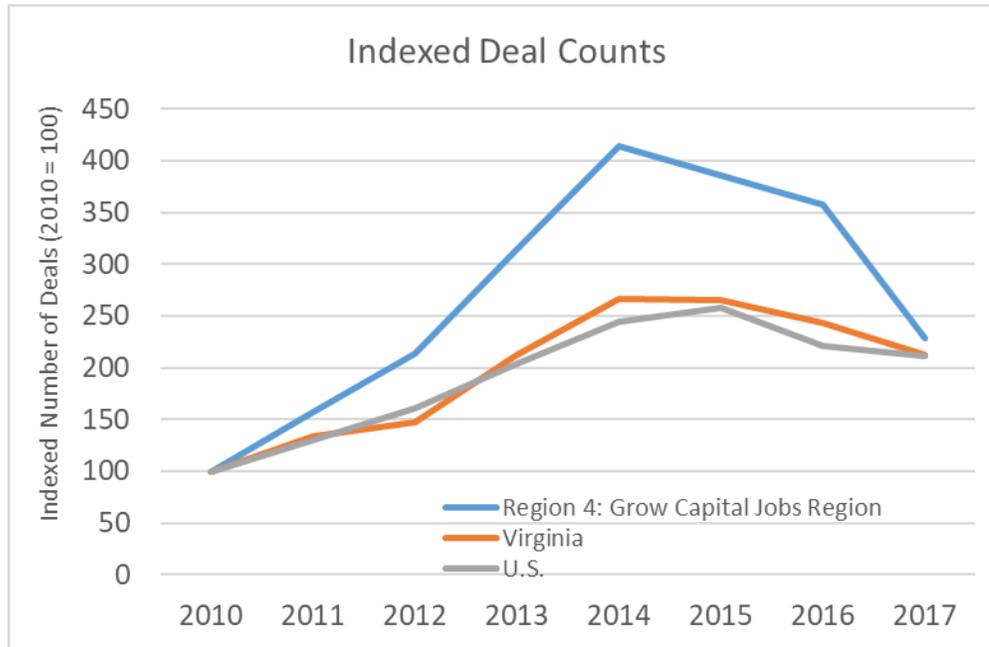
Leading Areas of Patent Activity, 2010-17

Technology Class Area	Number of Patents, by inventor, 2010-2017
Chemical features or treatment of tobacco	76
Digital payment architectures, schemes or protocols	73
Software for Finance; Insurance; Tax strategies; Processing of corporate or income taxes	58
Biopharmaceuticals	53
Electronic shopping or e-commerce	42
Devices for bringing media into the body in a subcutaneous, intra-vascular or intramuscular way	42
Materials analysis technologies or methods	37
Database administration and management	35

Sources: Association of University Technology Managers (AUTM) Licensing Activity Survey, U.S. Patent & Trademark Office data from Thomson Reuters Thomson Innovation patent analysis database.

Venture Capital

- Growth of venture capital investments has mirrored the state and lags behind the growth of the nation
- The number of deals increased significantly from 2010-2014 but has declined since



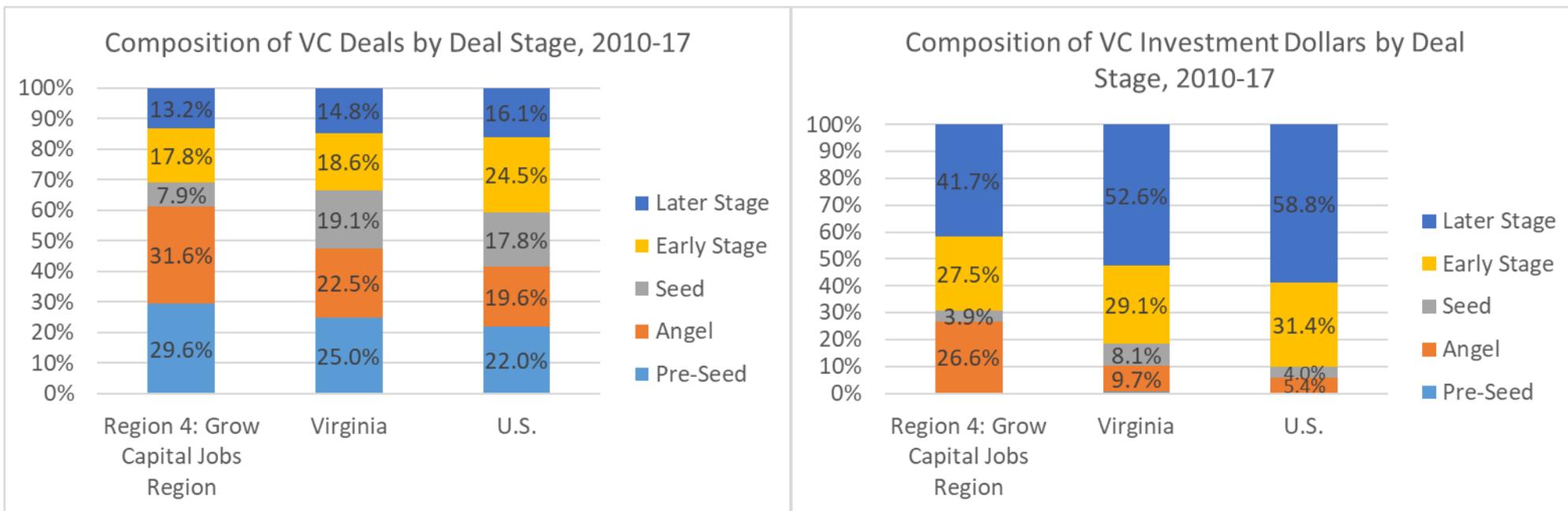
Region 4: Grow Capital Jobs Region	2010	2011	2012	2013	2014	2015	2016	2017	Total
Deal Counts	7	11	15	22	29	27	25	16	152
Investment Totals (Millions)	\$28.9	\$36.5	\$20.9	\$18.5	\$51.1	\$27.1	\$47.8	\$32.5	\$263.2

Source: PitchBook Data, Inc.

Venture Capital by Stage of Funding

- Pre-seed funding (accelerators and incubators) and angel investment stands out in the region
- Seed, early, and later stage funding represents a small portion of the number of deals compared to the state and nation
- Companies in region, however, are accessing all stages of funding

Region 4: Greater Capital Jobs	Pre-Seed	Angel	Seed	Early Stage	Later Stage	Total
Deal Counts	45	48	12	27	20	152
Investment Totals (Millions)	\$0.6	\$70.1	\$10.4	\$72.3	\$109.9	\$263.2



Source: PitchBook Data, Inc.

Venture Capital by Industry Clusters

- IT/Communication services stands out in driving venture capital funding
- Still, many other clusters represented with multiple deals over the period of 2010-2017

Total Venture Capital Investments by Industry Cluster, 2010-17

Region 4: Grow Capital Jobs Region	Deal Counts	Investment Totals (Millions)	% of Total
Information Technology & Communications Services	63	\$109.44	41.6%
Life Sciences	16	\$39.41	15.0%
Manufacturing	12	\$34.60	13.1%
Other	24	\$24.20	9.2%
Energy, Natural Resources, & Finished Products	4	\$22.92	8.7%
Agriculture & Food Processing	14	\$20.31	7.7%
Business Services	14	\$5.81	2.2%
Financial & Insurance Services	2	\$4.50	1.7%
Health Care Services	3	\$2.02	0.8%

Source: PitchBook Data, Inc.

Regional Use of SBA Loans

- **SBA 7(a) loans are the agency’s primary program for financial assistance to small businesses**

- Amounts: up to \$5M
- SBA guarantees: 75% to 85%
- Qualification: for-profit business, SBA size standards, demonstrate good credit/mgmt./ability to repay
- Use of Proceeds: Startup costs, buying land/buildings/equipment, new construction, working capital, seasonal lines of credit.
- Benefits: Flexible, longer terms, lower down payments, no prepayment penalties

Region 4: SBA 7(a) Loans and Loan Amounts, Cumulative Totals 2010-18*

Industry Clusters	Co's Receiving Loans	Total No. of Loans	Total Loan Amounts (\$)	% of Total Loan Amounts
Total, All Traded Sector Industries	232	285	\$107,681,600	100%
Agriculture & Food Processing	22	25	\$15,851,300	15%
Business Services	59	73	\$19,147,500	18%
Energy, Natural Resources, & Finished Products	19	23	\$9,290,500	9%
Engineering, R&D, Testing & Technical Services	19	25	\$11,766,100	11%
Financial & Insurance Services	11	11	\$2,532,900	2%
Information Technology & Communications Services	25	32	\$5,993,000	6%
Life Sciences	7	7	\$1,630,700	2%
Manufacturing	37	48	\$29,586,800	27%
Transportation, Distribution and Logistics	32	41	\$11,882,800	11%

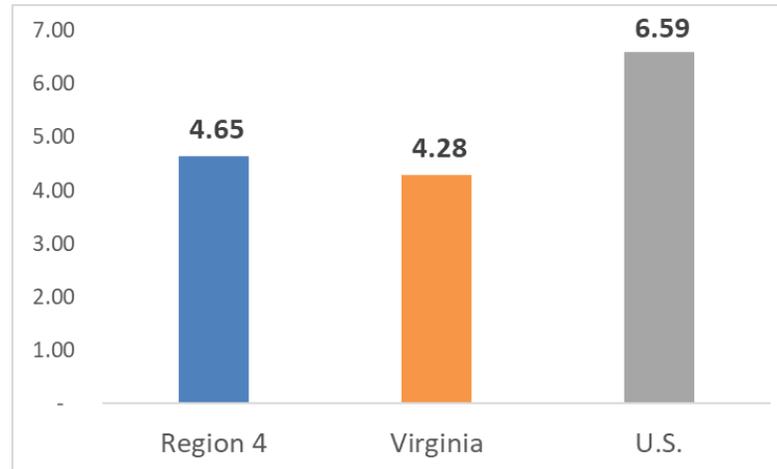
Source: TEconomy analysis of SBA loan data reports.

*Data for 2018 are through Q2.

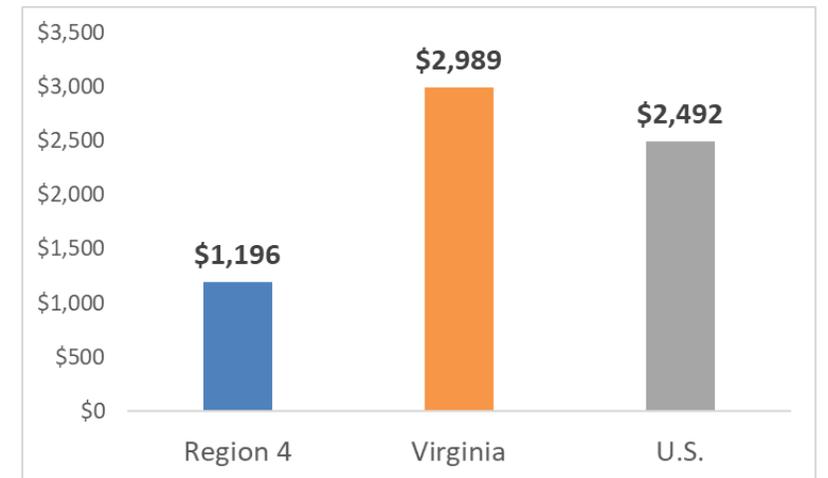
Regional Utilization of SBA Loans vs. State & U.S. Totals

- In 2017, regional companies approved for loan funding at a lower level relative to overall loan amounts compared with VA and US

SBA 7(a) Loan Counts, Traded Sector Companies Per 1,000 Establishments, 2017

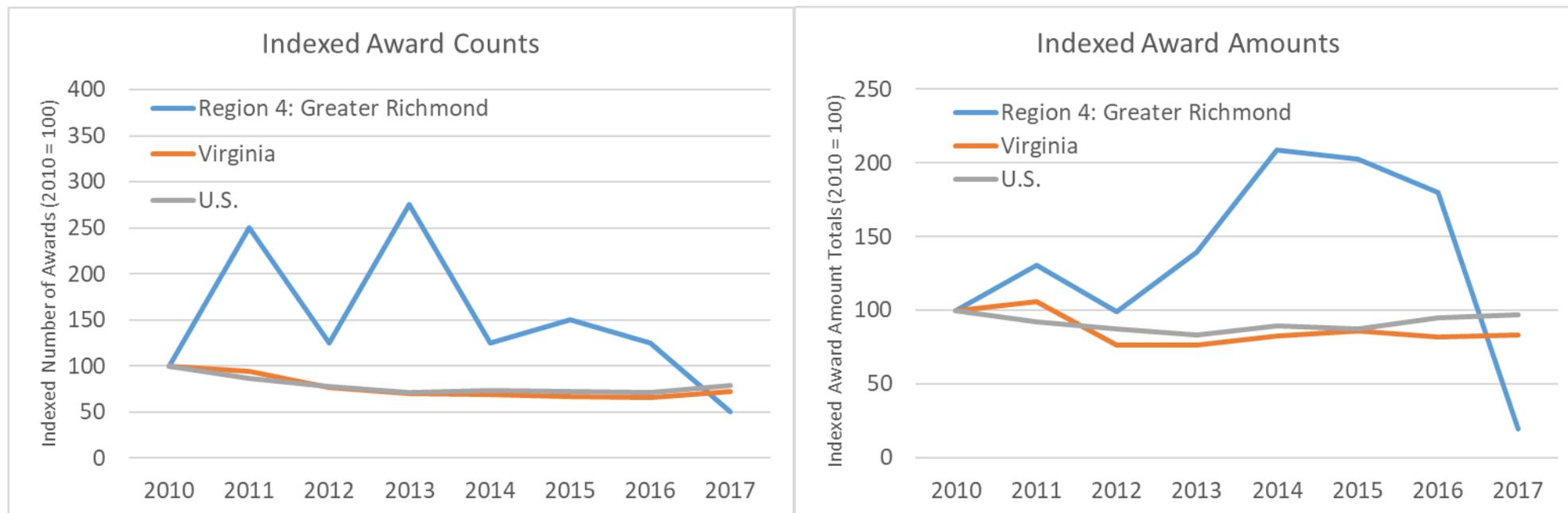


SBA 7(a) Loan Amounts (\$), Traded Sector Companies Per Establishment, 2017



SBIR/STTR Awards

- SBIR awards another important source of funding for emerging technology companies
- Region is falling off in SBIR activity in recent years



Region 4: Grow Capital Jobs Region	2010	2011	2012	2013	2014	2015	2016	2017	Total
Award Counts	4	10	5	11	5	6	5	2	48
Award Amounts (Millions)	\$1.53	\$1.99	\$1.52	\$2.13	\$3.19	\$3.10	\$2.74	\$0.30	\$16.49

Source: www.SBIR.gov

Appendix C: Inventory and Stakeholder Discussions

Informing the “Situational Assessment”

Stakeholder Discussions and Inventory *

- Carrie Roth – VA Bio+Tech Park and Activation Capital
- Garret Westlake – VCU Da Vinci Center
- Joe Whitchurch Capital - One Small Business
- Keith Middleton - Co-managing Partner and Co-Founder of The Fahrenheit Group
- Todd Nuckols, Lighthouse Labs
- Nicky Monk, VCU Ventures
- Paul Nolde, NRV
- Presentation to and feedback from the VA Bio+Tech Park Board
- Presentation to and feedback from representatives of the Crater Region

* See handout for inventory profiles

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)

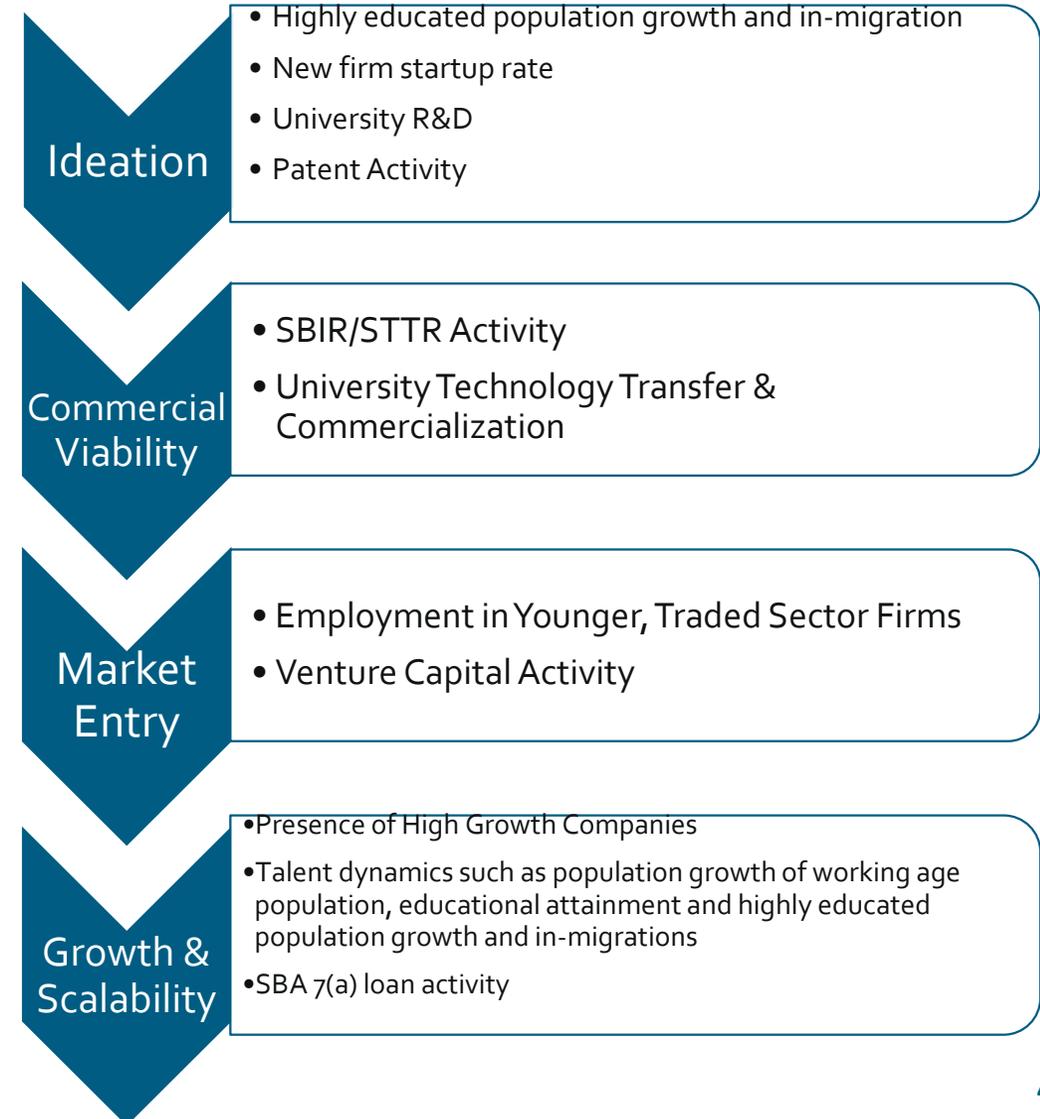
- **Rural regions with major research institutions**

- 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

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



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

Ideation

Ecosystem Element	Measure	GO VA Region 4	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%	7%	8%	9%	7%	7%	5%
	Percentage Pt. Change, 2010-14	0.3	0.3	0.2	0.0	-0.1	0.4	-1.0
University R&D	University R&D Expenditures per Capita, 2016	\$190	\$174	\$222	\$863	\$370	\$2,800	\$62
	Percent Change in Total R&D Expenditures, 2010-16	13%	22%	17%	16%	15%	13%	-25%
Patenting (Incls. Industry & University)	Invented Patents per 1,000 Population, 2017	0.2	0.3	0.5	2.1	0.4	1.4	0.2
	Percent Change in Total Invented Patents, 2014-17	-39%	-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

Commercial Viability

Ecosystem Element	Measure	GO VA Region 4	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	\$2	\$15	\$8	\$17	\$5	\$30	\$0.30
	SBIR, STTR % Pt. Change in Share of Award Funding, Avg. 2010-13 to 2014-17	0.02	-0.56	-	0.09	0.03	-0.04	0.00
	Number of Phase 1 Awards, 2010-2017	34	1,796	17,802	486	44	119	2
	Number of Phase 2 Awards, 2010-2017	14	935	10,002	235	33	49	0
University Technology Transfer & Commercialization	Avg. Annual Univ. Start-ups, 2014-16	5	17	911	28	5	21	-
	Avg. Startups Formed per \$10M Univ. Research, 2014-16	0.22	0.15	0.16	0.13	0.10	0.36	-
	Avg. Licenses/Options Executed per \$10M Univ. Research, 2014-16	0.76	1.12	1.14	1.54	1.03	2.87	-

Market Entry

Ecosystem Element	Measure	GO VA Region 4	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	6%	7%	8%	8%	6%	7%	3%
	Avg. Share of Employment Growth in Firms Ages 0-5, 2013-2017 Q2	32%	52%	46%	36%	34%	42%	30%
Venture Capital Investments	VC Investments, 2014-17	\$159 M	\$2.6 B	\$308 B	\$2.3 B	\$127 M	\$66 M	\$0.2 M
	VC Investments per Capita, 2014-17	\$128	\$315	\$954	\$1,221	\$164	\$255	\$1
	Change in VC Investment, 2010-13 to 2014-17	51%	24%	89%	42%	86%	-13%	2000%
	VC Deals, 2014-17	97	1,068	54,030	565	81	74	3
	VC Deals per 100,000 population, 2014-17	8	13	17	31	13	30	2
	Change in VC Deals, 2010-13 to 2014-17	76%	67%	58%	67%	49%	135%	125%
	Share of VC Investments in Angel + Seed + Early Stages, 2014-17	69%	51%	41%	36%	79%	65%	100%
	Share of VC Deals in Angel + Seed + Early Stages, 2014-17	89%	81%	88%	85%	84%	91%	100%

Growth & Scalability

Ecosystem Element	Measure	GO VA Region 4	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	2.7	2.9	4.7	3.6	2.7	2.0	3.2
	Change in SBA 7(a) Loans, 2010-2017	72%	11%	22%	55%	80%	-17%	-20%
	Avg. SBA 7(a) Loan Value, per Capita, 2010-2017	\$8	\$9	\$17	\$18	\$12	\$10	\$20
	Change in SBA 7(a) Loan Value, 2010-2017	222%	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	28	297	-	57	13	3	1
	Change in Companies in Inc. 5000, 2010-18	33%	2%	-	15%	13%	83%	-50%

Cross-Cutting Ecosystem Element: Talent Dynamics

Ecosystem Element	Measure	GO VA Region 4	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	4%	1%	3%	9%	5%	2%	-2%
	Growth in Young Working Age Population, 25-34—2012-2017	14%	3%	7%	11%	7%	6%	4%
Educational Attainment	Share of Population Ages 25-64 with a Bachelor's Degree or Higher, 2017	26%	28%	23%	31%	23%	21%	15%
	Growth in Highly Educated Workforce (BA+), (25-64, working age) — 2012-2017	16%	10%	12%	26%	17%	16%	6%
Highly Educated Migration	Net Migration of Highly Educated Workers (BA+), 2012-17	2,509	-14,000	154,411	45,424	2,279	-9,684	-1,402
	Foreign In-Migration (BA+), 2010-17	12,305	151,627	3,933,494	38,243	8,782	8,423	587

Competitive Benchmarking Assessment



Overall Assessment				
Measures Region is Performing Well In		<ul style="list-style-type: none"> • University tech transfer & commercialization – number of start-ups when normalized is ahead of mid-sized regions 		<ul style="list-style-type: none"> • Growth in young working age population • Share of population with Bachelor's Degree or Higher • Highly Educated Net Intrastate Migration • Presence of High Growth Companies
Measures Region is Performing on Par In	<ul style="list-style-type: none"> • Rate of new firm formation and percentage change –on par with mid-sized regions and increasing faster 		<ul style="list-style-type: none"> • Employment in Younger, Traded Sector Firms – on par with mid-sized regions 	<ul style="list-style-type: none"> • Growth in Total Working Age Population • Growth in Highly Educated Workforce
Measures Region is Lagging In	<ul style="list-style-type: none"> • University R&D – dollars invested lags mid-size regions and not growing as quickly • Patenting – lags mid-size regions and has been declining 	<ul style="list-style-type: none"> • SBIR activity – lags benchmarks 	<ul style="list-style-type: none"> • Venture Capital Investments – when normalized lags both in level of investment as well as number of deals across benchmarks although growth of number of deals has increased at a faster rate 	<ul style="list-style-type: none"> • SBA (7a) – average loan value when normalized is below benchmarks, but number of loans received and total dollars invested growing more rapidly

Appendix E: Benchmark Case Study Profiles

Benchmark Case Studies: Wide Number of Tools for Entrepreneurial Development



Typical Entrepreneurial Assistance Service Tools

Tool-Kit Components	<ul style="list-style-type: none"> Lean startup bootcamps/pre-accelerator preparation Mentoring by an EIR/venture advisor Pitch/Business competitions University entrepreneurship centers University technology commercialization scouting 	<ul style="list-style-type: none"> Accelerators/venture development organizations/incubators NSF iCorps Mentoring by EIRs with understanding of specific markets and technologies Incubator, co-working, maker-spaces 	<ul style="list-style-type: none"> Mentoring by EIR with serial startup experience Second stage incubators, research parks, multi-tenant specialized lab facilities 	<ul style="list-style-type: none"> 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
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Typical Risk Capital Catalysts Tools

Tool-Kit Components	<ul style="list-style-type: none"> Commercialization/Technology Transfer Funds Pitch competition micro-investments 	<ul style="list-style-type: none"> Proof-of-Concept Funds SBIR/STTR Matching Grants Accelerator and Pre-Seed Funding Refundable R&D and Technology Investment Tax Credits 	<ul style="list-style-type: none"> Angel Matching/Due Diligence Funds Angel Investment Tax Credits Seed Matching Funds 	<ul style="list-style-type: none"> Fund of Fund Investments (multiple ways to generate funding)
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Innovation and Entrepreneurial Development Ecosystem Components



Benchmark Communities			
Austin, TX	← IC ² 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 → StartupGNV networking events

Innovation and Entrepreneurial Development Ecosystem Components



Benchmark Communities	
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 NSF i-Corps Site ← Research Triangle Park, Centennial Campus, HQ coworking, American Underground & Biolabs → ← Active university alumni angel networks at Duke, NC State & UNC → NC State EIR to Scout for Technologies PoC Funds at NC State, UNC & Duke ← Duke collaboration with privately managed accelerator and incubators → ← NC Biotech Center → UNC Carolina Research Ventures \$10 m “Seed” Fund
Susquehanna, PA	← Rural Business Innovation network of incubators → College student internship funding Micro-startup grants from Rural Business Innovation ← 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Fast growing technology hub with smaller research anchors• Leveraging position in banking center to generate a rising entrepreneurial community.
Key Tools:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Role of community foundation and community leaders in spurring entrepreneurial development.

Benchmark Case Study: Chattanooga, TN

Regional Context:	<ul style="list-style-type: none">• Mid-sized region with limited research anchor.
Key Tools:	<ul style="list-style-type: none">• 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 proximity to downtown, and the rebranded Innovation District involved mixed use developments.
Successes:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Lack of capital is viewed as a key constraint to high-growth companies
Best Practice Lessons:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Creating more commercially focused technology-based companies.
Best Practice Lessons:	<ul style="list-style-type: none">• 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 (all 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, SC

Regional Context:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• New innovation center campuses outside of the main Clemson University campus with focus on specific technologies, including:<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• \$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:	<ul style="list-style-type: none">• Linking major public-private innovation center developments with entrepreneurial activity.
Best Practice Lessons:	<ul style="list-style-type: none">• Creating new anchor research and innovation centers around industry clusters through university, industry and state partnerships

Benchmark Case Study: Nashville, TN

Regional Context:	<ul style="list-style-type: none">• Mid-sized region anchored by a major research university, strong music scene and leading healthcare companies
Key Tools:	<ul style="list-style-type: none">• 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:<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Very diffuse entrepreneurial community, with need to create stronger presence of innovation in the region, including more placemaking
Best Practice Lessons:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Rural region with no university research anchors, but presence of non-research oriented colleges and universities.
Key Tools:	<ul style="list-style-type: none">• 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:<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Sustaining a rural economy by having new and small businesses generate job opportunities
Best Practice Lessons:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• Rural region with major research anchor
Key Tools:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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:	<ul style="list-style-type: none">• 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.



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