Regional Entrepreneurial Assessment Project:

Final Briefing Report

Region 8: Shenandoah Valley

January 2019

TECONOMY PARTNERS LLC

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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 8 – Shenandoah Valley.

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 1,198 surviving traded sector startups formed since 2007 in Region 8
- 7,118 jobs in 2017 were found in these 1,198 surviving startups
- By comparison, over the 2007-2017 period, total traded sector industry employment fell by 951 jobs in Region 8.
- So entrepreneurial growth has helped buffer the overall decline in traded sector industry employment from the height reached before the Great Recession.

Project Work Plan

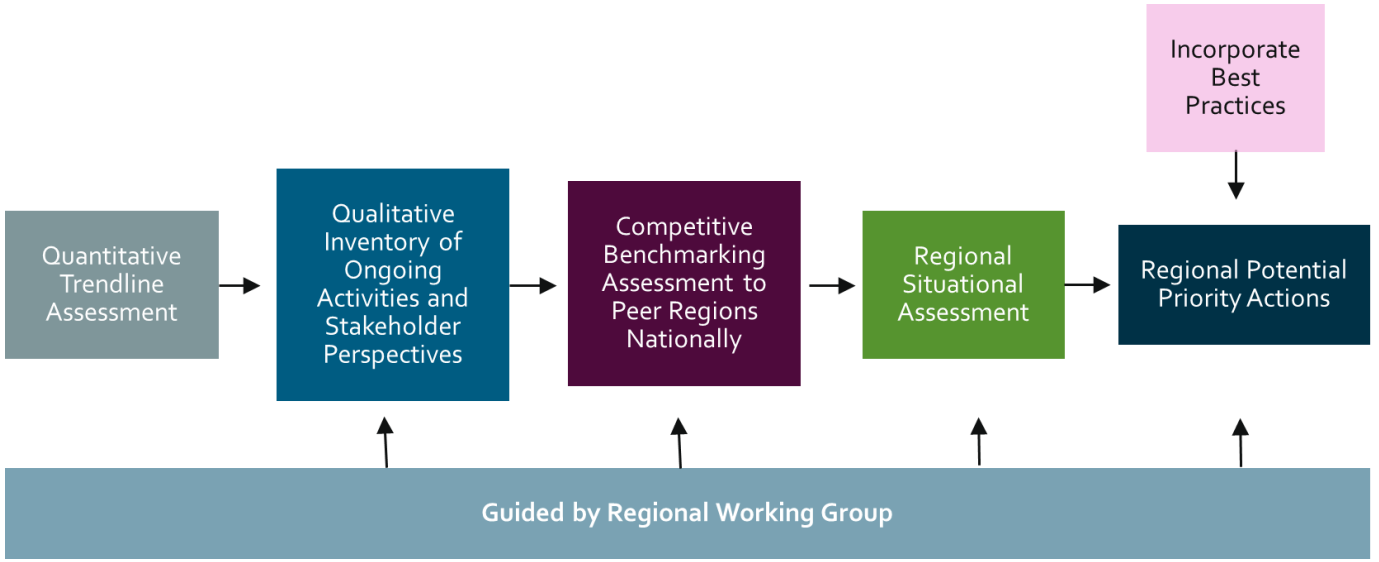
The work plan for preparing this Region 8 entrepreneurial development assessment involved examining:

- 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 8 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 8

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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 traded sector 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

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.

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 8

Overall Assessment:

Broad geographic and industry reach of startup activity, but concerns about falling business formation in recent years and entrepreneurial culture of region.

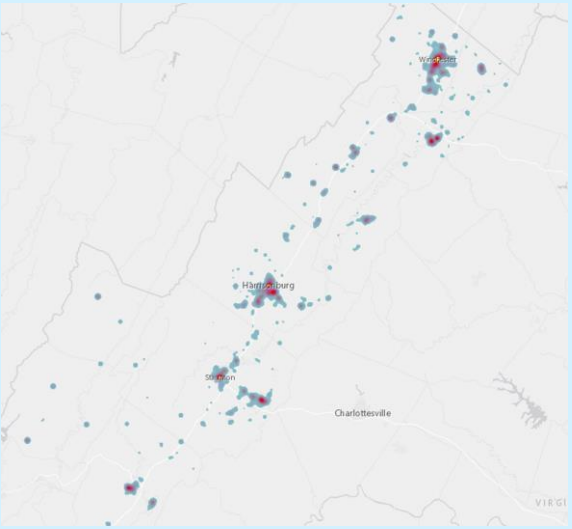
Strengths and Opportunities:

- **Despite lack of major research driver, there is not a lack of entrepreneurial ideas to invest in**, as demonstrated by activities across Shenandoah Valley Angel Investors, Staunton Innovation Hub/Fund and participation in SBDC Innovation Commercialization Assistance Program.
- **High concentration of startups in more traditional industry clusters,** such as ag/food, natural resources, other mfg and transportation/distribution/logistics.
- **Broad geographic footprint of traded sector startups across region**, with four nodes of activity in the region including Winchester area, Harrisonburg area, Staunton area and Shenandoah-Warren counties. No single node of activity dominates.
- **Highly educated workforce with growing in-migration of highly educated working age talent from other states and overseas.** High education attainment compared to rural and mid-sized regional peers, with 19% of working age population having bachelor's degree or higher compared to 15% of benchmark rural area. Region gained 1,800+ in net in-migration from other states and 2,500+ in foreign in-migration of working age highly educated populations in recent years.
- **Assets of local colleges and universities with their growing focus on entrepreneurship among local universities.** James Madison University, Shenandoah University and Mary Baldwin College all have growing entrepreneurial program efforts, specific technology program strengths and business schools to tap for increased reach.

Gaps and Weaknesses:

- **The fall-off in traded sector new business formations in recent years is a key concern**. While overall levels of business formation in the region is competitive with peer rural regions through 2014 (most recent data available nationally), there has been a fall off in new business formation rate in recent years, with two years of declining levels in 2016 (189) and 2017 (163), after reaching 236 in 2015.
- **Concerns from stakeholders voiced on need for more activation of entrepreneurial culture.** Entrepreneurship not viewed as traditional economic development driver for region and generally region is more conservative/risk-averse towards business development.

Region 8 has a broad geographic footprint to its traded sector startup activities



But concern about the fall-off in new business formations

Founding Year of Startup Cohort*	Number of Startups in Traded Sector Industries
2007	204
2008	239
2009	100
2010	269
2011	141
2012	235
2013	247
2014	197
2015	236
2016	189
2017	163

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

Assessment of Commercial Viability in Region 8

Overall Assessment:

Limited activities, but an area of opportunity for advancing formation of startup businesses.

Strengths and Opportunities:

- **Beginnings of an integrated startup system in Staunton** with buildout of Innovation Hub, maker-space and connective networking and access to resources.
- **Opportunities in other parts of the region**, especially around universities, to expand entrepreneurial programming and create full-service, place-based entrepreneurial hubs.

Gaps and Weaknesses:

- **Missing many tools for advancing commercial viability,** including an accelerator program beyond use of ICAP and proof-of-concept funding for validating technical solutions and prototyping.
- **Some SBIR activity but not large** (9 Phase I and 3 Phase II awards from 2010-2017)

Assessment of Market Entry in Region 8

Overall Assessment:

Young startups contributing to local economy aided by growing focus of resources to help in their launch.

Strengths and Opportunities:

- **Share of employment and employment growth generated by younger, traded sector firms (0-5 years old) and average share of quarterly employment growth (2013-2017) exceeds rural benchmark regions –** 6% for region vs. 3% for rural benchmarks in share of traded sector employment and 34% in average quarterly job gains for region vs. 30% for rural benchmarks.
- **Availability of risk capital to startup entrepreneurial businesses** through Shenandoah Valley Angel Investors and Staunton Creative Community Fund
- **Opportunity for follow-on financing to angel-backed and other traded sector emerging businesses**

Gaps and Weaknesses:

- **Quality of entrepreneurial management teams of concern and hard to recruit to the region.**
- **No local sources for follow-on financing, but efforts to syndicate with VC funding in Roanoke, Richmond, DC, NoVA and Chicago.**

Growing Track Record in Region 8 in Providing Access to Risk Capital for Startup Entrepreneurial Businesses

Shenandoah Valley Angel Investors – A network of private high-net worth investors, currently numbering 28, who have invested $5.5 million in 17 companies spanning agribusiness, artificial intelligence, biosciences, cybersecurity, digital data transmission, digital gaming, edtech, food & beverage, music & entertainment, personal grooming, travel, and unmanned aerial systems. Typically invest in the range of $50,000 to $300,000 per company, which may occur over several rounds as milestones are met.

Staunton Creative Community Fund – Established in 2008 to support entrepreneurs and small businesses, by combining a micro-loan revolving fund with business planning education and technical assistance to entrepreneurs. Average loan is approximately $17,000 and range from 1 to 6 years. Has invested nearly $1.3 million in 92 businesses that have created 324 jobs.

Assessment of Growth & Scalability in Region 8

Overall Assessment:

Concerns about lagging growth in workforce and highly-skilled talent base and access to growth capital

Strengths and Opportunities:

- **Contribution of startups generally very significant (exceeds net job growth of industry cluster) for both traditional industry clusters, as well as many emerging industry clusters** including financial & insurance, engineering/R&D and life sciences.
- **129 surviving high growth startups formed since 2007, measured by having greater than 25% growth over lifetime of business, generated sustained growth reaching 2000 jobs in 2017**, with 10 or more high growth companies found in seven clusters.
- **Survival rates slightly higher than state**. The cumulative 10-year startup cohort survival rates for region are 55.2% compared to statewide average of 53.5%.
- **Had two companies on Inc. 5000 fastest growing companies in 2018 after none in 2010.**

Gaps and Weaknesses:

- **Lower contribution of startups in Information and Communications Technology,** which is growing strongly in the region (86% growth in region from 2007-2017 compared to 51% nationally).
- **Scaling up of companies is a challenge –** lack of serial entrepreneurs as mentors and access to growth capital.
- **Population growth is flat and not keeping up in young working age population or overall growth of highly educated working age population,** compared to rural benchmarks/state average/national average, despite positive in-migration of talent from other states and overseas.
- **Declining level of SBA 7(a) loans supporting growth-oriented small businesses in more traditional-based traded sector industries.** The decline of 25% from 2010-2017 stands out among rural benchmark peers, which grew 33%.

Contribution of Entrepreneurial Development to Traded Sector Industry Cluster Growth

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

Potential Priority Actions Identified for Entrepreneurial Development in Region 8

- **Support advancement of integrated accelerators-incubators-coworking entrepreneurial hubs across the region**
- **Leverage and support engagement of college and university business schools and professional service providers** to assist startup companies from ideation through growth and scale-up**.**
- **Catalyze follow-on venture funding to go beyond initial risk capital sources in the region**
- **Concept of a "Regional Entrepreneurial Quarterback"**

Potential Priority Action: **Support advancement of integrated accelerators-incubators-coworking entrepreneurial hubs across the region**

Rationale:

- Creating a more entrepreneurial culture in the region and enhancing new startup activity is greatly enhanced by having value-added, place-based programming to support entrepreneurial development that can attract, engage and provide a platform for services to entrepreneurs.
- The geographic footprint of entrepreneurial activity in Region 8 calls for entrepreneurial hubs in Winchester, Harrisonburg and Staunton with strong connections to their local colleges and universities.
- Efforts in Staunton show the potential of a community-wide integrated entrepreneurial hub, but even in Staunton could use more acceleration services to support entrepreneurial teams to be mentored and provided initial pre-seed funding to advance their business concepts to the stage of company launch, including the identification of customers, new product development using new maker space and business planning for startups
- Harrisonburg has the potential to grow programming around The Hub and Ice House, including continuing to grow connections with JMU program efforts in entrepreneurship, commercialization/technology innovation and cybersecurity
- Winchester has the potential to create an entrepreneurial hub around the renovation of the Winchester Armory to house its Shenandoah Center for Immersive Learning with its virtual reality program along with an incubator and coworking space for student and community entrepreneurs.
- Other smaller communities in the region are starting to "boot-strap" coworking spaces

Possible Activities:

- Leverage existing and encourage formation of new entrepreneurial hubs offering incubation and coworking spaces found in Region 8
- Create a collaboration across entrepreneurial hubs and coworking spaces to develop shared programs, mentor networks, outreach activities, pitch competitions, etc.
- Offer acceleration services as a follow-on to use of ICAP and other ideation services for identified high-growth potential startups, especially targeting cohorts to specific industry clusters and market opportunities
- Engage with SVAI, Staunton Fund and other investors to develop a strong pipeline of investment-ready new venture startups

Illustrative Best Practice Examples:

- Birmingham, AL: Innovation Depot, a 140,000 incubator/coworking space, is home for a variety of entrepreneurial and talent initiatives in collaboration with community stakeholders and UAB, including a new technology accelerator, Velocity, that invests up to $50k in seed funding for selected startup teams.
- Charlotte, NC: Within their entrepreneurial hub, known as Packard Place, offers a network of accelerator program services including in cleantech, fintech and more general tech-based businesses
- Greenville, AL: 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.

Potential Priority Action: **Leverage and support increased engagement with entrepreneurs of college and university business schools and professional service providers**

Rationale:

- A critical challenge for Region 8 is strengthening the management teams of its startup businesses, particularly at market entry and growth/scale-up stages of development.
- Across the region there are business schools offering MBA programs with a focus on entrepreneurial development which can also offer broader expertise in customer discovery, marketing, financing, scaling up manufacturing and logistics, etc.
- These MBA students offer a talent pipeline to be retained for the region.
- The region and nearby regions also offer experienced base of professional service providers who could be tapped to provide counsel and insights to entrepreneurial management teams.

Possible Activities:

- For identified high-growth potential startups across traded sector industries, Region 8 could facilitate a wide range of programming and technical assistance to raise the entrepreneurial acumen of the management teams, in essence helping to grow its own management talent.
- Create a network of qualified service providers who have a track record of working with startups at different stages of development interested in offering periodic workshops and provide some one-on-one counseling sessions to high-growth potential startups.
- Invite network of service providers to have free coworking hours at entrepreneurial hubs.
- Better engage with local business schools by having a "site minder" at each to help match entrepreneurs with specific faculty expertise.
- Work with faculty at local business schools to create a senior entrepreneurial design program, similar to what many engineering schools offer, to engage faculty-led student teams to collaborate with management teams.
- Region 8 could provide a "growth voucher" to each identified high-growth potential startup to subsidize an initial entrepreneurial design project with a local business school.
- Over time, it might be helpful to have the region's business schools specialize in the industry focus for their entrepreneurial support services … such as for life sciences businesses, or cybersecurity or virtual reality or ag/food or transportation and logistics.

Illustrative Best Practice Examples:

- Austin: Austin Technology Incubator has a network of over 300 members of the Austin tech community – people who have been successful as entrepreneurs, executives, investors, technologists, professionals – to ensure we match the right people to the right problems at the right companies.
- Nashville: Vanderbilt Wond'ry Innovation Garage program pairs a corporate sponsor with teams of Vanderbilt students and faculty to tackle an issue or project identified by the company, with both undergrad and graduate students participating and committing to 5-10 hours per week.

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

Rationale:

Region 8 needs to build upon its initial sources of risk capital to offer a 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 8, it is important to have investment vehicles that can invest in multiple industries.

Possible Activities:

- **Form a region or multi-regional seed fund** able to bridge angel investors and more formal venture capital investments at Series A round, with ability to lead syndication at seed stage and participate in follow-on early stage rounds. State support via a pool of matching funds or other mechanism would be most important.
- **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. According to the SBA, SBIC investments that incorporate debt and equity are typically in the range of $250,000 to $10 million, with the interest rate loan portion at between 10% and 14%. There is only one SBIC in Virginia, based out of Reston. Nationally there are 150 SBIC that are actively investing, and most have a diversified investment approach.
- **Address need for increased funding of statewide angel investment tax credit, which is actively used by SVAI**. There is a $5 million cap in available credits each year, after which credits are prorated, which makes its benefit level uncertain for investors.

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.

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: Regional Council 8 Task Force on Startups/Innovation/ Commercialization

- George Pace, Shenandoah Valley Angel Investors
- Mary Lou Bourne, JMU
- Chris Cain, Staunton Innovation Hub
- Kathy Deacon, Staunton Creative Community Fund
- Peter Denbigh, Staunton Innovation Hub
- Christine Kriz, Lord Fairfax SBDC
- Anne Marchant, Shenandoah University
- Kirsten Moore, The Hub CoWorking
- Ashley Shickle, Northern Shenandoah Valley Regional Commission
- Joe Sprangel, Mary Baldwin College
- Robin Sullenberger, SVP

Appendix B: Quantitative Trendlines on Entrepreneurial Development

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

Key Measures:

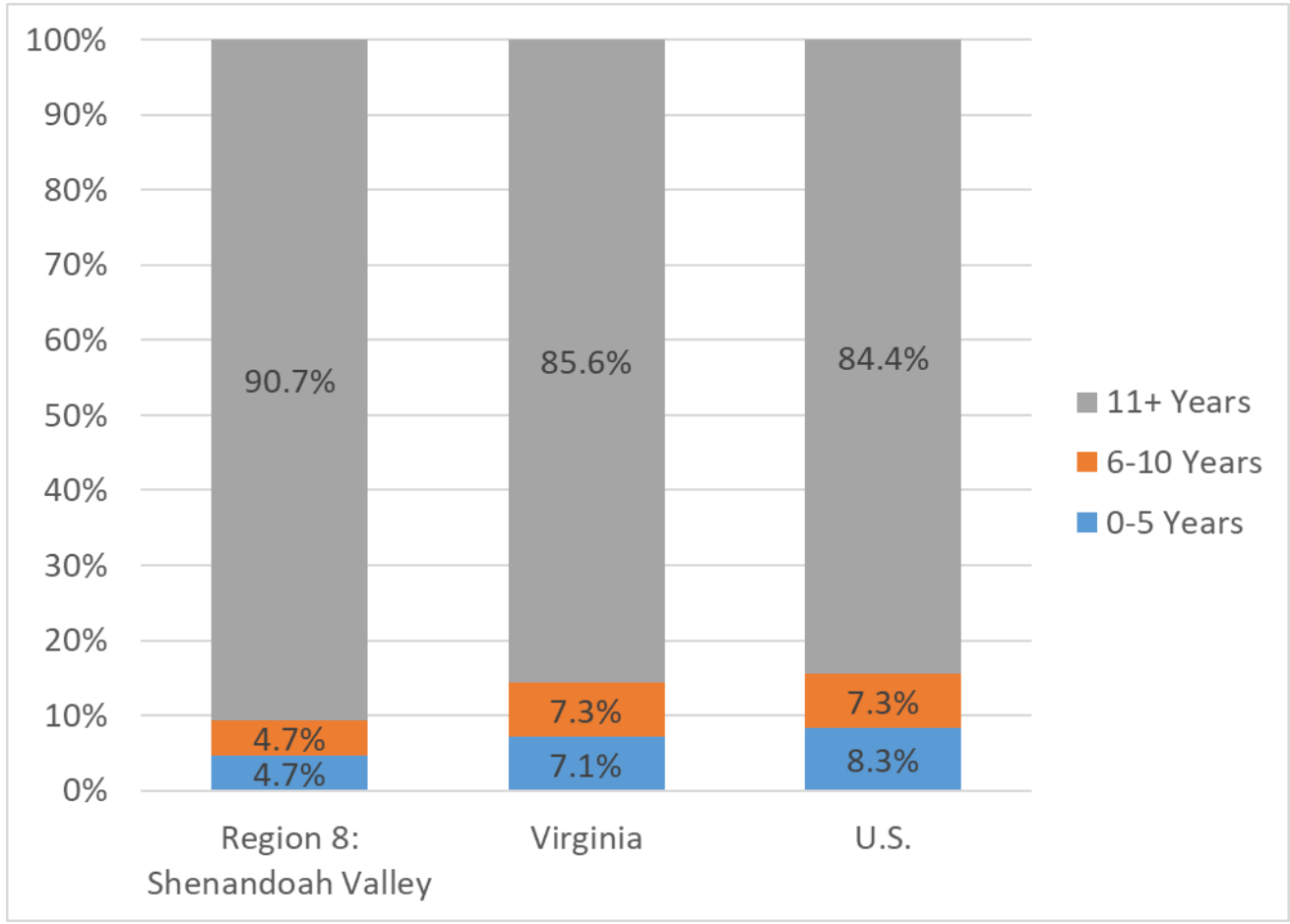
- Job distribution by age of firm
- Job creation by age of firm
- Business formation rates of start-ups
- Survival rates of startup companies
- Examining key elements of "net" employment growth
- The contribution of high-growth startups compared to all startups

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

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

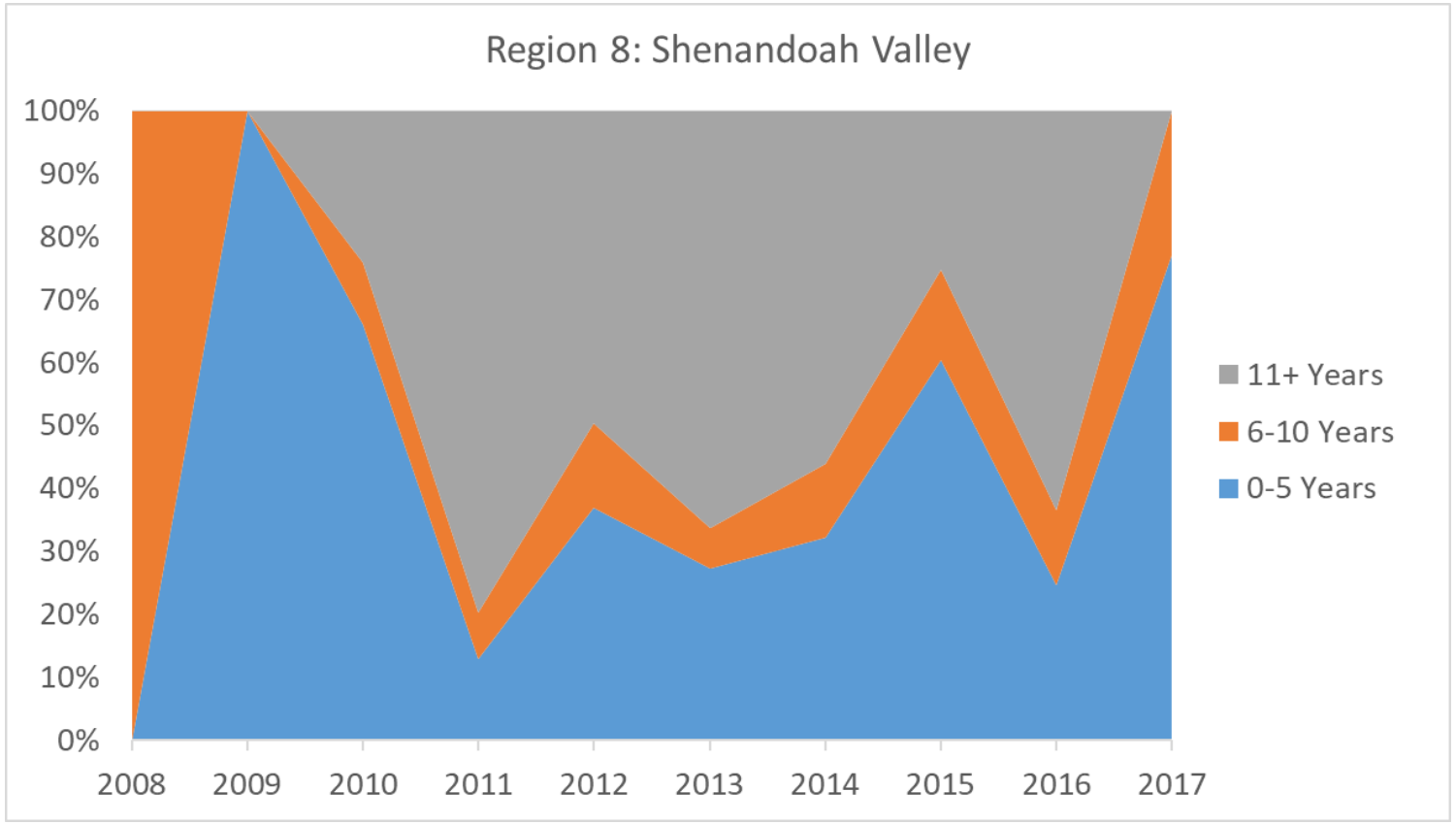


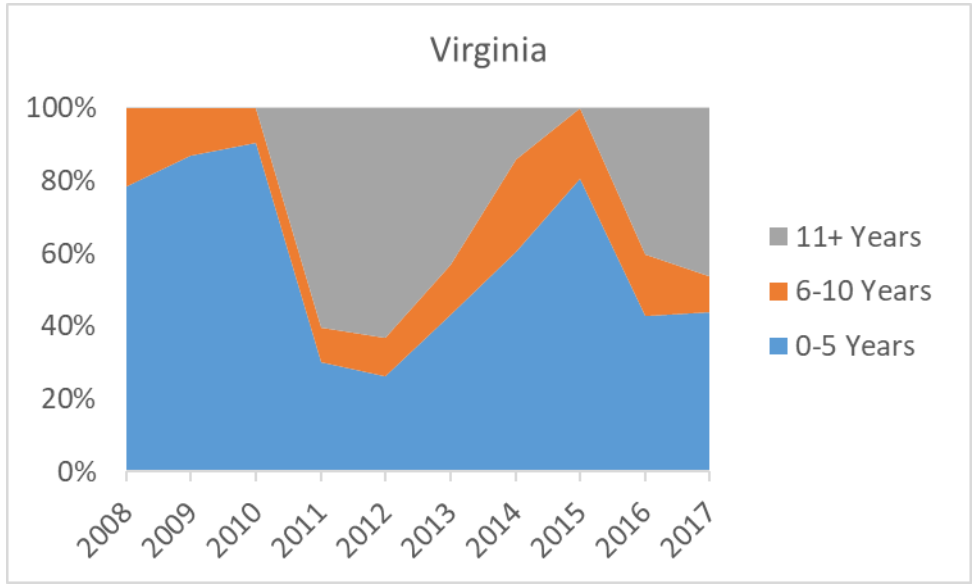
Traded Sector Employment Levels by Firm Age as a Percentage of Total Employment, Averaged 2008 Q1 through 2017 Q2

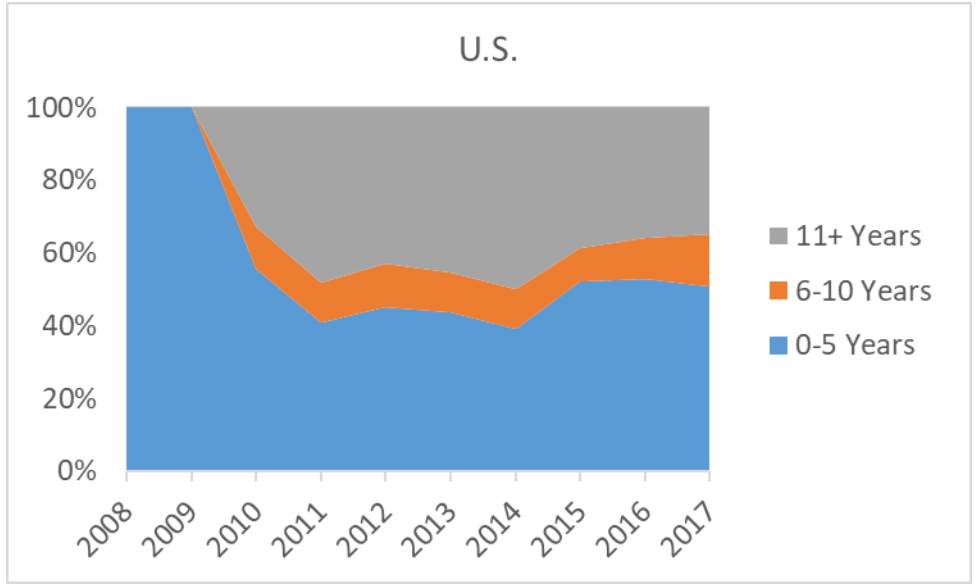
Source: U.S. Census Bureau Quarterly Workforce Indicators dataset.

Start-ups are important driver of net job change in any one quarter -- especially in recession and early years of recovery -- but older firms also contribute in Region 8

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







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

BDRC Profile of Startup Activity Trends in Region: While lots of ups and downs in start-ups, they do contribute significant a significant number of jobs

Founding Year of Startup Cohort*	Number of Startups in Traded Sector Industries
2007	204
2008	239
2009	100
2010	269
2011	141
2012	235
2013	247
2014	197
2015	236
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2017	163

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

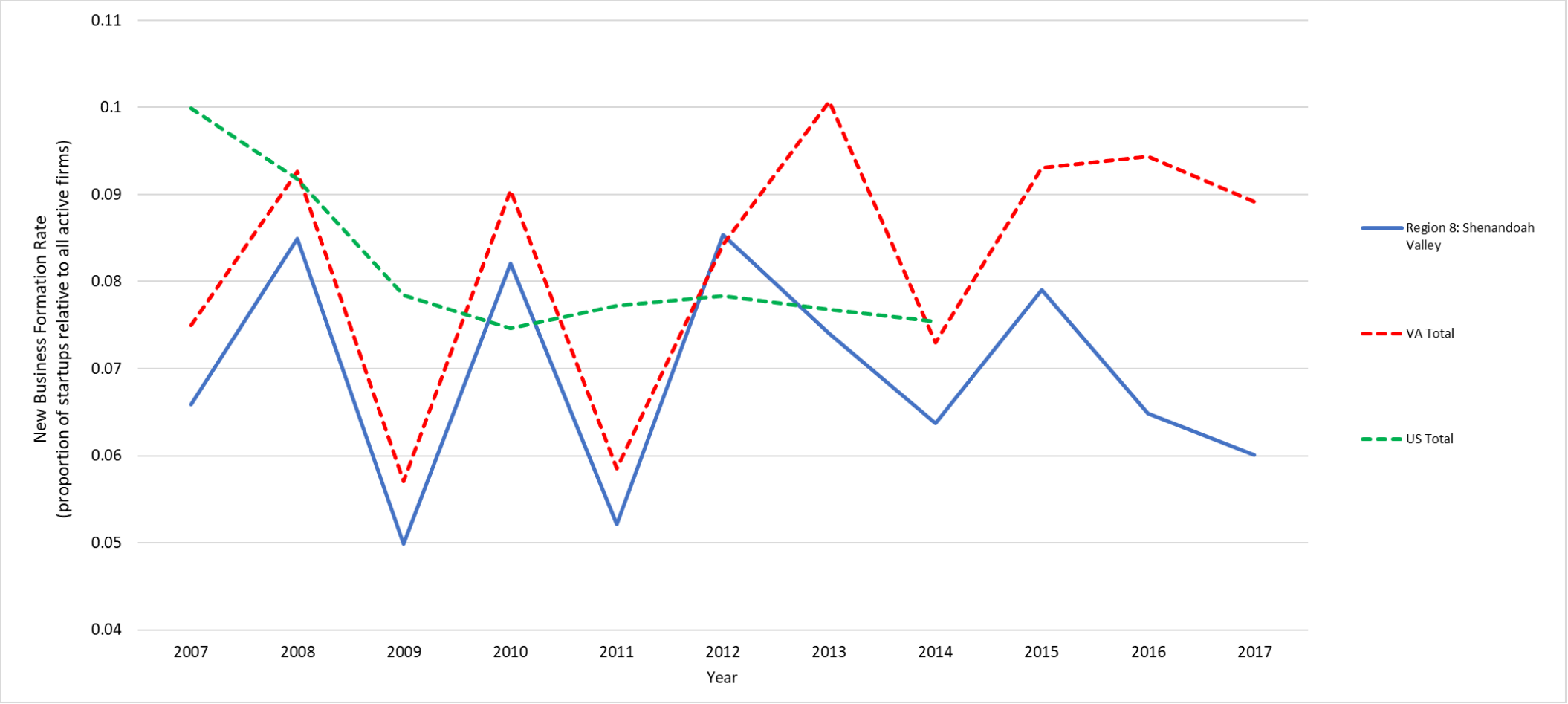
BDRC Profile of Startup Activity Trends in Region: While lots of ups and downs in start-ups, they do contribute significant a significant number of jobs

Founding Year of Startup Cohort*	Number of Startups in Traded Sector Industries	Number of Startups Surviving by 2017	Start-up Employment Levels 2017
2007	204	67	287
2008	239	75	547
2009	100	32	181
2010	269	100	412
2011	141	59	354
2012	235	120	952
2013	247	130	702
2014	197	123	902
2015	236	166	927
2016	189	163	893
2017	163	163	961

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

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

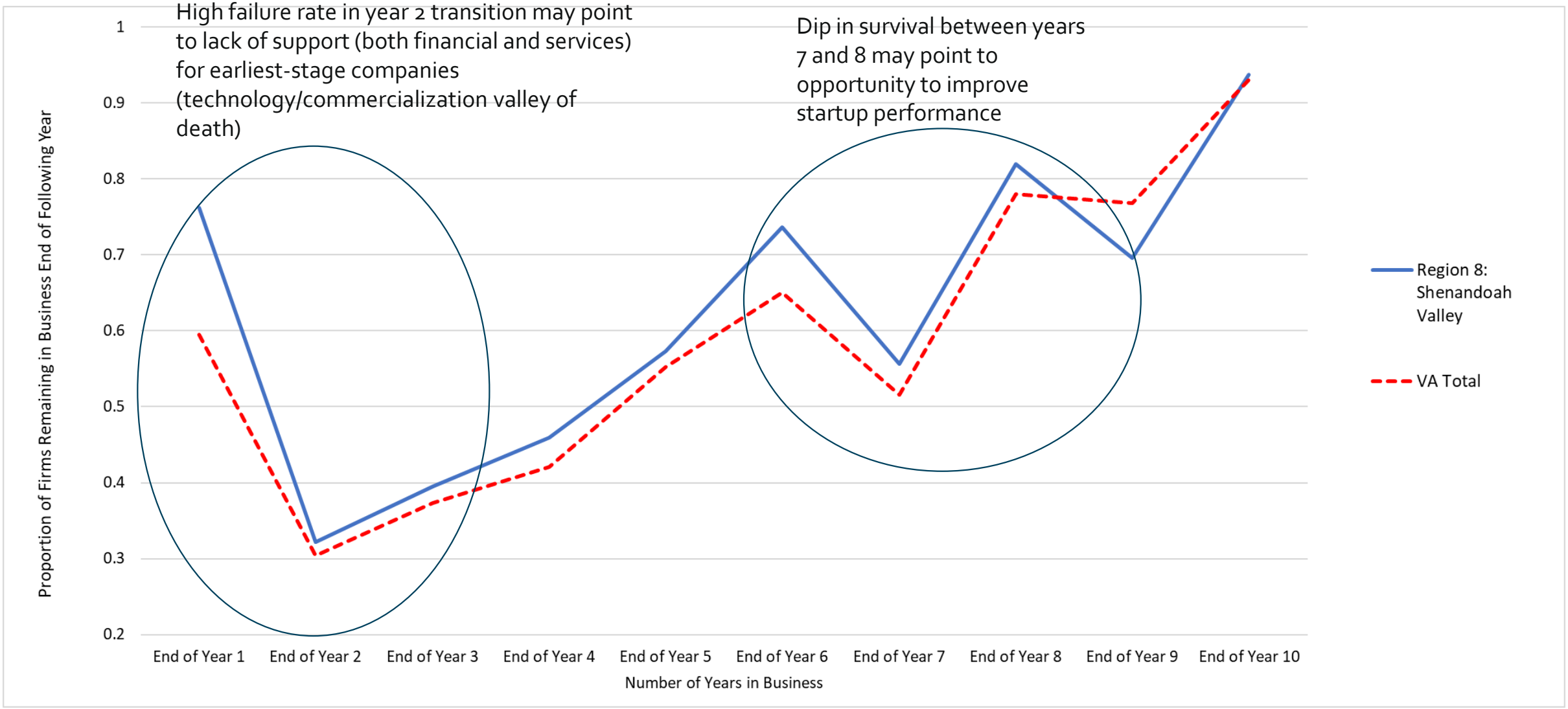
- Region 8 falling behind in new business formation rate in recent years.



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

Year over Year Survival Rate Trends in Regional Traded Sector Startups

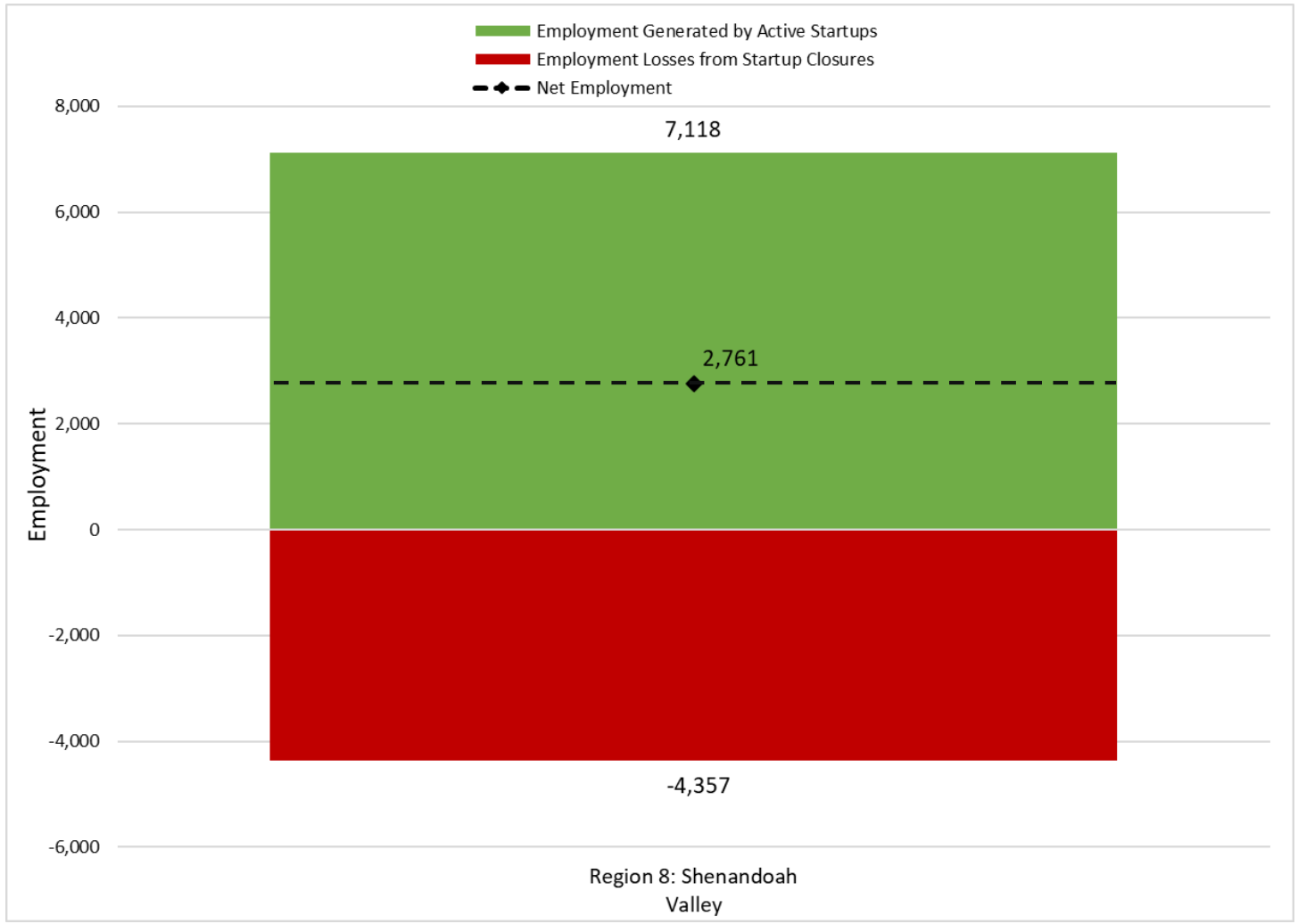
Cumulative 10-year startup cohort survival rates for region are 55.2% compared to a VA statewide rate 53.5%



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

Net Employment Impacts Generated by Traded Sector Startup Firms in Region

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



	Total Virginia Startups
Employment Generated by Active Startups	155,033
Employment Losses from Startup Closures	-98,732
Net Employment	56,301

*Indicates GO Virginia regions with research universities
**Startups defined as having firm age <10 years as of 2017

Profile of Traded Sector High Growth Startup* Activity in Region

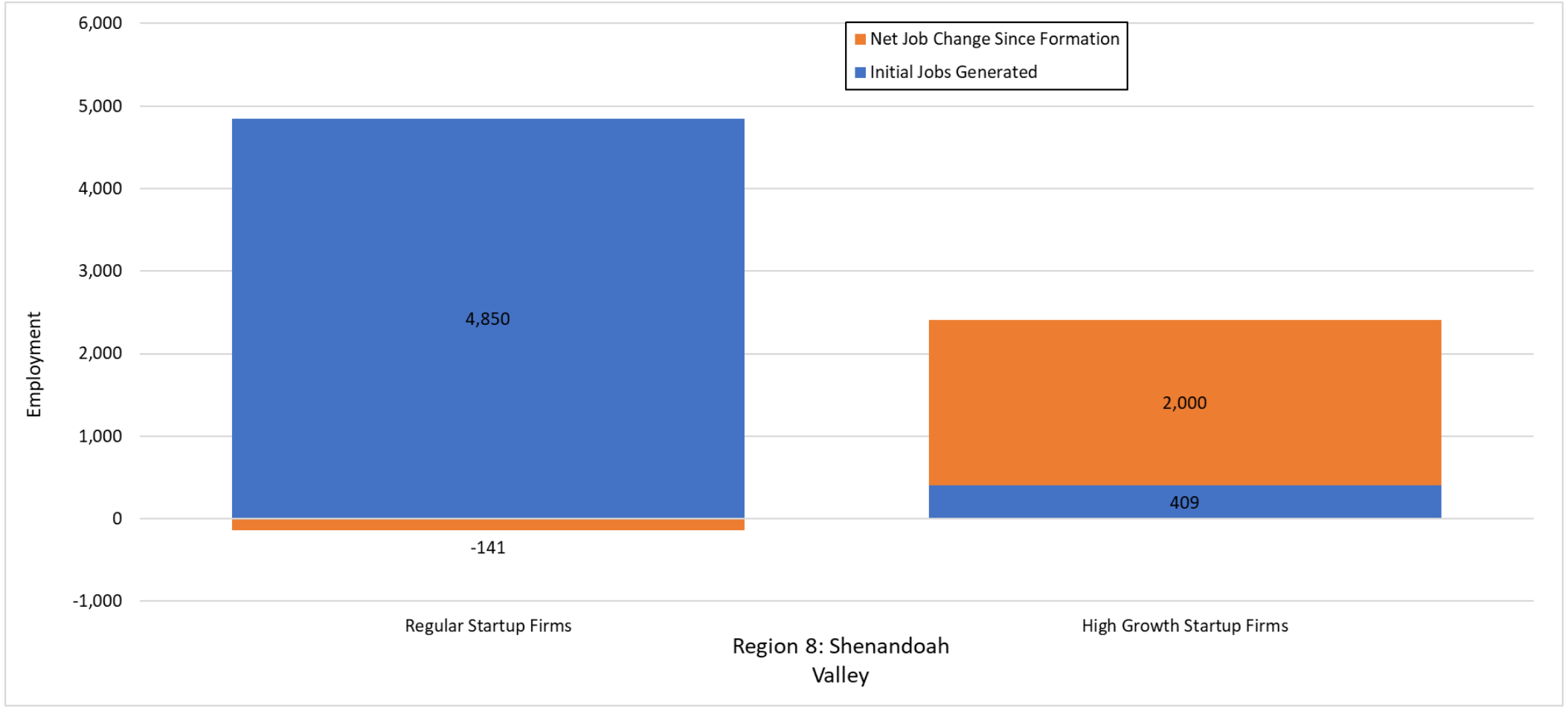
Founding Year of Startup Cohort**	Total Number of Startups in Traded Sector Industries	Number of High Growth Start-ups in Traded Sector Industries*	Number of High Growth Start-ups Surviving by 2017
2007	204	14	4
2008	239	15	6
2009	100	7	4
2010	269	10	3
2011	141	19	9
2012	235	50	27
2013	247	26	19
2014	197	40	29
2015	236	34	25
2016	189	3	3
2017	163		

* High growth startups defined as >25% annualized employment growth over lifetime of business
** Composed of all new non-branch firms with first recorded employment activity in a given year

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



*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 8 Priority Clusters from 2017 Growth and Diversification Plan:

- Financial and Business Services
- Health Care
- Information Technology / Communications
- Light Manufacturing
- Transportation and Logistics

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	426	252	13	1,137	2.87
Business Services	1,142	639	66	2,422	0.75
Energy, Natural Resources, & Finished Products	164	97	22	768	1.69
Engineering, R&D, Testing & Technical Services	107	56	11	323	0.46
Financial & Insurance Services	336	170	8	460	0.64
Health Care Services	51	30	6	316	0.42
Information Technology & Communications Services	106	57	18	393	0.38
Life Sciences	75	35	3	153	0.55
Manufacturing	132	84	17	818	1.57
Ship Building, Aerospace, & Defense	2	1	0	8	0.09
Transportation, Distribution and Logistics	503	257	50	1,871	1.17

*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

Additional Data Insights – Contribution of Entrepreneurial Development to Leading Industry Clusters

Many industry clusters doing well in region outside of "non-ag/food" manufacturing and natural resource industries

Role of entrepreneurial activity varies across leading industry clusters:

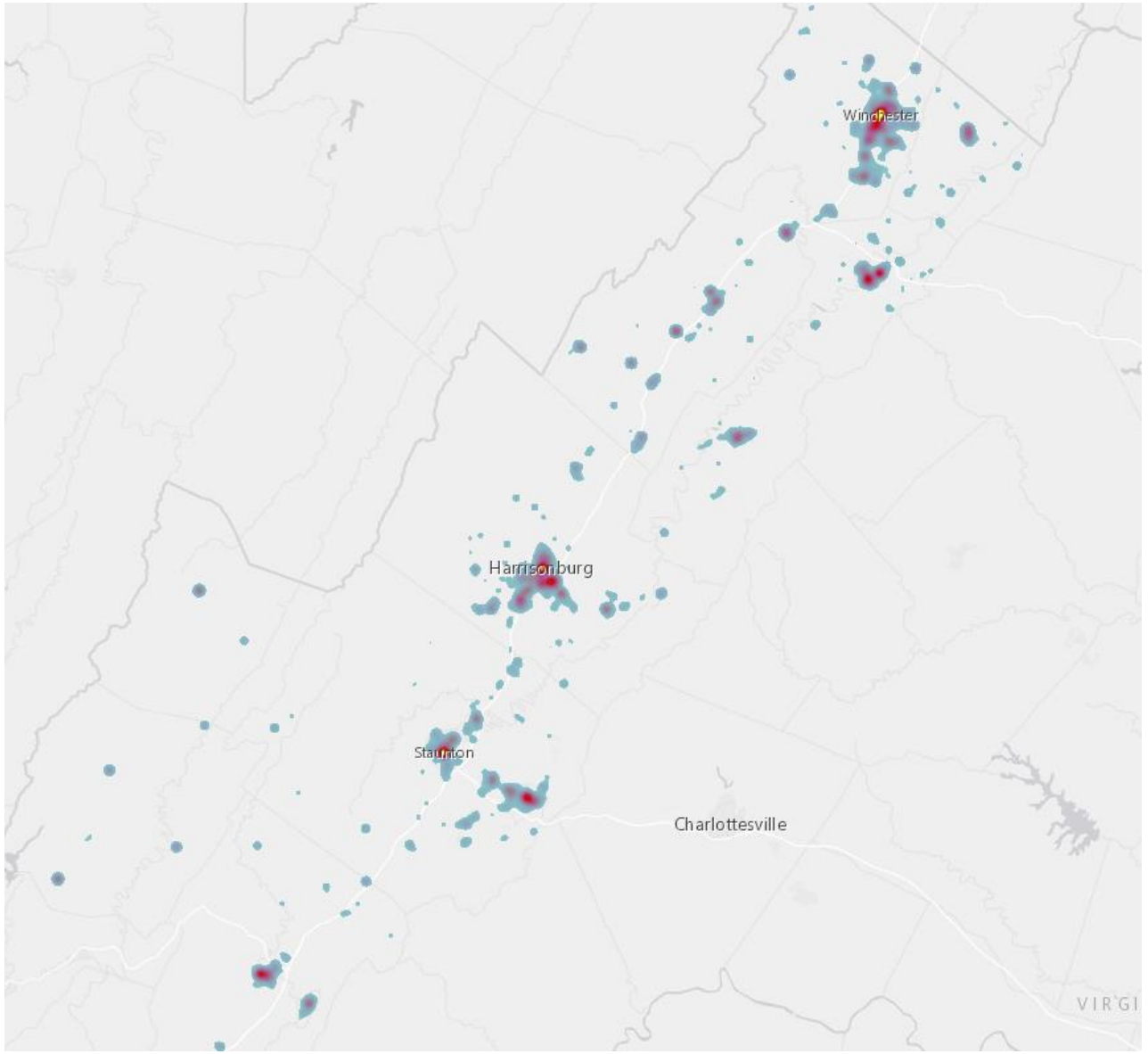
- In traditional industry strengths of region, more important in ag & food processing than transportation, distribution and logistics or overall manufacturing
- Helping to drive higher value/higher wage economy with emergence of business services, life sciences and engineering/R&D/testing/technical services and to a smaller extent ICT

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	**Current Strength**	**Significant**	13,649	2.90	10.1%	10.7%	1,247	1137	91%
Business Services	**Emerging Strength**	**Very Significant**	6,447	0.54	16.0%	9.1%	890	2422	272%
Energy, Natural Resources, & Finished Products	**Specialized/Declining**	**Very Significant**	4,459	1.16	-25.3%	-13.3%	-1,511	768	>100%
Engineering, R&D, Testing & Technical Services	**Emerging Strength**	**Very Significant**	1,152	0.44	33.0%	6.5%	286	323	113%
Financial & Insurance Services	**Emerging Strength**	**Very Significant**	1,247	0.26	5.1%	-4.1%	60	460	761%
Information Technology & Communications Services	**Emerging Strength**	**Modest**	1,421	0.32	86.2%	50.8%	658	393	60%
Life Sciences	**Emerging Opportunity**	**Very Significant**	1,635	0.72	10.1%	9.7%	150	153	102%
Manufacturing	**Specialized/Declining**	**Very Significant**	16,663	1.41	-24.0%	-13.5%	-5,257	818	>100%
Transportation, Distribution and Logistics	**Current Strength**	**Modest**	12,152	1.17	30.8%	8.7%	2,861	1871	65%

Geographic Distribution of Traded Sector Startup Activity in Region

High Regional Startup Activity Levels

Low Regional Startup Activity Levels



Additional Data Insights – Closer Look at Subregional Entrepreneurial Activities

Across the region, there is no dominant entrepreneurial hub, but a more distributed base of entrepreneurial activity.

Subregions	Specific County/ Independent Cities	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 High Growth Companies of 10+ employees
Harrisonburg subregion	Harrisonburg City; Rockingham County	494	1702	5	Diverse
Staunton subregion	Staunton City; Waynesboro City; Augusta County	440	1389	12	TDL/ICT/Natural Resources
Winchester subregion	Winchester City; Frederick County	575	2099	9	TDL/ICT
Shenandoah-Warren	Shenandoah County; Warren County	366	955	10	TDL/ICT
Total Region		2220	7118	39	

Initial Analysis of Broader Innovation Ecosystem Activity Innovation Ecosystem Activities

Key Measures:

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

R&D Expenditures

- **Region 8 is not an R&D intensive region**

Academic R&D Expenditures (Millions)

Region 8: Shenandoah Valley	2010	2011	2012	2013	2014	2015	2016	Total
James Madison University	$7.0	$7.3	$8.9	$5.8	$4.6	$3.7	$3.3	$40.7
Other Institutions	$1.8	$0.8		$0.3		$0.4		$3.4

"Other Institutions" includes Washington and Lee, Virginia Military Institute, and Eastern Mennonite University, but all report sporadically

Field	R&D Expenditures, 2010-16 (Millions)	% of Total
Other Geosciences, Atmospheric, and Ocean Sciences	$9.46	21.3%
Biological and Biomedical Sciences	$4.72	10.6%
Civil Engineering	$3.90	8.8%
Physics	$3.53	8.0%
Mathematics and Statistics	$2.86	6.4%

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

Base of Patent Activity That is Broad in its Areas of Focus

Total Patents, 2014-17

Region 8: Shenandoah Valley	2014	2015	2016	2017	Total
Patent Counts	167	159	173	125	624

Technology Class Area	Number of Patents, 2010-2017
Surgical devices	51
Network architectures or network communication protocols for network security	33
Medical prosthetics, filters, and other implantable devices	19
Materials analysis technologies and methods	13
Traction element conveyor systems	11
Digital computing or data processing equipment or methods, specially adapted for specific functions	11
Implements for cleaning floors, carpets, furniture, walls, or wall coverings	11
Arrangements for maintenance or administration or management of packet switching networks	10
Network-specific arrangements or communication protocols supporting networked applications	10

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

Low Levels of Venture Capital & SBIR

Venture Capital Activity

Region 8: Shenandoah Valley	2010	2011	2012	2013	2014	2015	2016	2017	Total
Deal Counts		2	1	2	5	3	3	4	20
Investment Totals (Millions)		$11.9	$0.2	$1.0	$0.5	$20.4	$7.7	$0.2	$41.8

Region 8: Shenandoah Valley	Pre-Seed	Angel	Seed	Early Stage	Later Stage	Total
Deal Counts	2	9	4	2	3	20
Investment Totals (Millions)	$0.1	$5.4	$1.7	$5.7	$28.9	$41.8

Source: PitchBook Data, Inc.

Small Business Innovation Research Awards

Region 8: Shenandoah Valley	2010	2011	2012	2013	2014	2015	2016	2017	Total
Award Counts	2			1		3	2	4	12
Award Amounts (Millions)	$0.49			$0.15		$0.69	$0.83	$0.38	$2.54

Source: www.SBIR.gov

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

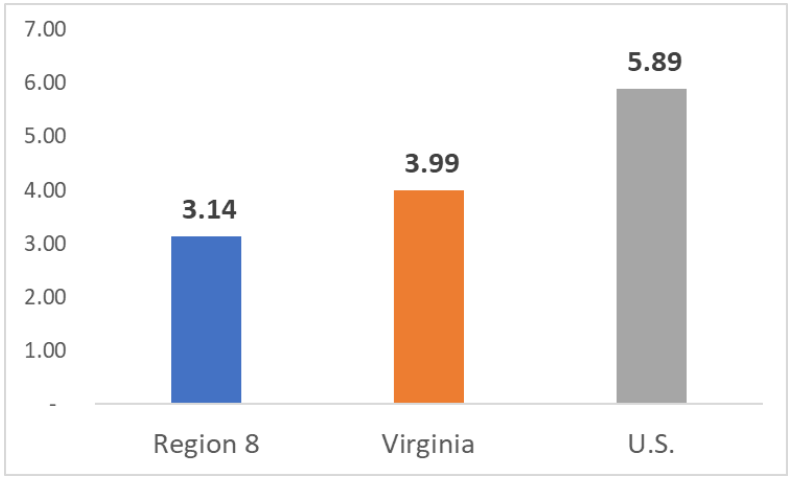
Industry Clusters	Co's Receiving Loans	Total No. of Loans	Total Loan Amounts ($)	% of Total Loan Amounts
Total, All Traded Sector Industries	**70**	**88**	**$24,687,100**	**100%**
Agriculture & Food Processing	17	20	$11,227,500	45%
Business Services	13	16	$3,059,000	12%
Energy, Natural Resources, & Finished Products	6	8	$485,000	2%
Engineering, R&D, Testing & Technical Services	2	2	$135,000	1%
Financial & Insurance Services	2	2	$300,000	1%
Information Technology & Communications Services	4	4	$267,000	1%
Life Sciences	1	1	$150,000	1%
Manufacturing	9	16	$4,583,800	19%
Transportation, Distribution and Logistics	16	19	$4,479,800	18%

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

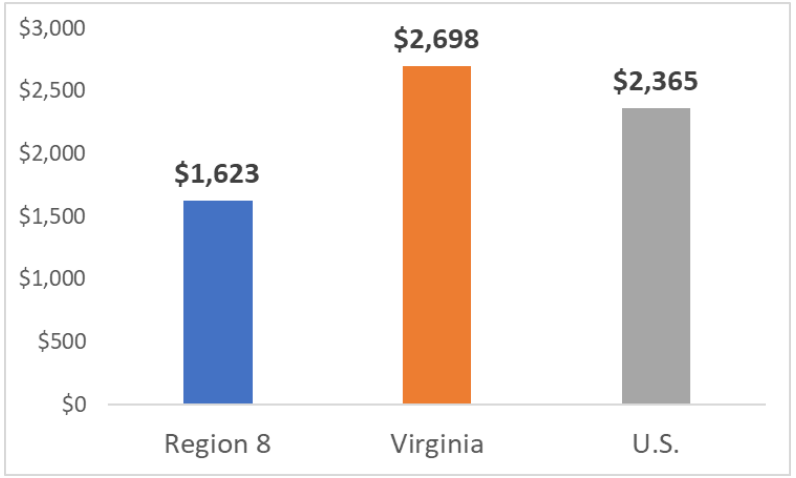
Regional Utilization of SBA Loans vs. State & U.S. Totals

- In 2017, regional companies approved for loan funding at a lower level relative to overall establishments 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



Source: TEConomy analysis of SBA loan data reports.

Appendix C: Inventory and Stakeholder Discussions

Informing the "Situational Assessment"

Inventory and Stakeholder Discussions

- Devon Anders, InterChange Group, Angel Investor
- Mary Lou Bourne, JMU
- Kathlynn Brown, SRI
- Chris Cain, Staunton Innovation Hub
- Kathy Deacon, Staunton Creative Community Fund
- Gerard Eldering, InnovateTech
- Christine Kriz, Lord Fairfax SBDC
- Anne Marchant and colleagues, Shenandoah University
- Keith May, Cottonwood Commercial
- Patrick McQuown, JMU Center for Entrepreneurship
- George Pace, Shenandoah Valley Angel Investors
- Joe Sprangel, Mary Baldwin College
- Robin Sullenberger, SVP

Entrepreneurial Activities Across Stages of Entrepreneurial Development

Entrepreneurial Activity	Ideation	Commercial Viability	Market Entry	Growth & Scalability
ASQ Innovation Interest Group				✓
Grow Waynesboro	✓		✓	
JMU Center for Entrepreneurship	✓			
JMU Technology Innovation & Economic Dev.	✓	✓		
Mary Baldwin College of Business & Prof Services	✓			
Open Source Stanton				✓
Shenandoah University	✓			
Shenandoah Valley Angel Investors			✓	
Shenandoah Valley Innovation Coalition				✓
Shenandoah Valley Technology Council				✓(networking)
Small Business Development Centers	✓ (ICAP)		✓	✓
Staunton Creative Community Fund	✓		✓	
Staunton Innovation Hub			✓	
The Highland Center			✓	
The Hub CoWorking			✓	

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* See Excel 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

*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 8	VA	U.S.	Benchmarking Groups: Median Value			
					Large Tech Hubs	Mid-sized Regions	Rural with Major Research Anchor	Rural with No Major Research Anchor
University R&D	University R&D Expenditures per Capita, 2016	**$6**	$174	$222	$863	$370	$2,800	$62
	Percent Change in Total R&D Expenditures, 2010-16	**-53%**	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	**-43%**	-33%	7%	16%	9%	20%	6%
New Firm Startup Rate	Rate of New Firm Formation as a Percent of All Firms, 2014	**5%**	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

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 8	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	**$1**	$15	$8	$17	$5	$30	$0.30
	SBIR, STTR % Pt. Change in Share of Award Funding, Avg. 2010-13 to 2014-17	**.01**	-0.56	-	0.09	0.03	-0.04	0.00
	Number of Phase 1 Awards, 2010-2017	**9**	1,796	17,802	486	44	119	2
	Number of Phase 2 Awards, 2010-2017	**3**	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 8	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	**34%**	52%	46%	36%	34%	42%	30%
Venture Capital Investments	VC Investments, 2014-17	**$29 M**	$2.6 B	$308 B	$2.3 B	$127 M	$66 M	$0.2 M
	VC Investments per Capita, 2014-17	**$54**	$315	$954	$1,221	$164	$255	$1
	Change in VC Investment, 2010-13 to 2014-17	**120%**	24%	89%	42%	86%	-13%	2000%
	VC Deals, 2014-17	**15**	1,068	54,030	565	81	74	3
	VC Deals per 100,000 population, 2014-17	**3**	13	17	31	13	30	2
	Change in VC Deals, 2010-13 to 2014-17	**200%**	67%	58%	67%	49%	135%	125%
	Share of VC Investments in Angel + Seed + Early Stages, 2014-17	**37%**	51%	41%	36%	79%	65%	100%
	Share of VC Deals in Angel, Seed + Early Stages, 2014-17	**87%**	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 8	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	**1.9**	2.9	4.7	3.6	2.7	3.0	2.0
	Change in SBA 7(a) Loans, 2010-2017	**-25%**	11%	22%	55%	8%	113%	33%
	Avg. SBA 7(a) Loan Value, per Capita, 2010-2017	**$4**	$9	$17	$18	$12	$10	$20
	Change in SBA 7(a) Loan Value, 2010-2017	**572%**	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	**2**	297	-	57	13	3	1
	Change in Companies in Inc. 5000, 2010-18	**- (0 in 2010)**	2%	-	15%	13%	83%	-50%

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

Cross-Cutting Ecosystem Element: Talent Dynamics

Ecosystem Element	Measure	GO VA Region 8	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	**0%**	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	**19%**	28%	23%	31%	23%	21%	15%
	Growth in Highly Educated Workforce (BA+), (25-64, working age) — 2012-2017	**4%**	10%	12%	26%	17%	16%	6%
Highly Educated Migration	Net Migration of Highly Educated Workers (BA+), 2012-17	**1,823**	-14,000	154,411	45,424	2,279	-9,684	-1,402
	Foreign In-Migration (BA+), 2010-17	**2,564**	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	• **Share of Highly Educated Population** • **Net Migration of Highly Educated** (Interstate) • **Foreign In-Migration**		• **Employment in Younger, Traded Sector Firms** – on par with mid-sized regions and ahead of rural regions with no research anchors • **Venture Capital Level and Growth**	• **Share of Highly Educated Population** • **Net Migration of Highly Educated** (Interstate) • **Foreign In-Migration**
On Par Measures	• **New Firm Startup Rates** (all industries, 2014 most recent year) • **Patent Activity** • **Growth in Young Working Age Population** • **Growth in Highly Educated**	• **SBIR**	• **Share of Deals in Angel, Seed and Early Stages**	• **Growth in Young Working Age Population** • **Growth in Highly Educated**
Lagging Measures	• **University R&D** • **Change in Patenting**	• **University tech transfer & commercialization**		• **SBA (7a) financing** • **Presence of High Growth Companies**

Note: Comparison made to other rural regions with no 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 Charlotte Venture Challenge	UNCC NSF i-Corps Site ←Network of accelerators (fintech, cleantech, NC Idea →	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

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 ← Active university alumni angel networks at Duke, NC State & UNC → PoC Funds at NC State, UNC & Duke	← Research Triangle Park, Centennial Campus, HQ coworking, American Underground & Biolabs → UNC Carolina Research Ventures $10 m "Seed" Fund	← NC Biotech Center →
Susquehanna, PA		← Rural Business Innovation network of incubators → Micro-startup grants from Rural Business Innovation	← Keysone Innovation Zone Transferable Tax Credits for Young Firm Revenue Growth →	College student internship funding
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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