Oregon Innovation & Entrepreneurship Benchmarking and Best Practices

Final Report

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Prepared for

Oregon Business Development Department
775 Summer St NE
Salem, OR
97301

Prepared by

Scruggs & Associates LLC

7642 SW Kelly Ave
Portland, OR
97219

RTI International

P.O. Box 12194
Research Triangle Park, NC
27709

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Executive Summary

Over the past 25 years, all net new job creation and 20% of gross job growth has come from startup companies less than five years old, with the majority of those jobs created by a small percentage of high growth firms.[1] High growth startups, often referred to as innovation-driven enterprises or IDEs, are essential for a thriving economy not only for their job creation potential, they also pay high wages, and account for a disproportionate share of GDP.[2] While recent data may indicate that overall entrepreneurship has declined in the US, innovation-based start-ups have increased in number.[3] Most important, the outsized contributions of innovation-driven enterprises provide the impetus for long-term economic stability and growth in a region. For example, a Stanford research study of all public companies indicated that VC-backed firms account for 82% of the R&D performed.[4]

This benchmarking and best practices study focused on Oregon's strengths and weaknesses for starting and growing IDEs, including the foundational assets that build the innovation capacity to develop new ideas and technologies. This study sought to explore the following questions within an overall I&E framework as illustrated in Figure ES-1.

Figure ES-1. I & E Ecosystem Framework

INNOVATION CAPACITY		ENTREPRENEURSHIP CAPACITY	
R&D	**PRODUCT DEVELOPMENT**	**BUSINESS DEVELOPMENT**	**BUSINESS SCALE-UP and GROWTH**
Are there robust levels of R&D providing the foundation for new ideas and products?	Is research being translated and commercialized into products with economic potential?	Are entrepreneurs launching scalable companies at an increasing rate and in a timely fashion?	Are startups growing and thriving in Oregon?
ASSETS Does Oregon have the people, capital, and infrastructure to attract and support innovation and high growth companies? Can researchers and entrepreneurs access the necessary resources to assist them?			
ENABLERS Does Oregon's culture promote and reward innovation and entrepreneurship? Are key institutions and initiatives operating at a scale that can drive impact and sustainability? Are public and private sectors coordinating and providing continuity to grow the I&E ecosystem?			

[1] Weins, Jason and Chris Jackson, "The importance of Young Firms on Economic Growth," Sept. 2015
[2] Hathaway, Ian and Robert E. Litan, "Declining Business Dynamism in the United States: A Look at States and Metros," (Brookings Institute, May 5, 2014)
[3] Wu, J John and Robert D. Atkinson, How Technology-Based Start-ups Support US Economic Growth, Nov. 2017
[4] https://www.gsb.stanford.edu/insights/how-much-does-venture-capital-drive-us-economy

This study sought to capture data and qualitative input for the assets and enablers of innovation and entrepreneurship.

- I&E "**assets**" such as capital, accelerators and incubators, and mentors and technical advisors, that support the development of technologies and companies.
- I&E "**enablers**" of the ecosystem—the culture, capacity and continuity of support—that amplify impact by creating an integrated and highly functioning ecosystem.

The study also sought to understand the differences across Oregon's innovation driven industry sectors.

- **R&D Intensive or Deep Technology**: Industries such as biosciences, advanced materials, cleantech and high-tech manufacturing that require significant R&D and intellectual property and have a longer time to market.
- **Technology Services**: Services designed to facilitate the use of technology by enterprises and end users, most commonly software as a service.
- **Consumer Products**: Industries developing products for the consumer market including food and beverage, outdoor gear, and apparel.

These types of industries were examined more closely because they were consistently referenced in the stakeholder interviews we conducted and reinforced by previous sector-based studies completed by Business Oregon.

Overall Findings

The story of I&E performance and growth within the state is both compelling in certain areas and concerning in others. On the positive side:

- Significant advancements have been made across Oregon over a short period of time. The array of programs and services to support entrepreneurs has multiplied outside of the Portland region, most notably in Central Oregon.
- Investment capital (both deals and dollars) has grown over the past decade, especially for technology services and to a lesser extent for consumer products.
- Almost all regions across the state have grown manufacturing and technology jobs, as well as their Science, Technology, Engineering and Math (STEM) workforce—assets that help drive innovation and entrepreneurship.
- Pockets of strong sector-based networks and organizations are propelling the growth and capitalization of startups in key industries, notably outdoor, food & beverage, and technology services.

On the less positive side:

- Investments in innovation capacity, particularly commercialization funding and support for R&D-intensive companies, are inadequate.
- Not all state programs have been successful. Those that have underperformed in the past appear to be a result of poor execution mechanics, rather than intent or need.

- Startups are not growing at a rate that would be expected for the industry mix found in Oregon. For example, while Oregon ranked well above average for the number of tech startups, it ranks #46 in the number of jobs per startup.[5]
- Interviews of stakeholders actively engaged in the I&E ecosystem consistently noted a lack of continuity with state support, particularly with regard to frequent changes to I&E programs and/or their parameters. Since I&E development is a long-term strategy, intermittent disruptions cause programs to lose ground and underperform.

In addition to strengths and weaknesses, several other observations were noted:

- Startups and small companies tend to be the primary mechanism for commercializing inventions from universities.
- As startups mature, their needs become more sector-specific.
- The most effective support for IDEs relies on focused and intentional coordination: research indicates the mere presence of resources is not enough to produce the desired impact.
- Connections to networks outside of Oregon are critical for the growth of startups.

These findings resulted from an assessment that compared Oregon with peer states and national performance, mapped the growth of assets within the state, and conducted interviews with an array of stakeholders. The following highlights these assessment steps.

Growth of Oregon I&E Assets

This study mapped the progress of innovation-driven industries, entrepreneurship resources, STEM talent, and capital investment within Oregon. It included calculating the concentration of key jobs compared to the US average and mapping the results by county. It also examined the three-year growth of these jobs, as well as mapping the location of equity-backed investment companies, capital resources, and technical assistance programs.

Key Take-Aways From Asset Mapping

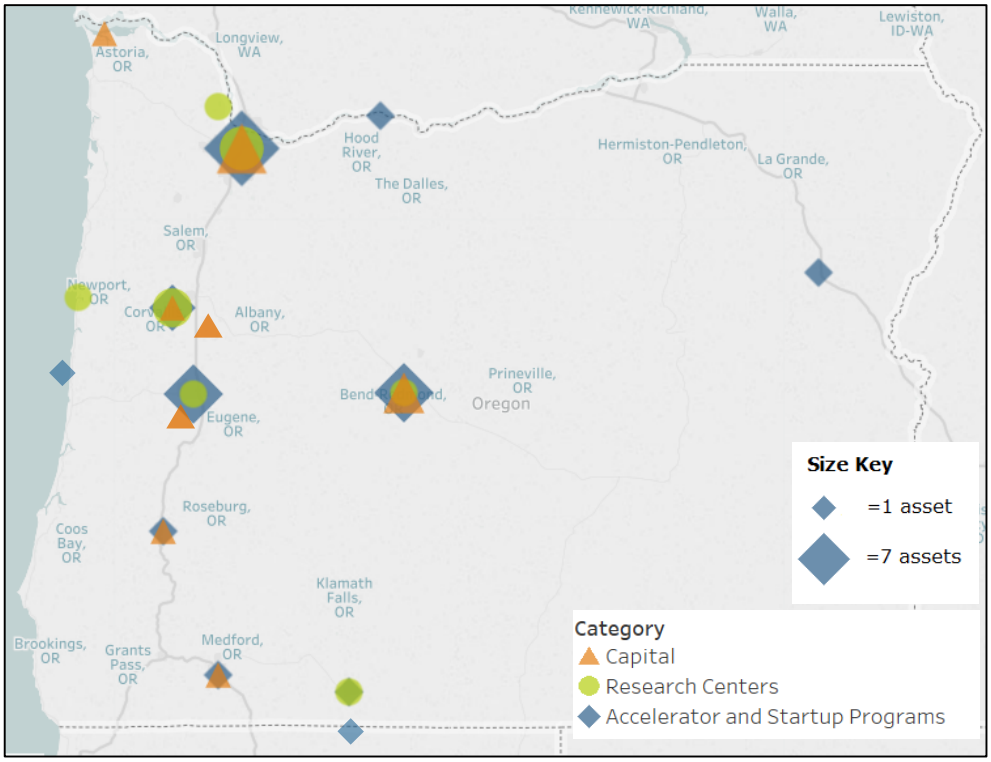
- Growth in I&E industries and workforce extends outside of urban centers and is becoming more distributed across the state.
  - Manufacturing is a competitive advantage for the state, with above average concentration of jobs in most counties. This could provide opportunities to connect new technologies from I&E hubs to more rural regions.
  - Oregon is growing knowledge-intensive business services that are key to building the network of resources for startups, especially in Deschutes and Benton Counties.
  - Growth in tech jobs can be found in almost all regions, with rural counties like Morrow and Hood River experiencing significant improvement.
  - STEM workforce has grown statewide: most rapidly in Central Oregon with high pockets of growth in Morrow and Columbia Counties.

[5] Wu, J John and Robert D. Atkinson, How Technology-Based Start-ups Support US Economic Growth, November 2017

- Even though innovation-driven jobs have grown throughout the state, wages remain much lower in more rural regions, an indication of the presence of fewer innovation-intensive industry sectors.
- While the Portland area continues to play an outsized role in startup activity, Central Oregon and the Corvallis-Eugene Corridor are establishing I&E hubs. In particular, Central Oregon has consistently outpaced other regions in almost every aspect.

When Oregon began a statewide innovation strategy 15 years ago, most resources were found in or around the Portland metropolitan region. Today, assets ranging from research centers to accelerators to angel capital funds are located throughout the state as illustrated in Figure ES-2. Central Oregon and the Eugene-Corvallis corridor are emerging as I&E hubs with an array of resources.

Figure ES-2. Distribution I&E Assets



Oregon's Comparative I&E Performance to U.S. and Peer States

The benchmarking of Oregon's comparative performance was conducted using metrics that examined five performance measures: rankings among six peer states[6] and the U.S. average, Oregon's 10-year performance compared to the U.S. average, Oregon's three-year performance compared to the U.S. average, and Oregon's rate of acceleration as measured

[6] Arizona, Colorado, Minnesota, Oklahoma, Utah and Washington were used as peer states due to similarities in size and economies, proximity, and maturity of state support for innovation programs.

by comparing the most recent three-year annual growth rate to its 10-year annual growth rate. Figure ES-3 summaries these metrics.

Figure ES-3. Innovation & Entrepreneurship Metrics

Metric	U.S. Rank	Peer State Rank (7)	OR 10-yr Performance Compared to U.S.	OR 3-yr Performance Compared to U.S.	OR Acceler-ation
Industry R&D as a percent of state GSP	7	2	Higher	Higher	Yes
Non-industry R&D as a percent of state GSP	35	5	Lower	Higher	No
University Invention Disclosures per $1 M in research expenditures	28	4	Higher	Same	Yes
SBIR/STTR funding per $1 M of state GDP	14	3	Lower	Lower	No
Inventor Patents per 1,000 people of workforce age	10	5	Lower	Lower	No
University Active Licenses per $1 M in research expenditures	4	1	Higher	Higher	No
Venture Capital as a percent of state GDP	17	4	Lower	Higher	Yes
Startups per 1,000 firms	15	5	Lower	Lower	Yes
University Startups per $1 M in research expenditures	16	3	Higher	Lower	No
Business Churn: startup and failure activity as a share of total firms	31	6	Lower	Lower	No
High Growth Companies per 100,000 firms	18	6	Lower	Higher	Yes
Startup job growth five years after founding	12	7	Lower	Lower	Yes
Initial Public Offerings: Value of IPOs as a share of	46	7	Higher	Lower	No
STEM Workers as a share of total workforce	18	5	Higher	Lower	No
Managers, Professional & Technical Jobs as a share of all jobs	15	4	Higher	Lower	No
Net Migration of Knowledge Workers as a percent of the total population	7	3	Higher	Lower	No
High Tech Jobs as a percent of all jobs	10	4	Higher	Higher	No
Survival Rate of Startups five years after founding	16	3	Lower	Higher	Yes

Overall, we find that

- The innovation and entrepreneurship performance within Oregon has increased, yet similar patterns across the U.S. means that Oregon's position relative to other states has stayed the same for many measures.
- Compared to peer states (Arizona, Colorado, Minnesota, Oklahoma, Utah, and Washington), Oregon's performance falls in the middle; Utah, Washington and Colorado consistently out-performed Oregon.
- Areas of strong performance include industry R&D, university active licenses, and the survival rates of startups.[7]
- Areas of weak performance include non-industry R&D, overall startup activity of high growth firms, and IPOs for companies that grow to significant size.

A complete characterization of performance is included in Figure ES-4 below.

Figure ES-4. Summary of Innovation & Entrepreneurship Metrics

Areas of Strong Performance	Above Average Performance with Declining or Flat Trend Lines
▪ Industry performed R&D ▪ University active licenses ▪ Survival rates of startups	▪ SBIR/STTR Awards ▪ STEM and management/finance workers ▪ Inventor patents (Patents awarded to individuals) ▪ The attraction of knowledge workers from outside of Oregon
Areas of Average or Below Average Performance with Improving Trend Lines	**Areas of Weak Performance**
▪ University invention disclosures and startups ▪ Startup job growth (average growth of employment five years after founding) ▪ The density of startups that become high growth (the percent of startups that scale) ▪ Venture capital funding ▪ High-tech jobs and STEM jobs	▪ Overall startup activity (number of new companies forming each year) ▪ Non-industry (University) R&D ▪ Companies that grow to significant size, as measured by initial public offerings

Insights from Interviews

Over 40 interviews were conducted, obtaining input from 52 entrepreneurs, investors, sector leaders, service providers, and university R&D offices. These interviews explored insights on the advantages and disadvantages of commercializing technologies and starting companies, as well as perceptions on what is needed in the future to enhance the state's I&E ecosystem. Figure ES-5 summarizes these interviews.

[7] There are many factors that affect the survival rate of startups including industry mix.

Figure ES-5. Summary of Interview Themes and Suggested Support

Interview Themes	Suggested Public Support
Core assets have been put in place that are fostering new startups – now is the time to connect them and build out programs that focus on scaling and growing what's been started.	▪ Focus future grant programs on connecting existing assets and expanding growth-stage services. ▪ Expand ecosystem building models that have been successful in Central Oregon and elsewhere is U.S. ▪ Broaden connections outside of Oregon; Establish more national and international networks.
There is repeated concern that Oregon's innovation capacity is declining and it is more difficult to start and grow R&D intensive companies.	▪ Support a full array of commercialization funds that move technologies from invention disclosure through proof of concept to a valid product prototype. ▪ Reauthorize University Venture Development Fund (UVDF) tax credits or enact a similar program. ▪ Continue and expand the state's SBIR matching fund program as well as provide funding for deep technology companies not on an SBIR pathway.
Oregon is a state that "makes things." Programs and resources should reflect the goods-producing nature of Oregon I&E industries.	▪ Ensure business loan programs align with the needs of startups in consumer products and tech-based manufacturing. Consumer products companies may need working capital to build inventories, tech-based manufacturing companies may need capital for prototyping or special equipment. ▪ Support facility expansions of incubators and post-incubation facilities for R&D intensive industries.
Oregon has embraced entrepreneurship, yet the overall culture is one that "thinks small." This was regarded as affecting the scalability of companies, the level of investment capital, and the scale at which the public sector supports I&E.	▪ Enhance marketing of efforts that celebrate and recognize successful Oregon-based companies. ▪ Change the dialogue from Oregon as a "Small Business" state to one of an "Entrepreneurial State." Language matters. ▪ Systematically facilitate connections between existing companies and startups to encourage corporate investment and engagement.
Oregon lacks a clear vision and shared I&E strategy, which is impacting the continuity of support and the ability to build scale and impact.	▪ Develop a clear 10-year statewide strategy for innovation and entrepreneurship with appropriate metrics. ▪ Strategically connect funding from philanthropy, government, and industry to address priority gaps. ▪ Establish state funding mechanisms that provide more continuity of support and is less reliant on lottery funds. ▪ Ensure transparency of how state I&E decisions are made with supporting data indicating why the state modified program or expectations.
Oregon is missing opportunities to align I&E assets with its potential to be a leader for national and global issues.	▪ Rally Oregon industry and government leadership around areas where the state is demonstrating policy leadership such as climate change.

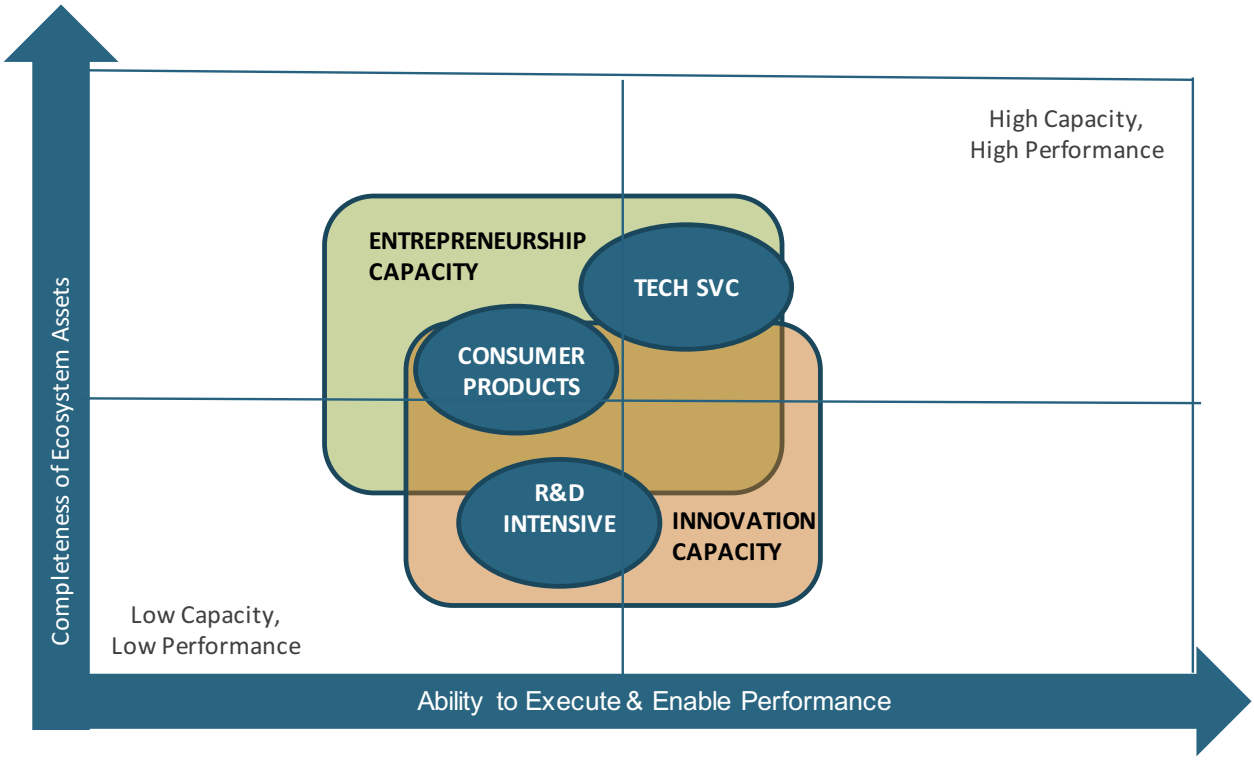
Summarizing Oregon's Innovation and Entrepreneurship Capacity

Successful I&E ecosystems can be defined as having both high capacity (abundant assets and resources) and high performance (adequate connectivity and capacity) for innovation and entrepreneurship. This corresponds to research showing that it takes more than presence of assets alone to have a successful I&E ecosystem.[8]

> ***Entrepreneurship*: Oregon is increasing its ability to start companies (with the exception of R&D intensive sectors), yet it struggles with growing firms.**
>
> ***Innovation:* Oregon's overall capacity for commercializing science and research is lagging; yet what capacity it has, appears to be fairly efficient at producing economic benefit**.

Simply put, Oregon has more entrepreneurship assets than innovation resources, especially for Tech Services and Consumer Product startups. Yet, the innovation resources appear to be slightly more connected and leveraged than the assets to start and grow companies. Figure ES-6 illustrates this overall construct.

Figure ES-6. Summary of Oregon's I&E Capacity and Performance



[8] Isenberg, Daniel, What an Entrepreneurial Ecosystem Actually Is, May 12, 2014

Opportunities for Oregon's I&E Ecosystem

The analysis of Oregon's ecosystem uncovered opportunities to enhance the state's innovation capacity, entrepreneurship capacity and overall ecosystem performance.

Enhancing the Innovation Capacity

Strengthening commercialization pathways for R&D intensive products and services. Increase commercialization funding and technical support that move research from proof of concept to product validation and prototyping.

Building competitive strengths and strategically aligning the state's policy priorities with I&E assets. The state should support strategic investments in facilities and research collaboratives that build on Oregon's inherent I&E strengths and enhance its position as a national leader in targeted markets and industries. This could be especially beneficial when investments are aligned with state policy priorities such as climate change.

Improving the mechanics of how grant or investment programs operate. Utilize national best practices from high performing innovation programs to create milestone and outcome driven criteria that directly connects programs to market needs, and to develop stage appropriate metrics that measure impact.

Enhancing the Entrepreneurship Capacity

Scaling regional and sector-based models that build capacity and connectedness. Utilize national best practice models that increase the integration of and access to resources, and enhance the impact and operational effectiveness of regional and sector-based ecosystems.

Filling targeted capital gaps. Support enhancements that expand early debt financing and working capital tools, specifically programs that apply to the business models of consumer products and R&D-intensive (deep technology) manufacturing companies.

Expanding programs to connect rural communities to I&E activities. Continue to seek opportunities for rural industries to be early adopters and partners of innovation developed by emerging Oregon companies (e.g., supporting efforts such as pilot programs for ag tech or clean tech).

Enhancing Overall Capacity and Impact

Creating more sustainable funding mechanisms for state support. Examine how other states are using funding mechanisms outside of general or lottery funds to finance I&E investments.

Establishing I&E performance metrics that align with the continuum of I&E and tell a more complete picture about impact. Utilize national practices to create a

cohesive set of I&E impact measures that measures appropriate level of impact at each stage in the I&E continuum (go beyond jobs).

Maximizing how philanthropic, government, and industry resources are coordinated and leveraged. Seize the opportunity for the state to not only develop a long-term I&E strategy, but to also connect that strategy to funding and priorities of philanthropic and industry partners.

Best Practices Summaries

As informed by the opportunities listed above, Business Oregon and a review team of experienced entrepreneurs, investors, and mentors requested that specific areas to be examined more closely to identify best practices. Specifically, this project examined practices for:

- Establishing more intentional commercialization pathways, especially connections between universities and industry;
- Scaling regional and sector-based models that build capacity and connectedness; and,
- Creating more sustainable funding mechanisms for state support.

In addition to these three priorities, the study also examined how I&E programs are approaching diversity, equity, and inclusion by creating on-ramps for women and minority entrepreneurs. This inquiry aligns both with Business Oregon's Strategy Plan priorities of Advancing Economic Opportunity for Underrepresented People and to Innovate Oregon's Economy as there is evidence that diversity improves business performance in a variety of settings.[9]

University-Industry Commercialization Pathway

Problem Statement
Oregon faces challenges in terms of commercializing university research, specifically from moving ideas from proof of concept to product validation stages.

Issue Examined
The state's role in fostering the commercialization of research, from universities and inventors, by making targeted investments in gap funding and technical assistance.

Summary
States that consistently outperform in terms of commercializing research do so by providing stage appropriate gap or proof of concept funds to help research reach specific milestones: 1) invention disclosures or patent applications, 2) licensing or SBIR applications and awards, and 3) product prototyping. In addition to funds, technical assistance is often provided

[9] https://www.oregon4biz.com/Publications/Strategic-Plan/

including training for university researchers to understand market applications based on the national I-Corp model, along with external advisors with industry experience that can help them navigate the technology and market assessments required to be commercialized. (In Oregon, this work is provided by signature research centers.)

Examples of best-practice university-industry commercialization include the Technology Development Corporation of Maryland (TEDCO) and Utah's Science Technology and Research (USTAR) initiative. What these programs and others have in common is a set of operating principles that guide the mechanics of managing grant programs. These include:

- Incorporating a market lens early in the commercialization process.
- Utilization of qualified external (out of state) reviewers for grant funding decisions.
- Staging gap capital based on achievement of objective milestones.
- Aligning gap funding and technical assistance/advisory services to ensure "smart money" deployment toward the best teams and technologies.
- Focused on sectors that have stickiness or an advantage in the state.

Grants typical range from $50,000 to $300,000 depending on the stage and industry. State's like Utah provide funding for approximately 30 projects per year through their process.

This research suggests that if Oregon wants to enhance the economic impact from research, it will need to develop a complementary set of funds that go beyond matching federal research dollars to also provide an intentional bridge for product development. Funds should be tied to advisory services that can help pull technologies into the marketplace. With organizations like signature research centers in place, and an increase in university research licenses and startups, Oregon has the foundation for executing a more robust commercialization program.

Regional & Sector-Based Ecosystem Building Models

Problem Statement

Oregon data and interviews suggest that the state struggles with growing new startups; while resources may be in place, most regions and sectors lack systematic coordination that creates the scale and capacity to maximize economic outcomes.

Issue Examined

Research by national foundations and universities point to the role of ecosystem builders or network leaders as a key contributor building and maintaining how assets are connected and deployed to amplify business growth.

Summary

A key aspect to early growth stage companies is their ability to quickly navigate resources and find appropriate advisors. Research suggests that the presence of I&E assets alone do

not drive a region's effectiveness, rather it is the degree to which assets are connected and coordinated to produce a system of integrated resources.[10]

Ecosystem builders help increase points of entry and seamless transitions for entrepreneurs by organizing I&E provider networks, enhancing the connection points between startups and investors, and facilitating efforts to fill specific resource gaps. These efforts have been shown to be very cost-effective and produce strong ROIs with measurable benefits:

- Growth of young companies (revenue, investment and job impact);
- Increase in resident and attracted capital;
- More diversity among entrepreneurs and service providers;
- System efficiencies that allow existing resources to do more; and,
- Enhanced reputations that further attracts entrepreneurs and investors.

The role of ecosystem builders has been applied at various levels. In Ohio and Pennsylvania, there are structured, statewide efforts implemented through regional hubs. In Oregon, there are regionally based programs such as Economic Development for Central Oregon's (EDCO) venture catalyst in Central Oregon, or sector-based models such as the collaboration of Oregon Outdoor Alliance and Bend Outdoor Worx. What these models have in common are a set of operating principles that include:

- The role of an ecosystem builder is explicitly funded: basically, someone's job is to catalyze interactions and build network connections.
- The role operates from an organization chosen by the region or sector which has standing and experience in playing a catalyst role (not "picked" through a grant process).
- There is consistent funding that recognizes this is infrastructure development and maintenance across programs rather than a standalone effort.
- Models operate at a scale large enough to sustain an active pipeline of high growth startups.[11]
- There are metrics that measure system enhancements and network connections as well as entrepreneurial outcomes.

With an array of assets now in place across the state, Oregon is well positioned to support a more focused effort on building regional and sector-based networks to optimize previous investments. The nationally recognized success of Central Oregon's entrepreneurial ecosystem provides the state with a model that can be scaled or replicated.

[10] Isenberg, Daniel, What an Entrepreneurial Ecosystem Actually Is, May 12, 2014

[11] In best practices, initiatives that serve scalable and innovation-driven enterprises tend to have populations at least 250,000 or more, or have complete ecosystems of capital and specialized services. Rural efforts, which operate at a different scale with different outcomes, tend to hybrid approaches combined with more general community development programming.

Public Sector Funding Mechanisms

Problem Statement

Continuity of support is important for I&E efforts that typically take a decade or more to adequately build. Oregon currently relies on lottery funds to support state investments in I&E efforts.

Issue Examined

The funding mechanisms deployed by other states that augment their use of general funds for I&E investments.

Summary

While most states use general funds, at least in part, to support I&E investments, there are multiple states that augment this funding with other types of revenue sources.

Bonds: The use of bonds to fund capital assets associated with building strong innovation infrastructure, including R&D facilities, equipment, and technology (e.g. Maine, Ohio). Oregon has authority to bond for innovation uses under the Oregon Innovation Council and could use such funds for investments to strengthen support for R&D Intensive industries.

Tax Increment Financing: States like Colorado use a Tax Increment Financing (TIF) model that produces funds by taking a portion of incremental growth of payroll tax from jobs in targeted innovation-based industries. These funds are then reinvested into programs that directly support further growth of these industries.

Targeted R&D and Investor Tax Credits: A majority of states use one or more targeted tax credits to spur private sector investment and risk-taking.[12] The two most common include:

- R&D tax credits to foster in-state research and development (used in 35 states). Some states focused their credits on small companies to provide reinvestment capital in startup operations. Oregon's tax credit expired in 2017.
- Investor tax credits are used to spur private investments in startup companies by providing angel/accredited investors a tax credit for investing in a qualified in-state company (used in 20+ states). Interviews also suggested an alternative: a capital gains reduction or holiday for proceeds from a sale of a company that is reinvested back into another Oregon company.

Since continuity is important, having a combined model of general or lottery funds with other mechanisms can help provide support that spans the ups and downs of economic cycles. Funding models should be established with an expectation of investments being required for a period of ten years or more.

[12] Oregon Legislative Office, Research Report 2-17, Review of Tax Credits, February 8, 2017

Diversity, Equity, and Inclusion Practices

In addition to best practice study briefs that examined a specific gap in the I&E ecosystem, this project conducted a limited examination of how I&E organizations are pursuing diversity, equity and inclusion (DEI) as they seek to provide greater opportunities for women and ethnically/culturally diverse individuals.

With research correlating the diversity of founders and management with higher performance, diversity becomes an economic asset for growing companies. As such, supporting efforts to create easier on-ramps for women and entrepreneurs of color[13] can provide extensive social and economic benefits. For instance:

- A McKinsey and Company report states that companies in the top-quartile for ethnic/cultural diversity on their executive teams were 33% more likely to have industry-leading profitability and 27% more likely to have superior value creation.[14]
- Research from venture capital investments indicates that diversity significantly improves financial performance on measures such as profitable investments at the individual portfolio-company level and overall fund returns.[15]

Despite research indicating the economic and social benefits of diversity, women and entrepreneurs of color remain underrepresented as founders and recipients of investment capital.

In recent years, there has been more intentional focus on incorporating diversity and inclusion as a business lens at both an organizational and program level. In terms of DEI efforts focused on innovation-driven industries, we found three common types of activities being used to specifically increase diversity:

- Groups of organizations (**community collectives**) that are working together to foster a shared understanding about why DEI matters, and developing collaborative tools and programs to increase access and support across the I&E ecosystem.
- Targeted **entrepreneurship programs** that are creating the on-ramps and skills development for diverse entrepreneurs to successfully start and grow scalable companies—whether through a broader I&E organization or within specific mission-based groups working explicitly with targeted populations.
- Organizations that are intentionally increasing the level of **investment capital** available to women and entrepreneurs of color.

Reports reviewed for this project noted that DEI efforts typically start with developing clear expectations and outcomes through open and continuous dialogue. Interviewees noted that

[13] Business Oregon uses a broader definition of diversity. For this study, we used a more limited definition in order to compare programs.
[14] Hunt, Vivian, et al. McKinsey and Company. "Delivering through Diversity." January 2018
[15] Gompers, Paul and Silpa Kovvali, The Other Diversity Dividend, Harvard Business Review, 2018 https://hbr.org/2018/07/the-other-diversity-dividend

embracing DEI as a way of doing business is akin to organizational change management in that it requires alignment at the strategy, program, and policy levels. Such change takes time to modify fundamental business processes and overcome implicit cultural biases that have been in place for decades. Underestimating the effort it takes to gain agreement on issues and interventions was perhaps the most cited lesson learned from these programs.

Setting clear and explicit goals was also essential to the success of the efforts examined. Whether it was a target for the diversity of founders in an accelerator program, or the percent of investment deals with women CEOs, having clear, and often stretch, goals challenged organizations to think differently about their approach, partners, and metrics.

Once priorities were identified, the programs examined tended to deploy a similar approach to program development. They based their work on the premise that entrepreneurs of color and female entrepreneurs achieve greater access to business and capital resources (as well as overall company success) when there is a diverse makeup of mentors, technical providers, and investors. Many programs had dedicated network-building roles to maintain momentum and to create/support on-ramps for entrepreneurs of diverse backgrounds and connect them to diverse providers.[16]

In Oregon, groups like Cascade Angels, VertueLab, TiE, and others view diversity and inclusion as a core part of their work. Community Development Financial Institutions (CDFIs), microenterprise organizations like Meso, and regional entities like Prosper Portland continually seek on-ramps for entrepreneurs with diverse backgrounds. Furthermore, Oregon's philanthropic community has long played a role in promoting DEI and improving access and outcomes for people of diverse backgrounds. In other words, there are pockets of promising practices and experience on which to build.

Business Oregon has an opportunity to work alongside foundations and other leaders to create measurable goals and shared tools, supporting efforts that enable scalable startups founded by females and entrepreneurs of color to increase their access to vital investment and mentoring resources.

Directional Conclusions

Compared to other states, Oregon's history of I&E public investment is relatively young. It started in the 1990s, whereas other parts of the U.S. started I&E public investment decades earlier. The progress made establishing I&E assets is consistent with the maturity of the ecosystem. Investments by other states, however, have been equal or more intensive (see Section 2, part C for data on specific state's investments). Therefore, Oregon is merely keeping pace. **If Oregon seeks to grow its innovation and entrepreneurship**

[16] The Case and Kauffman Foundations are strong promoters of network or ecosystem building roles to support diversity.

capacities, it will need to be focused and connected in its efforts, and increase funding for foundational programs.

The state now appears to be at a stage where several issues will be formative to future performance:

- The ability to improve overall innovation capacity, especially the connections between university research and industry;
- The ability to connect and scale[17] or replicate existing high-performance programs and assets that can help grow companies that have been started;
- The ability to foster a more vibrant entrepreneurship culture that includes greater understanding of and support by the public sector on the role innovation and entrepreneurship plays in the state's economy; and,
- The ability to support a long-term I&E strategy that is created and executed through a partnership of public, private, university and nonprofit organizations, and which includes long-term and collaborative funding mechanisms.

[17] In terms of program development "scale" can refer to growing a single program or replicating a program in different regions. The ability to replicate in other regions should be based on the ability to have an adequate and sustained pipeline of activity to avoid spreading resources too thin.

Section 1. SWOT Analysis

This report provides an evaluation of Oregon's I&E ecosystem by benchmarking the state's performance against peer states and national trends, gaining insights on key attributes and challenges from Oregon stakeholders, and assessing how other states address similar opportunities and challenges. It is the first step in the development a comprehensive statewide innovation and entrepreneurship strategy to be developed by Business Oregon in 2019.

This analysis focuses on the subset of new startups described as innovation-based or enabled or "innovation-driven enterprises" (IDEs). Innovation-driven enterprises are essential for a thriving economy, accounting for the lion's share of net new jobs, and almost all new jobs during a recession. They not only create a significant number of jobs, but also pay high wages, and account for a disproportional share of GDP.[18] While recent data may indicate that overall entrepreneurship has declined in the US, start-ups with significant innovation and growth potential have grown in number over the last decade.[19]

Scott Stern of the Massachusetts Institute of Technology (MIT) finds that around five (5) percent of all start-ups are "high-quality"—start-ups that have significant innovation and growth potential. Most important, the outsized contributions of innovation-based enterprises provide the impetus for long-term economic stability and growth in a region. They create the culture and resources that turn ideas into thriving companies. In short, they have high impact potential and can be aligned with Business Oregon's key industry sectors.

> *Over the last few years a widely held narrative has emerged that new business formation is down. There is a parallel narrative that holds that large technology firms are crushing technology-based start-ups, using their power to enter markets that otherwise start-ups would occupy. As it turns out, neither claim is true. While it is true that fewer "mom and pop" start-ups are forming, technology-based start-up formation appears robust. In fact, from 2007 to 2016, the number of technology-based start-ups has grown, and these firms have increased their overall share of U.S. employment. Moreover, inflation-adjusted wages have increased faster among start-ups than across the technology-based sector overall. Start-up firm tenure has increased, with start-ups more able to stay in business. And start-ups have grown as a share of all technology-based firms.*
>
> *How Technology-Based Start-ups Support US Economic Growth, November 2017*

[18] Hathaway, Ian and Robert E. Litan, "Declining Business Dynamism in the United States: A Look at States and Metros," (Brookings Institute, May 5, 2014)
[19] Wu, J John and Robert D. Atkinson, How Technology-Based Start-ups Support US Economic Growth, November 2017

Part A: Characteristics of Oregon's I&E Ecosystem

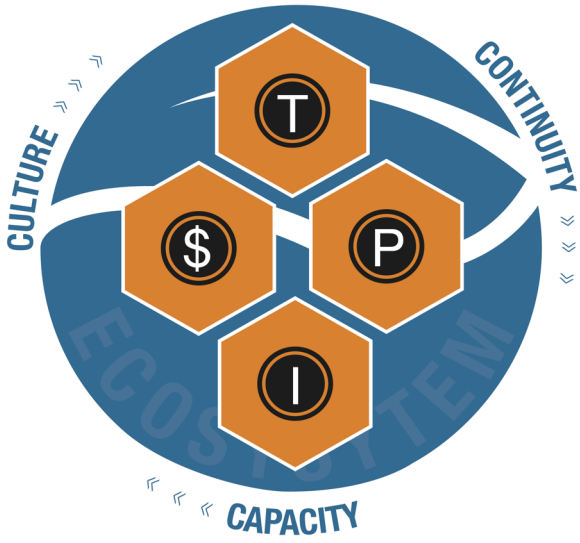
This section describes different elements and characteristics of an I&E ecosystem and describes their role and relationship in terms of impacting performance. These elements provide an interrelated set of lenses by which the SWOT analysis was conducted.

In broad terms, Oregon's I&E ecosystem consists of an **Innovation Capacity** and an **Entrepreneurship Capacity** that are complementary aspects of an overall I&E framework. In Part V, we summarize the state's strengths and weaknesses in both categories to help refine specific challenges and opportunities.

- The state's **Innovation Capacity** refers to the ability to take science and research ideas and translate them into products, technologies and services across industries.
- The state's **Entrepreneurship Capacity** refers to a region's capabilities and conditions for forming enterprises.

The innovation and entrepreneurship capacities are supported by specific **Assets** that provide key resources, which are surrounded by **Enablers** that optimize the impact of the ecosystem.

- **Assets** include people or human capital (Talent: "T"), investment and operating capital (Capital: "$"), physical and digital infrastructure and facilities (Infrastructure: "I"), and business development programs and resources (Programs: "P").
- **Enablers** include the I&E culture of a region (Culture), the capacity and capabilities of core institutions to support the demand for I&E assistance (Capacity), and the consistency of leadership and program support over time (Continuity).



A robust I&E ecosystem requires a combination of these assets and enablers, yet they can vary from industry to industry, and according to the maturity of the I&E ecosystem. This analysis attempts to highlight such variations to help focus state investments.

When the elements of the ecosystem are combined, an I&E framework emerges that is used to guide the SWOT analysis and Best practices research. **Figure A-1** shows the framing questions used in this process to analyze data and guide stakeholder interviews.

Figure A-1. I & E Ecosystem Framework

INNOVATION CAPACITY		ENTREPRENEURSHIP CAPACITY	
R&D	**PRODUCT DEVELOPMENT**	**BUSINESS DEVELOPMENT**	**BUSINESS SCALE-UP and GROWTH**
Are there robust levels of R&D that provide the foundation for new ideas and products?	Is research being translated and commercialized into products with economic potential?	Are entrepreneurs launching scalable companies at an increasing rate and in a timely fashion?	Are startups growing and thriving in Oregon?
ASSETS Does Oregon have the people, capital, and infrastructure to attract and support innovation and high growth companies? Can researchers and entrepreneurs access the necessary resources to assist them?			
ENABLERS Does Oregon's culture promote and reward innovation and entrepreneurship? Are key institutions and initiatives operating at a scale that can drive impact and sustainability? Are public and private sectors coordinating and providing continuity to grow the I&E ecosystem?			
IMPACT Are we creating measurable economic impact? Are we accelerating the growth of key industries and Oregon's position in national and global markets?			

The Maturity of Oregon's I&E Ecosystem

Innovation and entrepreneurial ecosystems are generational investments: a 30-year journey at best.[20] Evaluating an I&E ecosystem needs to account for the maturity of the region in order to set appropriate expectations and maximize the value of state investments.

Compared to many other states and innovation hubs, Oregon is relatively new to the game. Boston, the Silicon Valley and Research Triangle Park are approaching 60 years of activity and Austin over 30 years.

From a maturity point of view, Oregon's 15 years of support can be described as in the adolescent stage.

[20] Innovation-driven development has been described as a "generational effort" in an array of studies. This timeline has also been verified by various projects conducted by RTI and Scruggs & Associates. This is further confirmed by founding dates of well well-known innovation hubs (late 1950's: Boston and Research Triangle Park; 1960: the first four Silicon Valley Venture Funds)

I & E Ecosystem by the Decade

- 1st Decade: build assets and foundational institutions
- 2nd Decade: scale and connect
- 3rd Decade: optimize and enhance

Another aspect that underscores time to maturity is the years between the founding of a company and its various investment stages. An analysis of over 500 Oregon companies receiving investments funds since 1999 found an average of over nine (9) years from the founding date to the time it received late stage venture[21] funding.

An analysis conducted in Ohio indicated very similar results. In this analysis, job growth was slow to start and averaged 3 employees during the first few years, but then averaged 63 employees during late stage investments[22]. Both data points indicate it takes at least a decade to prime the pump with companies reaching a scalable job growth stage. Once that tipping point is reached then growth is compounded at a more rapid pace. Data from benchmarking metrics and the Oregon Capital Scan[23] indicates that Oregon may be reaching a level of ecosystem maturity where this pattern of accelerated growth occurs.

Oregon's Unique I&E Features

Industry Types (based on business model)

The state of Oregon and regional economic development organizations target the growth of various traded sector industry clusters. However, the innovation and entrepreneurial needs of these clusters (such as capital, facilities and talent) tend to group various industry clusters into three types of I&E business models related to their innovation intensity, time to market, capital requirements, and talent needs. These three models can be described as:

- **R&D Intensive (Deep Technology) Industries**: Industries such as biosciences, advanced materials, cleantech and high-tech manufacturing that require significant R&D and intellectual property. Many of these sectors produce technologies used by other industries.
- **Technology Services**: Services that are designed to facilitate the use of technology by enterprises and end users. They include companies providing software-as-a-service, network integration, information security, data management, and emerging applications like blockchain.
- **Consumer Products**: Industries developing products (goods) for the consumer market including food and beverage, outdoor gear, and apparel.

[21] Investments made in more established startups, typically after commercial manufacturing and sales but before any IPO
[22] A 2018 assessment of investments in state-supported entrepreneurial programs in the Columbus, Ohio region conducted by Rev1Ventures.
[23] Oregon Capital Scan, Lundquist College of Business, University of Oregon, December 2016

Geographic Characteristics

The state's relatively small population and low density means that there are fewer opportunities to create the critical mass needed for I&E hubs; however, all regions can benefit from the broader I&E ecosystem through activities and resource that align with their unique capabilities (details in Section B). Regions in Oregon can be described as having one of three I&E geographic characteristics:

- **I & E Hubs**: Regions that have (or potential to have) both innovation and entrepreneurship capacity--new product innovation alongside startups and scaling companies that compete on a national and international level. Hubs would include Portland metro, Central Oregon and the Eugene-Corvallis regions.
- **Mid-Scale Regions**: Regions with less research intensity, yet have enough scale in terms of population and business activity to sustain an array of entrepreneurial resources. These include Mid-Willamette Valley and Southern Oregon.
- **I & E Supported Regions:** More rural regions that lack the critical mass of innovation-based businesses and entrepreneurs, yet they have pockets of startup activity and industries that can benefit from the deployment of new innovations. These regions include most areas of the Coast, the Gorge, and Eastern Oregon.

The combination of factors described in this section became the basis for the three-part SWOT evaluation: asset mapping of resources within Oregon, data benchmarking to the US and peer states, and interviews with primary stakeholders.

Part B: Asset Mapping

KEY DATA TAKE AWAYS

- From 2014-17, **Oregon significantly outperformed the US** in the growth of manufacturing, high tech, knowledge-intensive business services and STEM jobs.
- The **Portland area continues to play an outsized role in startup activity**. However, the growth in other regions of the state are outpacing Portland: specifically:
  - Central Oregon and the Corvallis-Eugene Corridor are creating I&E hubs by increasing the mix and scale of core I&E assets and jobs across innovation-driven industries. Central Oregon has consistently outpaced other regions in almost every aspect.
- **Growth in I&E industries and workforce is statewide.**
  - Oregon is **rapidly growing knowledge-intensive business services** that are a key support system for startups, especially in Deschutes and Benton Counties.
  - **Growth in tech jobs can be found in almost all regions**, with counties like Morrow and Hood River experiencing significant improvement.
  - **STEM workforce has grown statewide**; most rapidly in Central Oregon with high pockets of growth in Morrow and Columbia Counties.
- **Manufacturing is a specialization for the state**, with above average concentration of jobs in most counties. It provides key opportunities for connecting rural regions to I&E hubs.
- While innovation-driven jobs have grown throughout the state, **wages remain much lower in more rural regions**, an indication of lower paying sectors or a less mature I&E ecosystem.

Analysis of Innovation-Driven Industries

This section of the report examines key innovation-driven industries alongside the analysis of talent, capital, and technical resources to provide useful insights about the growth and distribution of assets across Oregon. These assets were chosen because of their impact on I&E ecosystems that include:

- The presence of innovation-driven industries like manufacturing and high technology that are more likely to:
  - Lead to R&D activities that create new products, processes, and services.
  - Be early adopters/first customers of new technologies, which can then increase competitiveness and productivity.
- Professional and technical talent that is strongly correlated with innovation and can:

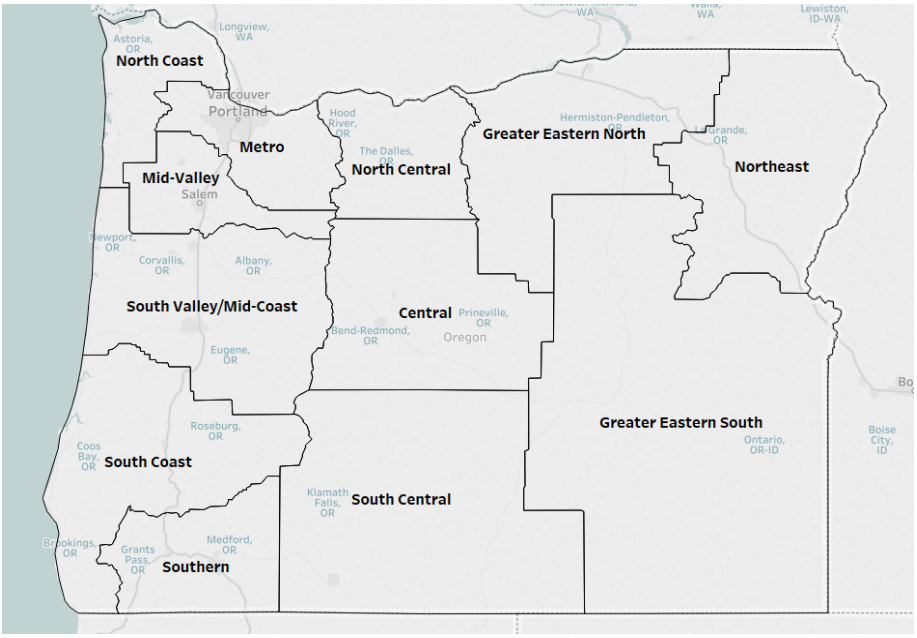
  - Provide mission-critical skills to grow existing companies, and
  - Encourage a more active startup environment for new knowledge-based companies.
- The availability of assets such as investment capital and technical assistance which promote:
  - The presence of a regional culture and mindset that supports I&E as a part of a diverse economic strategy, and
  - Public-private partnerships that create regional resource networks that help new companies scale.

Growth and Concentration of Innovation-Driven Industries

Jobs in innovation-driven enterprises can be examined across three key sectors: manufacturing, technology-intensive, and knowledge-intensive business services.[24] We examined the geospatial distribution and growth in these sectors by county and region to provide insights into the regional specializations within Oregon's I&E ecosystem and recent trends. Specifically, we analyzed 2017 jobs, location quotients, and post-recession job growth from 2014-2017.

For the regional analysis, where county level data is available, we use Business Oregon's twelve regional service areas.[25] In some cases, we rely on congressional district data.

Figure B-1. Oregon Regional Service Areas



Source: Business Oregon

[24] Detailed definitions of these three sectors are included in Appendix A.
[25] https://www.oregon4biz.com/About-Us/Contact-Us/map.php

Manufacturing

Overall Conclusions:

- Manufacturing strengths can be found throughout Oregon, with many counties growing jobs at a rate higher than the US average.
- The above average concentration of manufacturing jobs indicates a comparative advantage for Oregon, and is consistent with interviews that noted startup growth in an array of manufacturing sectors.
- Manufacturing wages vary across regions, indicating a range of innovation-intensity associated with manufacturing sectors.
- Manufacturers could be a way to connect more rural counties to I&E hubs. Manufacturers represent potential customers as well as settings where new technologies could be piloted.

Many of Oregon's active startups and R&D intensive companies are found in manufacturing sectors: food & beverage, outdoor gear, apparel, semiconductors and electronics, medical devices and cleantech. Examining their growth and distribution can provide insights into whether regions outside of the Portland area are creating or expanding this base of industries.

Overall, Oregon has a higher than US average concentration of manufacturing, which extends into all regions of the state. The state's continued growth in manufacturing indicates that the innovation and entrepreneurship ecosystem may be more dependent on startups that are hardware and consumer product oriented, requiring talent, capital, and infrastructure assets that correspond with goods-producing industries.

Manufacturing expanded in every region of Oregon from 2014 to 2017 achieving 5.0% job growth statewide, with Central, Greater Eastern South, and North Central each growing more than 10% over that time frame (although some smaller counties did lose manufacturing employment).

Average earnings in this sector are high at nearly $88,000 per job, which is driven by the Metro region with more than half of Oregon's manufacturing jobs and average earnings of $110,000.

Various parts of the state have manufacturing employment above the US average concentration, or what is referred to as the location quotient (LQ) for an industry. Pockets of highly concentrated employment (twice US average) are found in the Northeast and central regions, Portland, the Willamette Valley, and along the coast. (see ***Figure B-2***.)

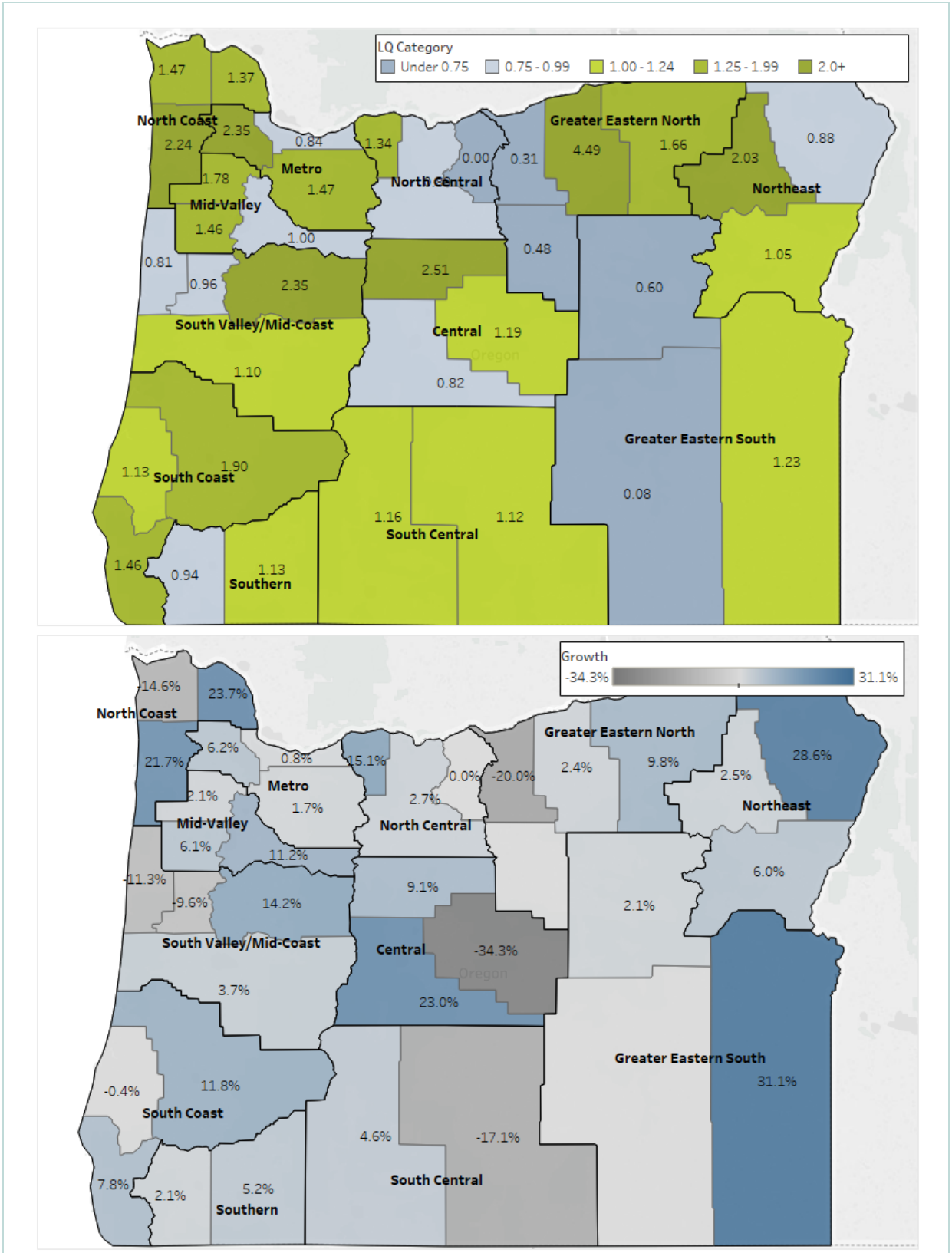
Table B-1. Oregon Manufacturing Jobs and Growth Rates, by Region

	Jobs, 2017	Growth, 2014–2017	% of OR's Mfg Jobs	Average Earnings
Central	5,755	**12.1%**	3.7%	$59,171
Greater Eastern North	5,076	7.3%	3.2%	$52,738
Greater Eastern South	1,118	**29.3%**	0.7%	$46,327
Metro	83,908	3.6%	53.4%	$110,458
Mid-Valley	15,783	7.9%	10.0%	$56,341
North Central	1,867	**10.2%**	1.2%	$58,262
North Coast	4,164	3.7%	2.7%	$65,862
Northeast	1,852	5.1%	1.2%	$56,005
South Central	1,910	1.9%	1.2%	$58,667
South Coast	6,808	**8.3%**	4.3%	$60,544
South Valley/Mid-Coast	20,915	4.3%	13.3%	$72,317
Southern	7,956	4.6%	5.1%	$57,196
Statewide	157,114	5.0%		$87,810
US Average		2.0%		

Source: Analysis of EMSI data that uses state reported QCEW data and non-QCEW estimates from County Business patterns, BEA, National Industry-Occupation Employment Matrix (NIOEM) and industry projections published by individual states.

LQ of 1.0 = national average

Figure B-2. Oregon Manufacturing 2017 LQs and 2014–2017 Growth



Knowledge-Intensive Business Services (KIBS)

Overall Conclusions:

- Knowledge services have grown across the state, however, they remain highly concentrated in metro regions (due to the intensity of innovation businesses needed to sustain the presence of KIBS).
- Central Oregon is the only region outside of Portland to have a concentration of knowledge services proportional to their overall economy—supporting the growth of the region as an I&E hub for the state.

Knowledge-Intensive Business Services (KIBS) are companies that create and provide technical and professional services to innovation-based industries. They include firms such as IT services, engineering consultancy, prototyping and testing, specialized legal and accounting, marketing, and industrial design. KIBS are viewed as an essential aspect of the I&E ecosystem because they provide startups with expanded expertise, transfer specialized knowledge, and act as co-creators in developing new innovations and products.[26] Examples include contract research organizations that provide clinical trial and manufacturing support to biotechnology and medical device companies or specialized intellectual property attorneys.

The presence of KIBS is greatly dependent on urbanization and the density of innovation-based companies. States the size of Oregon typically have lower concentration of KIBS, putting greater pressure on firms to find such services outside of the state and emphasizing the importance of the national and global networks cultivated through intermediary organizations that serve entrepreneurs.

Not surprisingly, the Portland metro region has the greatest concentration of knowledge-intensive businesses services (see ***Figure B-3***). However, Central Oregon's knowledge services grew at more than 36% over the past three years. It is the only region outside of Portland where the concentration of knowledge services is equal to or greater than the region's portion of state employment (5.5% of the state's knowledge services, yet just over 5% of the state's total jobs). North Central also has about average degree of knowledge services with an LQ of 0.9 and growth of 23% in KIBS over the past three years.

[26] Zieba, Malgorzata, Knowledge-Intensive Business Services and Their Role in the Knowledge-Based Economy, July 2013

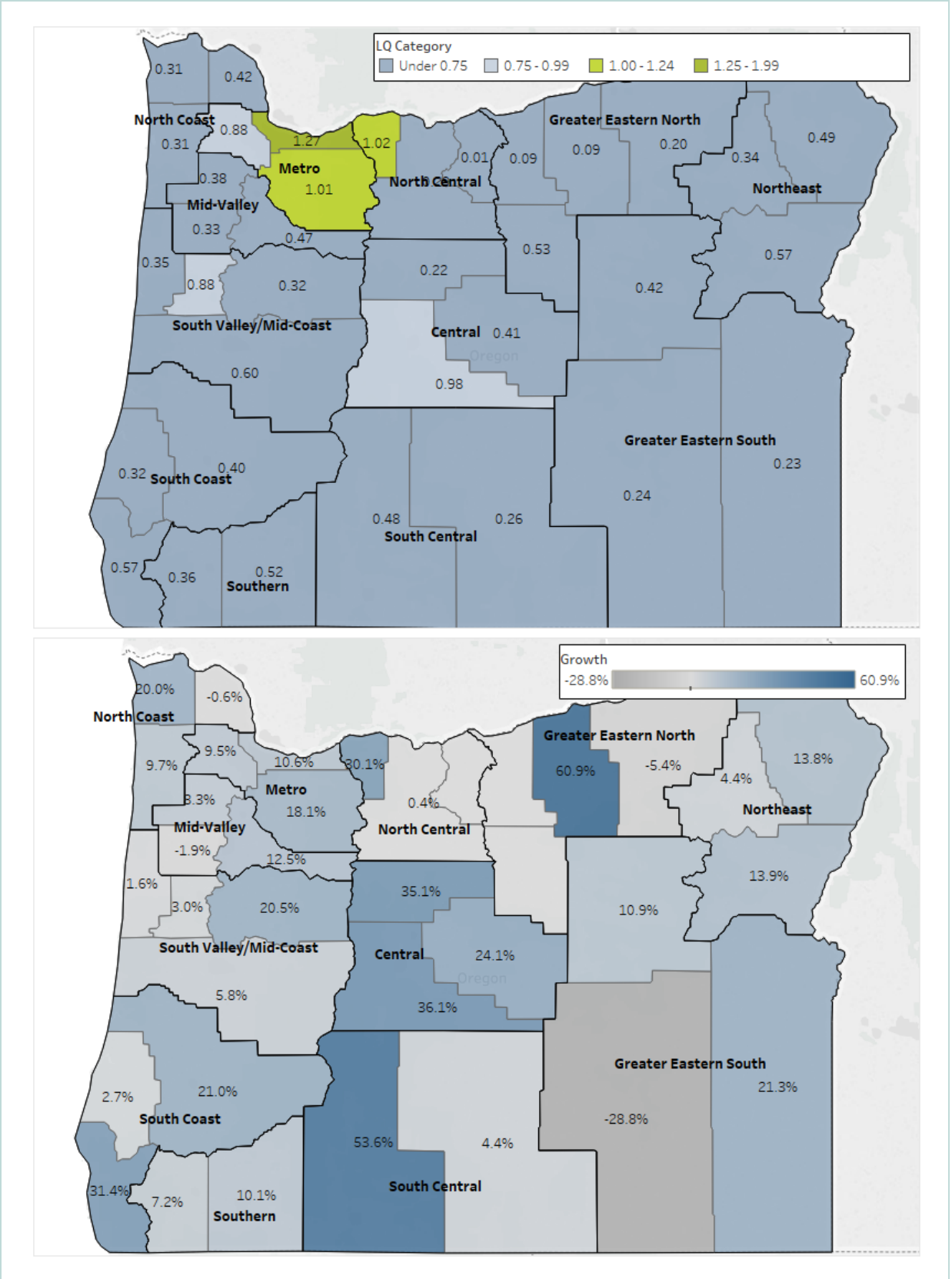
Table B-2. KIBS Jobs and Growth Rates, by Region

	Jobs, 2017	Growth, 2014–2017	% of OR's KIBS Jobs	Average Earnings
Central	5,550	**35.7%**	5.5%	$67,770
Greater Eastern North	469	0.9%	0.5%	$54,377
Greater Eastern South	311	8.4%	0.3%	$47,802
Portland Metro	70,064	11.5%	69.2%	$92,342
Mid-Valley	6,083	10.6%	6.0%	$64,904
North Central	1,187	**22.8%**	1.2%	$86,133
North Coast	918	9.6%	0.9%	$46,118
Northeast	541	9.6%	0.5%	$42,761
South Central	795	**49.5%**	0.8%	$50,229
South Coast	1,749	16.7%	1.7%	$49,049
South Valley/Mid-Coast	9,848	6.2%	9.7%	$63,123
Southern	3,761	9.6%	3.7%	$52,003
Statewide	101,276	12.2%		
US Average		7.0%		

Source: Analysis of EMSI data that uses state reported QCEW data and non-QCEW estimates from County Business patterns, BEA, National Industry-Occupation Employment Matrix (NIOEM) and industry projections published by individual states.

LQ of 1.0 = national average

Figure B-3. Oregon KIBS LQs and 2014-2017 Growth



Technology Jobs

Overall Conclusions:

- The most technology-intensive sectors of manufacturing and services continue to be highly concentrated in the Portland area, accounting for 79% of Oregon's tech jobs.
- Benton County has high concentrations of tech jobs, yet growth has recently declined.
- Central Oregon's technology job growth continues to outpace state averages, with pockets of growth in Eastern and South Central Oregon and parts of the Gorge.

Technology jobs are the subset of manufacturing and knowledge services with the greatest concentrations of STEM employment and R&D: what many national studies refer to as core innovation-industries.[27] While technology jobs make up less than 5 percent of U.S. businesses, they make outsized contributions to income, employment, innovation, competitiveness, and productivity.[28] Nationally these jobs tend to be concentrated in urban areas and regions with research universities.

Five counties have a concentration or share of high-tech employment that exceeds the national average as measured by their Location Quotient (LQ). Surprisingly, two rural counties, Morrow and Hood River, are included in this mix.

Table B-3. Technology Jobs in Counties with LQ Greater than 1

County	Region	Tech Jobs, 2017	LQ, 2017	2014–17 Growth Rate
Washington County	Metro	45,596	3.21	6%
Benton County	South Valley/ Mid-Coast	3440	1.76	−4%
Morrow County	Greater Eastern North	385	1.28	183%
Clackamas County	Metro	9,312	1.13	16%
Hood River County	North Central	747	1.06	33%

LQ of 1.0 = national average

While high tech jobs remain highly concentrated in the Metro region (LQ=2.3), recent growth in other areas have been significant. Central, North Central, Northeast, and South Central Oregon have all grown high tech jobs at more than 25% since 2014; the Greater Eastern North region has nearly doubled its tech jobs. While total tech employment remains relatively low in more rural regions, the fact that these jobs are present and growing supports the premise that I&E benefits are occurring throughout the state.

[27] The U.S. Bureau of Labor Statistics (BLS) classifies an industry as technology-based if its share of science, technology, engineering, and mathematics (STEM) workers is twice the national average. The Organization for Economic Co-operation and Development (OECD) identifies technology-based industries as ones with a high R&D-to-sales ratio (e.g., R&D intensity).

[28] Haltiwanger, John, Ian Hathaway, and Javier Miranda, "Declining Business Dynamism in the U.S. High-Technology Sector," (Kauffman Foundation, February 2014)

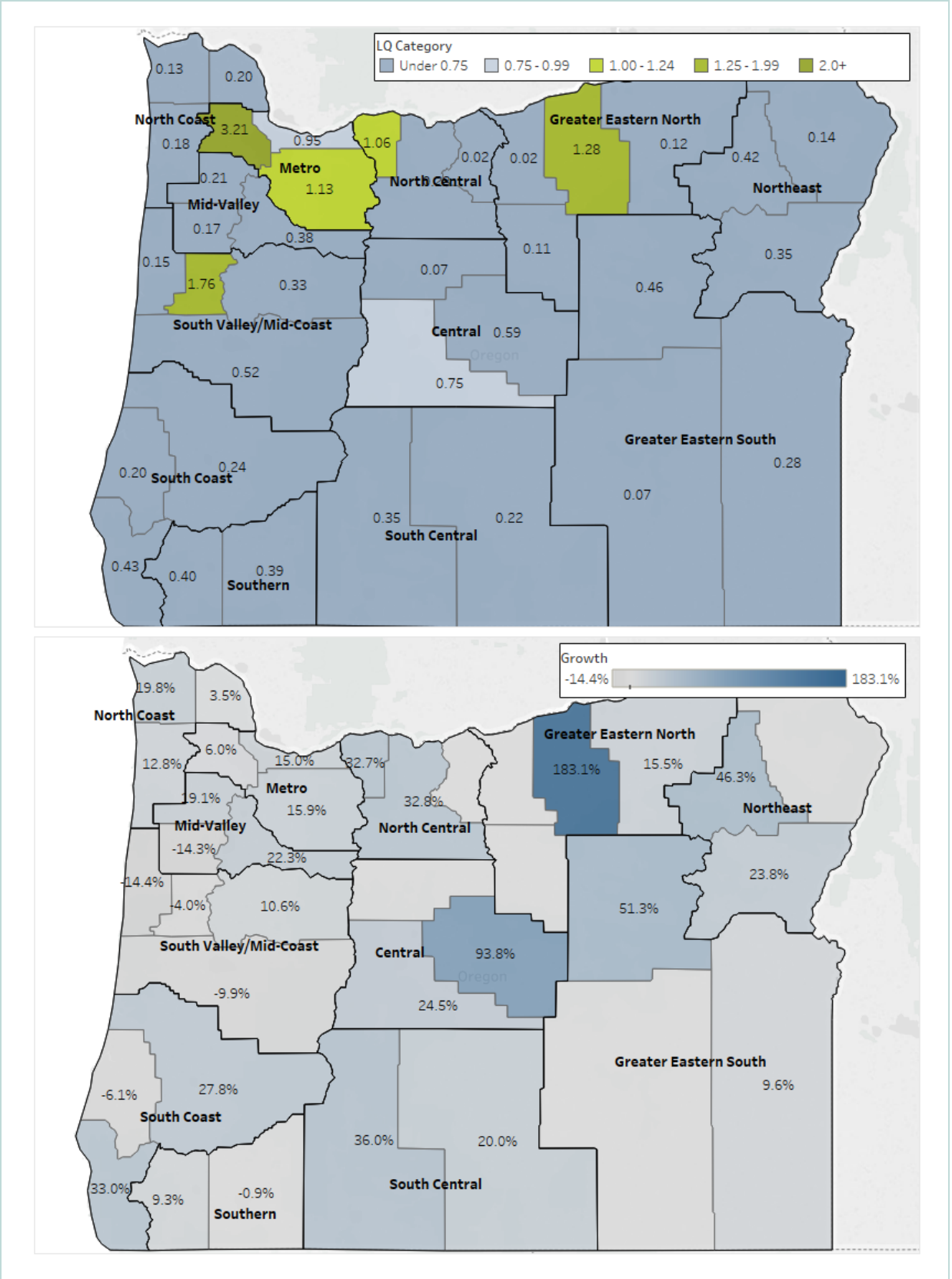
Table B-4. Tech Jobs and Growth Rates, by Region

	Jobs, 2017	Growth, 2014-2017	% of OR's Tech Jobs	Average Earnings
Central	3,293	**28.0%**	3.3%	$95,491
Greater Eastern North	579	**90.3%**	0.6%	$104,415
Greater Eastern South	241	17.6%	0.2%	$80,529
Portland Metro	79,042	9.7%	78.9%	$137,738
Mid-Valley	3,428	19.2%	3.4%	$82,775
North Central	917	**32.8%**	0.9%	$130,578
North Coast	328	11.5%	0.3%	$58,062
Northeast	337	**46.9%**	0.3%	$55,865
South Central	449	**35.0%**	0.4%	$62,604
South Coast	833	17.0%	0.8%	$68,353
South Valley/Mid-Coast	8,387	−6.0%	8.4%	$94,969
Southern	2,309	1.4%	2.3%	$70,688
Statewide	100,144	9.5%		$127,493
US Average		5%		

Source: Analysis of EMSI data that uses state reported QCEW data and non-QCEW estimates from County Business patterns, BEA, National Industry-Occupation Employment Matrix (NIOEM) and industry projections published by individual states.

LQ of 1.0 = national average

Figure B-4. Oregon Tech LQs and Growth, 2014 to 2017



Startups Within the Technology Sector

Overall Conclusions:

- Tech services dominate activity in the state, accounting for 2 out of every 3 tech-based startups.
- The western part of the Portland Metro is particularly strong in the tech manufacturing.
- Startups in Bio and R&D services, while smaller in number, are more distributed among regions.

The previous section examined all technology jobs. This section explores what specific sectors within technology-based jobs are creating newer companies (10 years or younger) that are associated with rapid levels of job growth. We analyzed Oregon's 2016 startup activity in four high-technology verticals that included both manufacturing and service-based sectors. This provided an understanding of the startup activity as a part of the overall tech sector and the differences in the type of companies starting in various regions.[29]

We analyze four tech-based startup verticals:

Tech manufacturing: Oregon had 282 startups in 2016 in aerospace, computers, semi-conductors, and semi-conductor machinery manufacturing.

Biosciences: Oregon had 137 startups in 2016 in pharmaceuticals and medical devices.

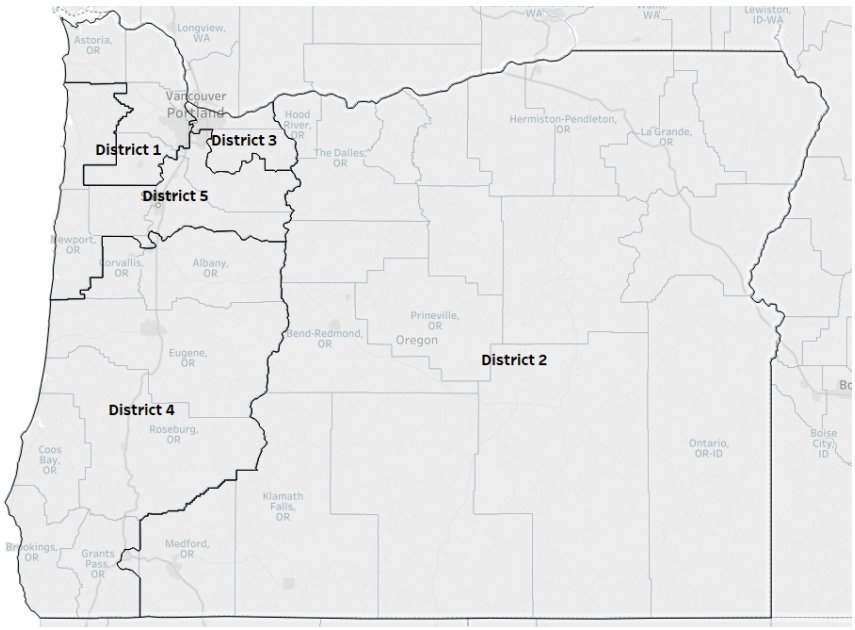
Tech Services: Oregon had 1,956 startups in 2016 in data processing, software development, and computer systems design and related services.

R&D Services: Oregon had 581 startups in 2016 in physical, engineering, and life science R&D.

The data available for this analysis was reported by congressional districts (as compared to county level). Since these districts have similar populations, it serves to normalize the regions for comparative purposes.[30] In Oregon, there are five congressional districts.

[29] See Table 1 in ITIF (2017) for additional details.
[30] Each congressional district has approximately 710,000 individuals: https://www.govtrack.us/congress/members/OR#representatives

Figure B-5. Oregon Congressional Districts



Our analysis of tech-based startups shows that the Portland area, primarily the first and third districts, plays an outsized role in startup activity. Even though congressional districts have similar sized populations, there is a widely varying level of tech-based startup activity across the districts, and the data clearly provide another confirmation that Portland is the major hub for tech-based startups.

Figure B-6. Distribution of Tech Startups by Congressional District

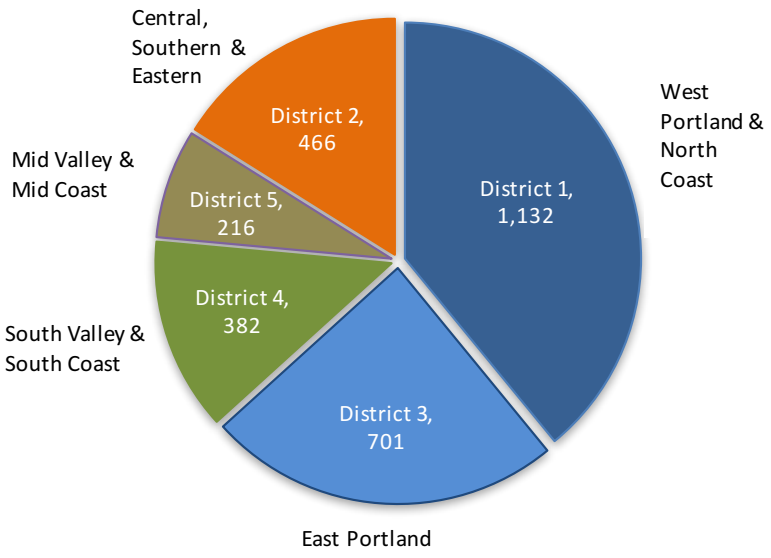
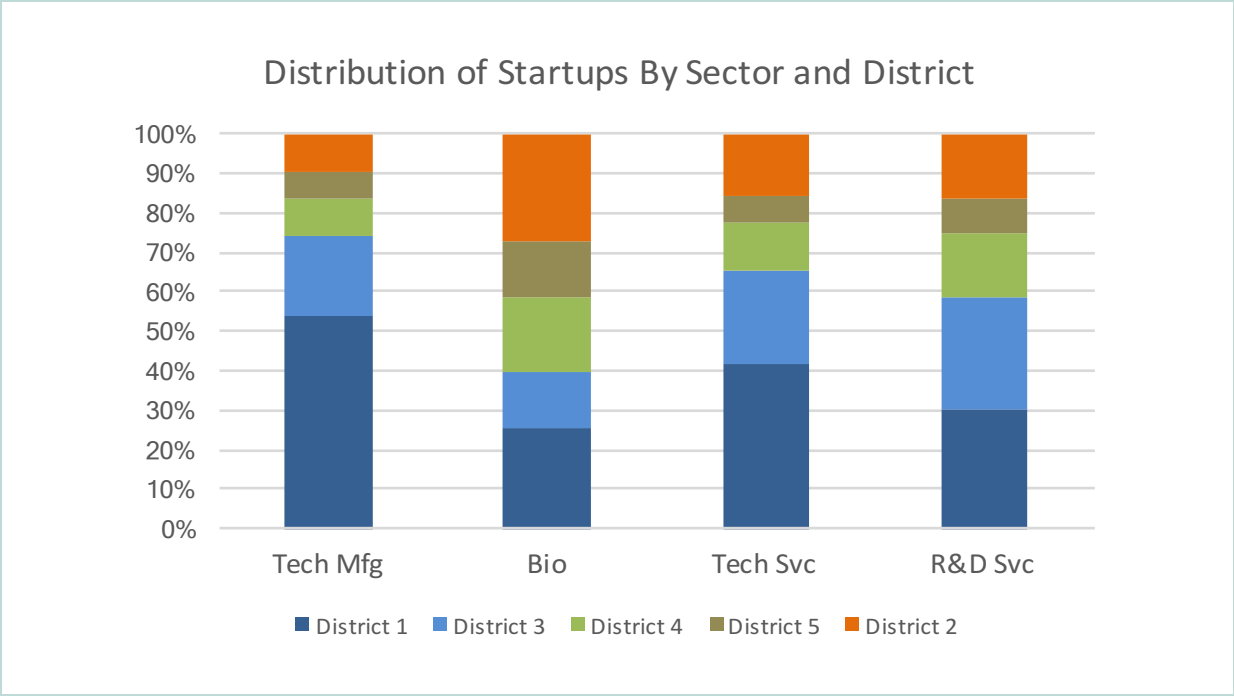


Figure B-7. Tech-based Startup Shares by Congressional District, 2016



Source: Analysis of ITIF Technology-Based Startup (2017) report

Distribution of I&E Assets in Oregon

In this section we analyze I&E assets including STEM occupations (talent), technical assistance resources, and capital. These are foundational elements of the I&E Ecosystem as described in Part I, and understanding the dynamics of these assets will help provide an insight into how performance is distributed across the state.

STEM Jobs

STEM workers are a critical component of the talent pipeline for I&E ecosystems. STEM jobs include computer, math, engineering, and life and physical sciences occupations.[31] STEM workers have the specialized technical knowledge and skills that are important for innovation-driven enterprises. In the analysis of Oregon's STEM workforce, several finding stood out. (Additional comparisons are found in Part C of this report.)

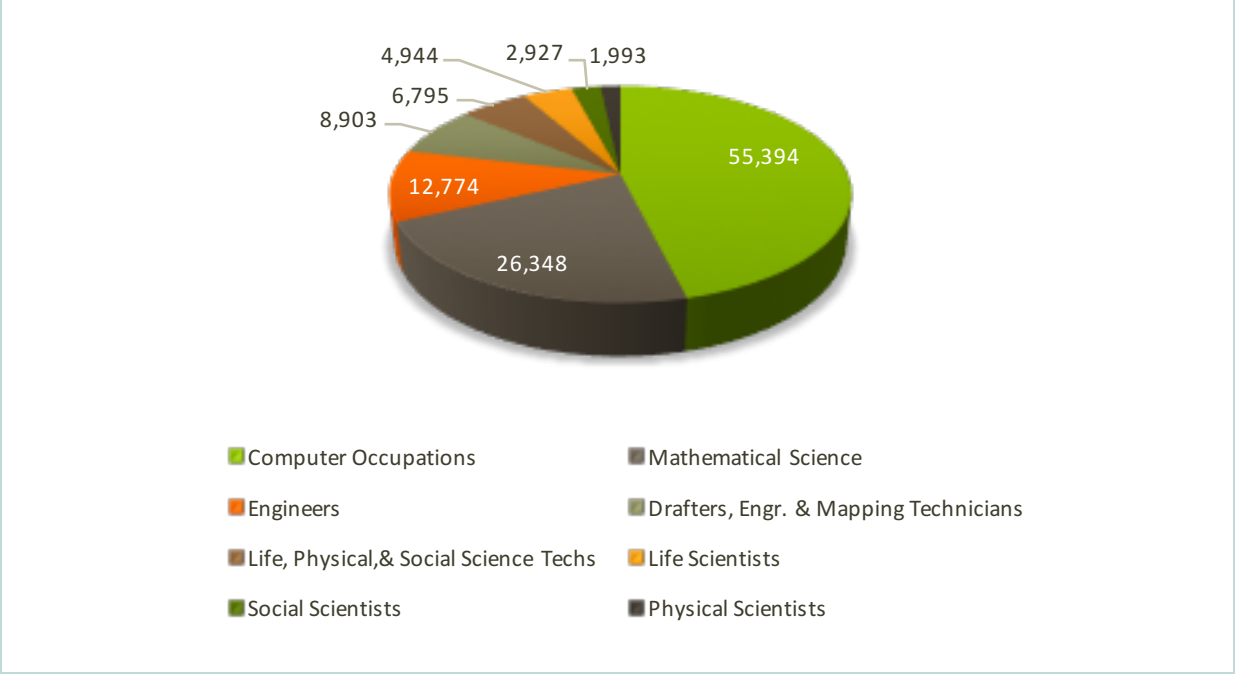
Oregon's STEM workforce is distributed throughout the state with high concentrations of engineers and life scientists[32]. While computer occupations are concentrated in metro

[31] STEM occupation codes are defined in Appendix A.
[32] The analysis of STEM workers includes private and public employers. Both were included since companies pull talent from all sectors, and because the public sector can play a role being an early adopter or first customer for new innovations.

regions, Oregon's engineering and life science workforce is distributed across the state, supporting manufacturing, biosciences, natural resources and tech-based products.

- Oregon significantly outperformed the US average for growing STEM jobs, adding almost 12% new jobs in three years versus <1% nationally. Oregon is forecasted to grow their base of STEM jobs by 14% from 2017-2027 (EMSI, 2017).
- Based on this definition of STEM, Oregon has about 120,000 STEM jobs as of 2017. 46% of those jobs are computer occupations, 22% are engineers, with the remainder spread across the other occupations (See ***Figure B-8***).
- Compared to six peer states, Oregon ranks in the middle with an LQ of 1.11. Washington and Colorado have substantially higher STEM LQs at 1.45 and 1.36 respectively (see ***Figure B-9***).
- While computer related jobs make up the largest percent of STEM jobs in Oregon their concentration is similar to the US average. Whereas the concentration of life scientists and engineers are more concentrated than the US average and many peer states (See ***Figure B-10***).

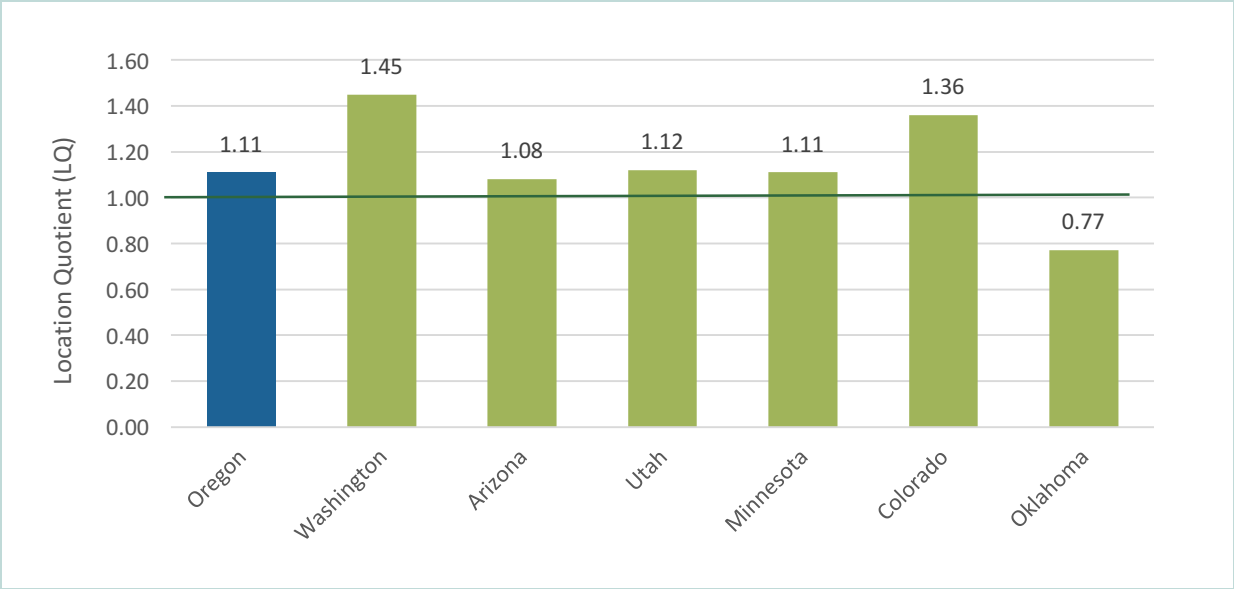
Figure B-8. Occupational Distribution of Oregon STEM Jobs, 2017



Source: Analysis of EMSI data, derived from Oregon Employment Department reporting and BLS Occupational Employment Statistics

Figure B-9. Location Quotient (LQ) Concentration STEM Jobs, 2017

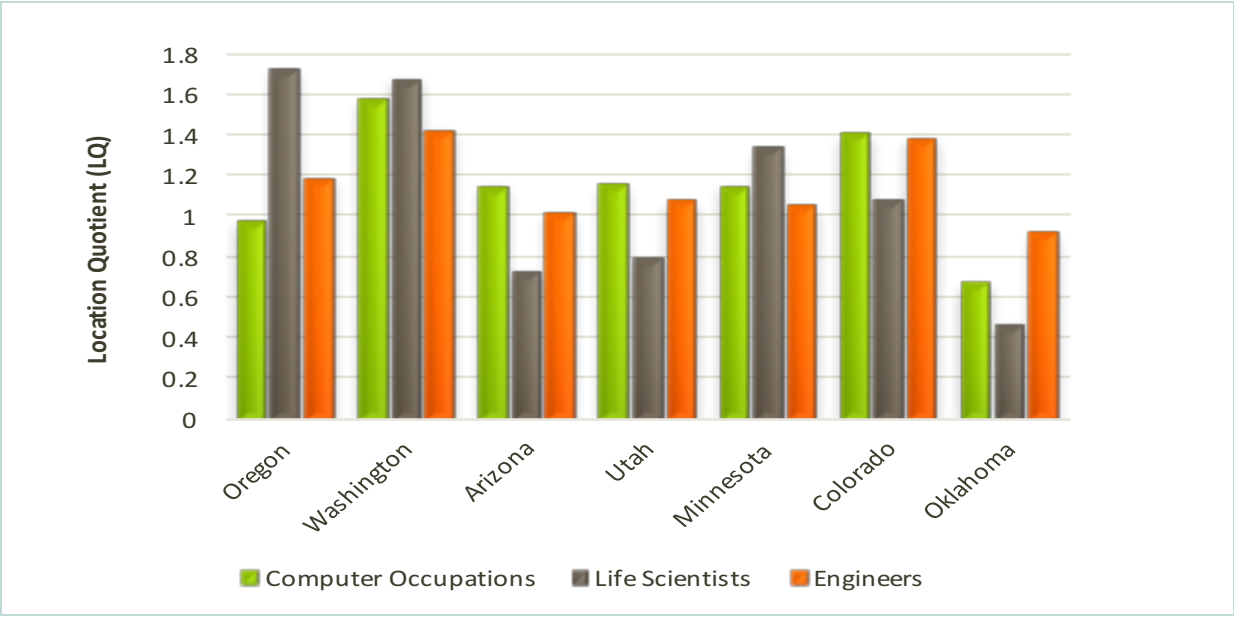
1.0= US average



Source: Analysis of EMSI data, derived from Occupational Employment Statistics, the National Industry-Occupation Employment Matrix, and the American Community Survey

Figure B-10. Concentration of STEM Employment by Occupation Type, 2017

1.0 = US average



Source: Analysis of EMSI data, derived from Occupational Employment Statistics, the National Industry-Occupation Employment Matrix, and the American Community Survey

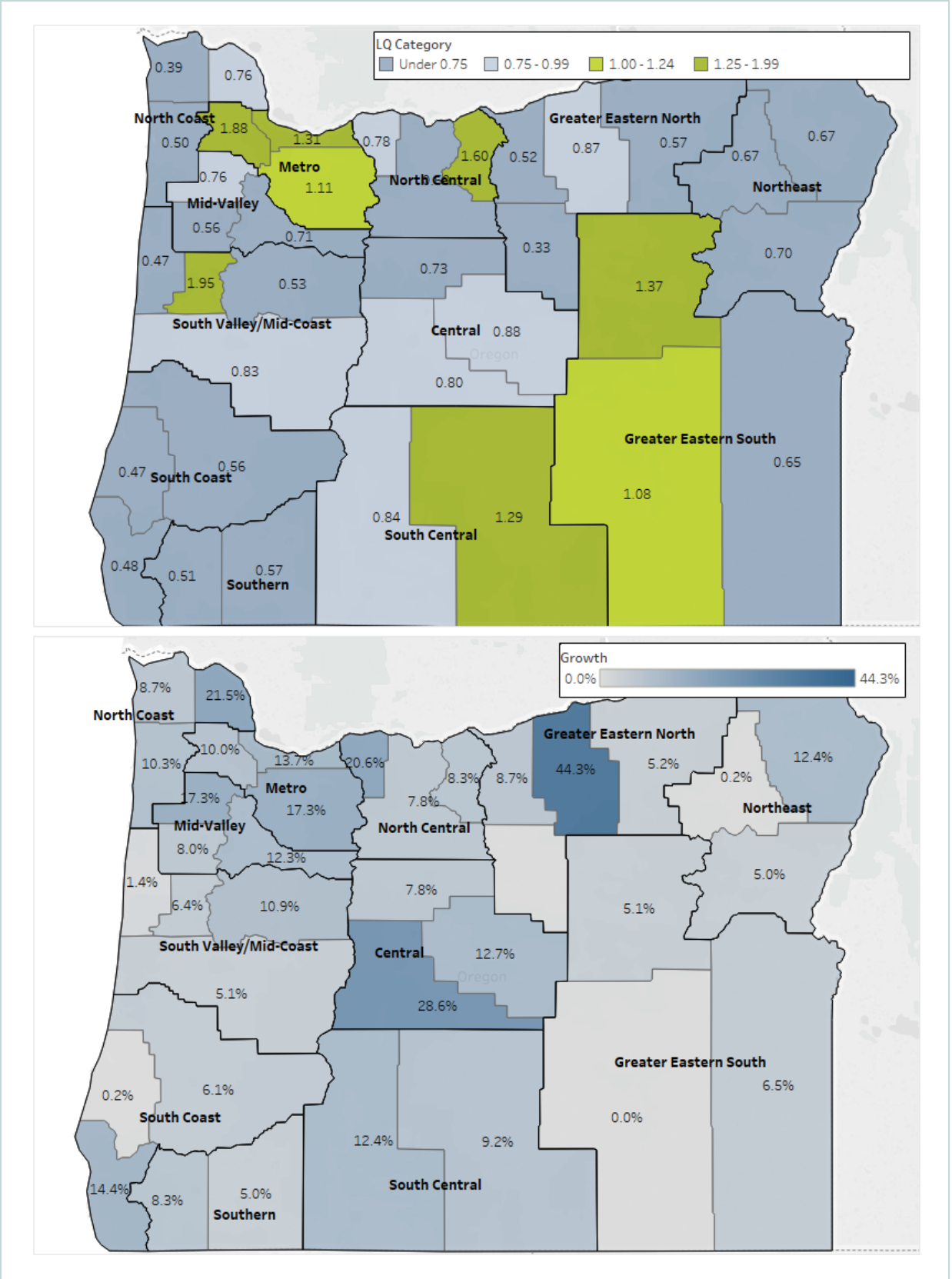
Within Oregon, STEM jobs are highly centralized in the Metro region and South Valley/Mid-Coast. Interestingly, they are growing most rapidly in the Central Oregon region. The Metro region and South Valley/Mid-Coast combined account for nearly 80% of statewide STEM jobs. Note: STEM occupational data contains both private and public employment since it represents the labor shed by which companies seek workers.

Table B-5. STEM Jobs and Growth Rates, by Region

	Jobs, 2017	Growth, 2014–2017	% of OR's STEM Jobs
Central	4,437	**25.7%**	3.7%
Greater Eastern North	1,393	11.8%	1.2%
Greater Eastern South	856	4.9%	0.7%
Metro	80,326	12.7%	66.9%
Mid-Valley	8,671	12.9%	7.2%
North Central	1,143	**14.5%**	1.0%
North Coast	1,246	**14.2%**	1.0%
Northeast	746	3.4%	0.6%
South Central	1,361	11.9%	1.1%
South Coast	2,070	4.9%	1.7%
South Valley/Mid-Coast	13,961	5.9%	11.6%
Southern	3,796	5.7%	3.2%
Statewide	120,007	11.8%	
US Average		.2%	

Source: Analysis of EMSI data, derived from Oregon Employment Department reporting and BLS Occupational Employment Statistics

Figure B-11. Oregon STEM LQs and Growth, 2014 to 2017



Capital

The findings of the 2016 Oregon Capital Scan indicated a continual growth in capital not only for the state in general, but for regions outside of Portland. The 2016 Oregon Capital Scan also found:

- The number of accelerators and incubators across the state has increased, providing mentoring alongside capital.
- The availability of early stage capital has improved.
- Crowdfunding is a growing option for those looking to raise early seed capital.
- Oregon's Angel and Seed investment rate have grown steadily.
- The Pacific Northwest share of overall angel investment in 2015 was up to 8.7% versus 4.3% in 2014. This rapid growth is supported by the findings from within Oregon where total funding in 2014-15 more than tripled versus the 2012-2013 findings.

Reliable angel investment data at the state level in not available. Therefore, we analyzed company level data from Pitchbook for 539 Oregon companies that have raised $2.5 billion in cumulative funding from a variety of sources including accelerators, crowdfunding, angels, and venture capital funds. While there are data gaps due to non-disclosure by some companies, this is arguably the most complete source available.

Since the age of a company tends to dictate the stage of funding being raised, we analyzed the data in two groups, those companies founded prior to 2010 (those with market traction) and those after 2010 (what can be considered more early stage startups). While Portland has been the dominant source of new "backed" startups, there are noticeable changes since 2010 along the I-5 corridor as well as increased activity in Deschutes County.

Although there are data limitations including attrition of companies founded prior to 2010, **the number of active startups in the I-5 corridor founded since 2010 has increased by more than four-fold when compared to those founded before 2010. In Deschutes County, the same figure is five-fold.** Portland over the same time grew activity level by less than two-fold. This relative growth demonstrates that startup activity is in fact increasing in these hubs outside of Oregon. This increase in startup activity corresponds with the establishment of new angel and venture funds outside of Portland.

Figure B-12. Number of Startups by City, Founding Years Prior to 2010

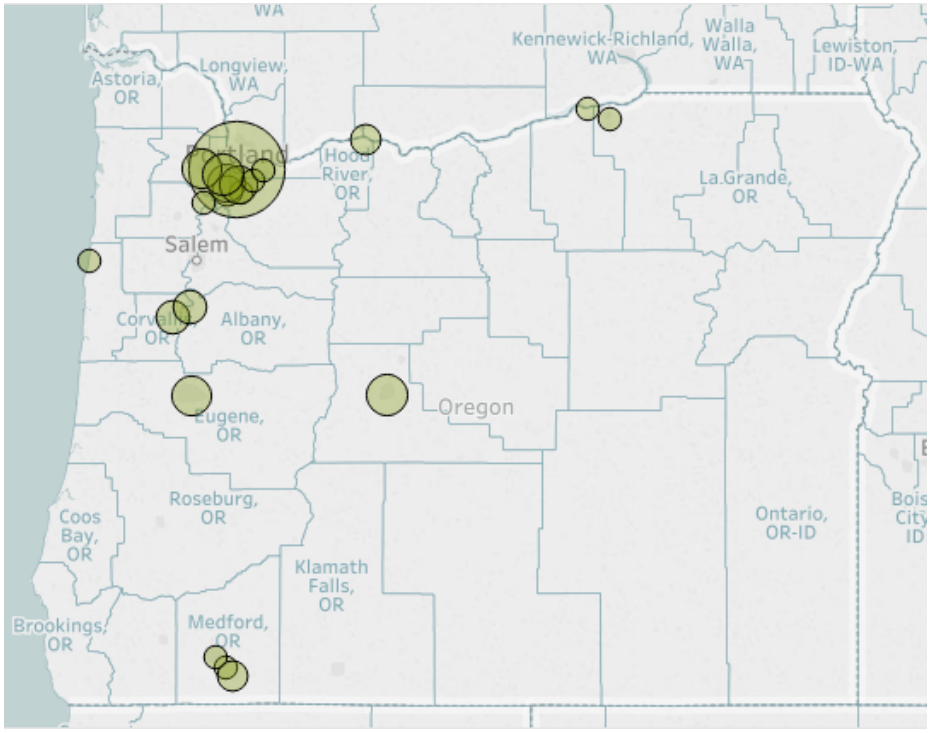
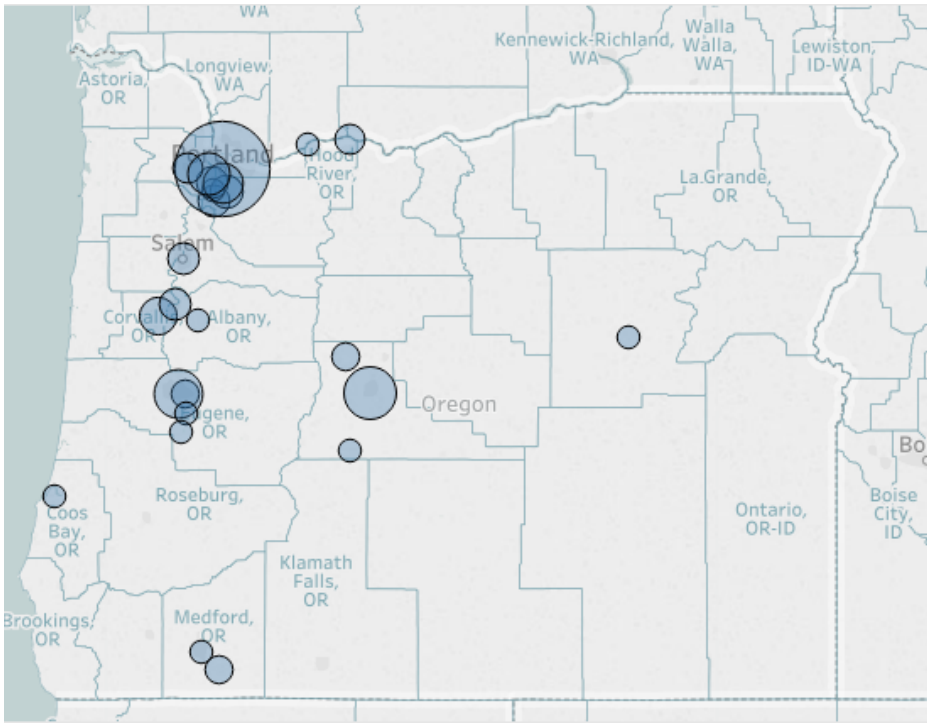


Figure B-13. Number of Startups by City, Founding Years 2010-Present



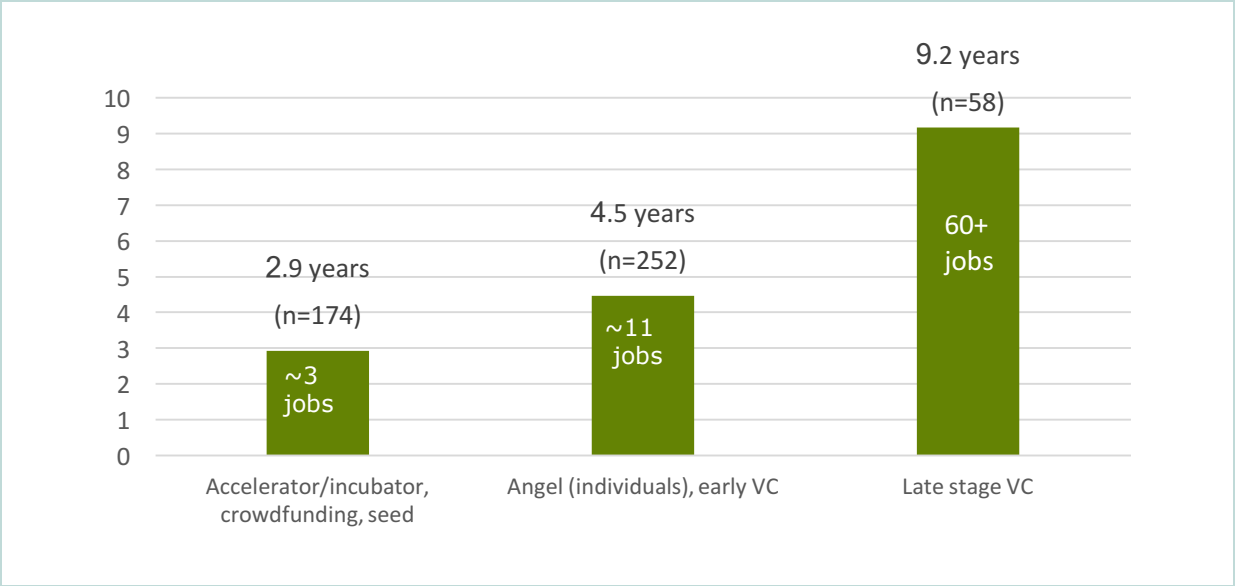
Source: Pitchbook Accelerator/Incubator-, Angel-, and VC-backed companies in Oregon

Time to Investment Analysis

Examining the timeframe that it typically takes innovation-driven industries to reach the point where they are attracting investment and employing a significant number of jobs is helpful in terms of establishing program expectations and setting metrics. Using the same set of companies mapped in the previous section, we calculated the time from founding to different stages of investment. On average, we found that it takes startups 2.9 years to reach the accelerator, incubator, or crowdfunding stage; 4.5 years to obtain investment from individual angel investors or early venture capital funding; and an entire 9.2 years to obtain late stage financing.

This data illustrates that in general it takes a long time to scale. This timeline varies slightly industry to industry, with technology services being quicker to market and scale, which is why they are more likely to be venture-backed.

Figure B-14. Time to Investment Stage and Jobs per Company at Each Stage



Source: Pitchbook Accelerator / Incubator-, Angel-, and VC-backed companies in Oregon
Job estimates from analysis of Rev1Venture investments

Overlaying data from a similar study, the job impact tends to grow exponentially after early stage investment. Using client data from Rev1 Ventures in Ohio, a startup has approximately three jobs during concept and seed stages. This rises to 11 jobs per company in early stage investment, then scales rapidly to over 63 jobs per company in later stages of investment.

Industry or Technology-Focused Technical Assistance Resources

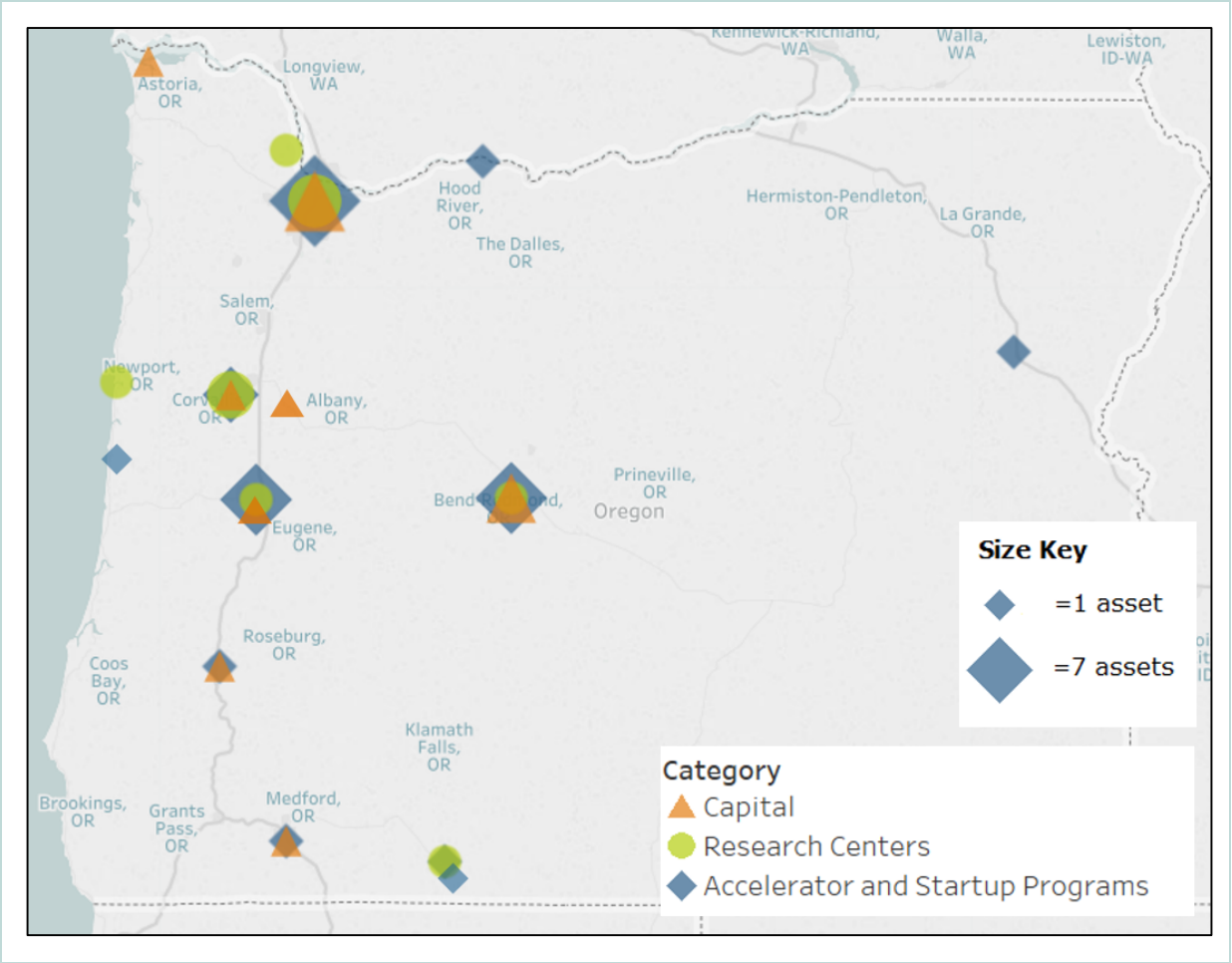
Organizations that provide focused technical assistance are essential to the I&E ecosystem. In Oregon, these support organizations include signature research centers, regional and industry-specific accelerators, incubators, co-working organizations and others providing high touch services to entrepreneurs.[33] These organizations generally provide at least one of three valuable functions to entrepreneurs:

- Assistance helping researchers and inventors commercialize research.
- Assistance helping entrepreneurs evaluate, validate and launch new businesses.
- Capital connections to investors, strategic corporate partners, and financial organizations.

In documenting the distribution of resources across the state we found that significant hubs of I&E support organizations are taking root outside of Portland, particularly in the Bend area and South Willamette Valley region.

[33] We limit accelerators, incubators, and co-working organizations to those organizations that are recognized by Oregon studies and interviews as being focused on supporting innovation-based startups. For this project, it does not include organizations such as small business development centers and micro-enterprise organizations with a client base that is primarily main street or lifestyle businesses.

Figure B-15. Selected I&E Assets by Area



Note: Size of the symbols represents the number of organizations in each category.

Defining I&E Regions

In a state the size and density of Oregon not all regions can be innovation hubs, but all regions can benefit from a strong I&E economy. When we overlay the regional mapping of industry, talent, capital and technical assistance assets, Oregon's I&E landscape can be described by the three types of regional ecosystems described below. Thinking about regions in terms of their capacity and role in an I&E ecosystem, rather than by the 12 economic development service boundaries, can help the state develop and deploy innovation resources more effectively.

I & E Hubs: Regions that have (or potential to have) both research and entrepreneurship capacity--new product innovation alongside startups and scaling companies that compete on a national and international level. They have enough active startups to support private investment funds. Hubs[34] are defined by:

[34] The characteristics of venture development hubs were derived from reports from SSTI and Brookings Institute, and Ohio Third Frontier and Pennsylvania Ben Franklin Partnership programs.

- Presence and growth in all three types of innovation-based industries: Research-based products, technology services, and consumer products.
- Presence of active resident investment capital.
- Strong ratios of knowledge-intensive business services to support startups.
- Presence of research universities, incubators and specialized facilities.
- Presence of industries in the value chain that can be strategic partners or first customers.

Hubs include Portland Metro, Central Oregon and the Eugene-Corvallis regions.

Mid-Scale I&E Regions: Regions with less research intensity, yet have enough scale in terms of population and startup activity to sustain an array of entrepreneurship resources. Characteristics of these regions include:

- Presence and growth in specific innovation-based industries: primarily technology services, and consumer products.
- Modest or emerging pockets of resident investment capital: some activity, yet not enough to support regional investment funds.
- The presence of entrepreneurial resources or modest levels of knowledge-intensive business services.
- Presence of industries in the value chain that can be strategic partners or first customers.

Mid-scale regions include Mid-Willamette Valley and Southern Oregon.

I & E Supported Regions: More rural regions that lack the critical mass of innovation-based businesses and entrepreneurs, yet have pockets of startup activity and an array of industries that benefit from new innovations. The characteristics of these regions tend to include:

- Presence and growth in innovation-enabled industries, especially manufacturing, energy, agriculture, and natural resources that can be customers or co-developers of technologies and services.
- Presence of technology deployment and testing sites, especially around energy and cleantech.
- Presence of general entrepreneurship support (e.g. small business development centers) with digital capabilities to access statewide resources.
- Little resident investment capital and specialized business resources.
- Lower than average concentrations of STEM talent.

These regions include most areas of the Coast, the Gorge, and Eastern Oregon. A deeper dive into specific innovation-based industries and why they are growing in each these regions is beyond the scope of this analysis.

Part C: Data Scorecard

This section uses comparative data consistent with national studies and state resources to explore the following question:

> ***Compared to the U.S. and peer states, is Oregon positioned to be a leader in innovation and entrepreneurship?***

We developed a set of metrics organized by the I&E Ecosystem Framework (Figure A-1) to measure Oregon's relative ranking with both peer states group and the U.S. In addition, we calculated trends based on ten and three-year time frames, and examined whether the recent performance trends differed from long-term trends to identify shifts that may warrant additional exploration. This set of metrics complements the analyses in Part B by providing a standardized, normalized set of data by which Oregon can be readily compared to other states and itself over time.[35]

We evaluated and selected metrics based on several criteria:

- **They were meaningful to Oregon**: They are directly related to Oregon I&E goals and addressed one or more framing questions.
- **They are a national standard or well-recognized metric**: They are used consistently by other states or national organizations.
- **Metrics can be easily collected and analyzed**: There are available data sources that included other state and U.S. figures by which to compare Oregon's relative standing. We also prioritize metrics with no more than a two-year lag.

For each metric, we examined five data points:

- Oregon's **latest national ranking** for that indicator.
- Oregon's **latest ranking among peer states** for that indicator.
- Oregon's **10-year performance compared to the U.S. average**. Was Oregon's annualized performance over the past 10 years greater than the US average?
- Oregon's **three-year performance compared to the U.S. average**: Was Oregon's annualized performance over the past three years greater than the US average?
- Oregon's **acceleration**: How does the annualized performance in Oregon over the past three years compare to annualized performance over ten years?

The scorecard of 18 metrics are included in **Table C-1**.

[35] This analysis is complementary to the Oregon Innovation Index produced by Business Oregon. It places more emphasis on comparative ranking to the U.S. and peer states and examines both long and short term performance to identify areas where Oregon may be gaining or losing ground against national trends.

Table C-1. Summary of Metrics

Proposed I&E Framework	Type of Measure
INVENTION/R&D ***Are there robust levels of R&D that are foundational for new ideas and products?***	
Industry R&D Performed/Business R&D Intensity	Measure of private R&D
Non-industry R&D Performed	Measure of R&D performed by other sectors (universities, federal labs, etc.)
Invention Disclosures	Measure associated with university invention
PRODUCT DEVELOPMENT ***Is research being translated and commercialized into products with economic potential?***	
SBIR/STTR Funding	Measure of public R&D funding
Inventor Patents	Measure of individual inventors
Active licenses[36]	Measure of university innovation and commercialization
BUSINESS DEVELOPMENT ***Are entrepreneurs launching scalable companies at an increasing rate?***	
Venture Capital Investment	Measure of scalable companies
New Startups	Measure for overall startup culture
Business Churning	Measure for overall startup culture
University Startups	Measure of university innovation
BUSINESS SCALE-UP AND GROWTH ***Are startups growing and thriving in Oregon?***	
High Growth Startups	Measure of scalable startup activity
High Growth Density	Measure of scalable startup activity
Initial Public Offerings or Merger & Acquisition Market Value	Measure for companies with strong national/global reach
ECONOMIC IMPACT ***Are we creating measurable economic impact?***	
High Tech Jobs	Measure of overall economic impact on innovation-based enterprises
Establishment Survival Rate	Measure of startup sustainability
CROSS-CUTTING METRICS ***Does Oregon have the people to attract and support innovation and high growth companies?***	
Net Migration of Knowledge Workers	Measure of talent attraction
STEM Jobs	Measure of industry growth requiring a technical workforce
Managerial, Professional, and Technical Jobs	Measure for occupations required by innovation-driven enterprises

[36] We also considered university licensing income in an earlier version of this study which has a different rankings and trends. However, there has been a move away from using licensing income to assess the value and/or success of technology transfer (see for example, Association of Public Land-Grant Universities (2017). *Technology Transfer Evolution: Driving Economic Prosperity* available at http://www.aplu.org/library/technology-transfer-evolution-driving-economic-prosperity/file. A benchmarking study solely focused on university technology transfer should, in our opinion, include at least some level of information on licensing income even if secondary to other activities.

Gaps that remain are private sector outcome metrics for product development / research translation. Angel investment is not published at the state level due to concerns about reliability. The lowest level it is available across states in a comparable dataset is regional (i.e., the Northwest).

Once we selected metrics available both over time and across states, we determined peer states that made logical sense for benchmarking. Each peer state must meet at least two selection criteria below:

- **Similar Degree of Urbanization**: defined as having a similar population density, similar number of metropolitan statistical area (MSAs), and similar share of the population living in MSAs.
- **Regional Competitor**: defined as a state in the western half of the U.S.
- **Similar I&E Maturity**: defined as states who have been developing their I&E ecosystem through policies and programs for on the order of approximately 15 to 20 years.
- **High Performing I&E State**: defined by being consistently included in the top quartile in either innovation-focused indices such as the ITIF New Economy Index or entrepreneurship-focused indices such as the Kauffman Foundation's indices, or both.

Peer states selected using these criteria include Arizona, Colorado, Minnesota, Oklahoma, Utah, and Washington. **Table C-2** includes a summary of the criteria for the selected peer states.

Table C-2. Summary of Peer States

	Population (2016 est.)	Population Density (pop/sq mi) + ranking	Economic Competitor state*	Ecosystem Maturity **	Avg. Rankings in I&E indices from 2010-2017
Oregon	4,093,465	41 (#39)		Early 2000's	2nd Quartile
Arizona	6,931,071	60 (#33)	Yes	Early 2000's	2nd Quartile
Colorado	5,540,545	52 (#37)	Yes	1990s	1st Quartile
Minnesota	5,519,952	68 (#30)	Yes	Mid 2000's	2nd Quartile
Oklahoma	3,923,561	57 (#35)		Early 2000's	3rd Quartile
Utah	3,051,217	40 (#40)	Yes	Mid 2000's	1st Quartile
Washington	7,288,000	107 (#24)	Yes	1990s	1st Quartile

Data Summary

Overall Conclusions:

- The innovation and entrepreneurial performance within Oregon has increased, yet similar patterns across the U.S. means that Oregon's position relative to other states has stayed the same for many metrics.
- Compared to peer states (Arizona, Colorado, Minnesota, Oklahoma, Utah, and Washington), Oregon's performance falls in the middle with Utah, Washington and Colorado outperforming Oregon fairly consistently.
- Areas of strong performance include industry R&D, university active licenses, and the survival rates of startups[37]
- Areas of weak performance include non-industry R&D, overall startup activity, and IPOs for companies that growth to significant size.

A more detailed snapshot is depicted in **Figure C-1**. Based on these results, the strengths that emerge for Oregon are industry R&D performance, high tech jobs, and the survival of new establishments.

The data benchmarking one pagers in **Appendix B** show Oregon is consistently outperformed by Utah, Washington, and Colorado. Utah in particular is a high performer that warrants further study as part of best practices research.

[37] There are many factors that affect the survival rate of startups including industry mix.

Figure C-1. Oregon Details by Metric

State **Oregon**

Oregon Metrics Snapshot

Stage of Continuum	Metric	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Invention and R&D	Industry R&D Performance	●	●	●	●	●
	Non-Industry R&D Performed	○	○	○	●	○
	University Invention Disclosures	○	○	●	○	●
Product development	SBIR and STTR Awards	●	◐	○	○	○
	Inventor Patents	○	●	○	○	○
	Active Licenses	●	●	●	●	○
Business development	Venture Capital Investment	○	◐	○	●	●
	New Startup Firms	○	◐	○	○	●
	Business Churning	○	○	○	○	○
	University Startups	●	◐	●	○	○
Business Scale-up and Growth	Fast Growing Firms	○	○	●	◐	●
	High Growth Density	○	◐	○	●	●
	Start Up Job Growth	○	●	○	○	●
	Initial Public Offerings	○	○	●	○	○
Economic Impact	High Tech Jobs	○	●	●	●	○
	Establishment Survival Rate	●	◐	○	●	●
Cross-Cutting Metrics	Net Migration of Knowledge Workers	●	●	●	○	○
	STEM Jobs	○	◐	●	○	○
	Managers, Professionals and Technichian Jobs	○	◐	●	○	○

Note: Improvement compared to the US is defined as 10-year annual growth rate of state greater than the 10-year annual growth rate of the US. Acceleration is defined as a 3-year annual growth rate that is faster than the 10-year annual growth rate. Large blue circles mean that criteria is met. Medium light blue circles mean the improvement criteria is within 10% of U.S. or the rank is outside of top quartile but in the top 20 states.

Part D: Stakeholder Perceptions of Oregon's I&E Ecosystem

During September and October 2018, we conducted over 40 stakeholder interviews with investors, entrepreneurs, industry sector leaders, technical services providers, universities and Business Oregon staff. They included those working in urban, small metro and rural regions throughout the state. We prioritized stakeholders for interviews based on having a mix of geographic and industry perspectives.

Interviews were meant to provide additional insights on Oregon's I&E ecosystem that may be difficult to derive from data alone. Interviews also served to confirm or refute some of the findings from the data analysis. These interviews explored:

- The advantages and disadvantages of commercializing new products[38] and/or starting and scaling companies in Oregon.
- The presence and value of I&E resources and assets, and gaps in the ecosystem that inhibit innovation and growth.
- The culture and connectedness surrounding the ecosystem.
- Potential state-level improvements to the I&E ecosystem.

Oregon's I&E Assets (Programs, Talent, Capital, and Infrastructure)

Innovation-driven enterprises require assets of talent, capital, know-how (programs and technical assistance) and supportive infrastructure to succeed. Interviews noted areas of progress and also identified key gaps that they viewed as the next set of priorities to be addressed.

Significant progress has been made in developing individual assets. This is supported by a number of active accelerators, the growth in investment capital, and the increase in STEM jobs throughout the state. Most interviews noted the growth of overall investment capital as perhaps the most significant accomplishment in the past decade.

There was concern, however, that the proliferation of small accelerators programs, while well intended, may actually be hurting startups if they simply help develop a business model but cannot connect new companies to the "next step" of market growth.

Resident capital and the ability to attract outside capital has improved more for some sectors than others. Interviews noted that most capital investments remained focused on tech services and consumer products, with fewer deals going to R&D intensive industries. This lack of deal flow was viewed as stemming from an inadequate number of

[38] We use the word products broadly to encompass goods and services.

early stage commercialization funds that helped deep technology startups validate new products—whether from university research or individual inventors. The new fund from Oregon Innovation Council to provide gap capital was viewed as beneficial, however, not at an adequate scale. It was also noted (and supported by best practice research) that this type of gap funding is most effective when tied directly to organizations providing the technical assistance.

Needs and solutions vary by industry type: Interviews stressed that the needs of R&D intensive companies are very different from consumer products or tech services. Therefore, investors, service providers and entrepreneurs underscored the importance of having programs that were focused on industry type rather than one size fits all.

- Consumer products noted an array of accelerators, although their reach throughout Oregon could be enhanced with regional chapters. They also noted an increase in angel capital, but a lack of prototyping and early production financing for startups to reach the traction required to be attractive to private investment and banks.
- R&D intensive sectors stressed a lack of adequate commercialization funds and early working capital. There was also a need for specialized facilities (e.g., post-incubator facilities, contract research and manufacturing firms) required to support the unique needs of deep technology companies. Companies noted that their early or contract production was being done by out of state firms due to a lack of resources in state.

Networks connecting Oregon to national and global markets are essential. Interviews noted the importance of connections outside of Oregon. All types of stakeholders interviewed underscored how small amounts of support for activities such as showcases, travel and booth support at national/international conferences, and participation in national programs, could be extremely valuable. Entrepreneurs noted that organizations that helped them develop networks outside of the state were much more valuable in helping them scale companies than those with only an Oregon focus. Sector-based accelerators and signature research centers were noted as examples of such outward-focused organizations.

Table D-1 summarizes how I&E assets are perceived across industry types, geographies, and stakeholders. For the most part, there is agreement about the improvement of almost all assets except for capital and facilities for R&D intensive industries.

Table D-1. Overall Perceptions of Oregon's I&E Ecosystem Assets

	Programs/ Technical Assistance	Capital	Talent	Facilities and Infrastructure
Industry Type				
R&D Intensive Products	◑	○	◑	○
Technology-Based Services	●	◑	●	◑
Consumer Products	◑	◑	◑	◑
Geographic Characteristic				
I & E Hub	●	◑	●	◑
Mid-Scale Region	◑	◑	◑	◑
I & E Supported Region	◑	◑	◑	○
Stakeholders				
Entrepreneurs	◑	◑	◑	◑
Investors	◑	◑	◑	◑
Service Providers	◑	◑	◑	◑
Research Institutions & Organizations	◑	○	◑	○

○ viewed as a weakness/need ◑ viewed as improving ● viewed as a strength

Oregon I&E Ecosystem Enablers (Culture, Capacity and Continuity)

As an I&E ecosystem matures, issues such as capacity, connectedness or continuity become more important, especially at the stage where Oregon now finds itself—in the middle of building a generational foundation. While the assets previously described help build what makes up the ecosystem, these findings present opportunities for improving how the ecosystem performs.

Overall the enablers of culture, capacity and continuity were viewed much less favorably than the progress made on developing individual assets; implying a need to focus on the elements that enhance the connections, institutional capabilities, and sustainability of past and future investments.

The following insights from interviews attempt to capture how different enablers are helping or hindering I&E performance.

CULTURE: Oregon has embraced entrepreneurship as a key economic driver, yet, the overall culture is one that "thinks small." The sentiment that Oregon celebrates the craft, artisan, or niche characteristics was a repeated theme in almost all interviews. While interviewees noted this can be great for certain industry segments, investors especially felt that it was limiting how entrepreneurs thought about the growth potential of their company. The "craft" reputation was also viewed as carrying over to state leadership, describing Oregon as a small business state rather than an innovative or entrepreneurial one. The perceived lack of recognition or celebration of large company success was viewed as influencing the scale and sophistication of state support for I&E, where interviews noted a lack consistent state support for R&D intensive industries where scale and time to market require bigger plays. As one interview noted. "There are no 'lifestyle' biotechnology or semiconductor companies. If Oregon want high wage jobs, our support systems need to recognize the level of effort that requires."

CAPACITY: A future focus should emphasize building capacity of proven programs and intentionally connecting resources. As technical assistance and funding grows throughout the state, it becomes more critical to connect and leverage assets in order to increase the overall capacity within both regions and key industry sectors. National best practices clearly show that venture development hub organizations[39] and ecosystem building roles amplify the results of individual assets with very modest investment. With a few exceptions, Oregon has invested little in these models, yet it was one of the most recommended next steps in interviews. Interviewees also preferred that the state invest in expanding or replicating proven models run by existing organizations that have the staff with expertise and experience in serving high growth firms.[40]

SCALE: Think of scale in terms of regions not cities or counties. Oregon's population naturally limits the number of I&E regions that can operate on a sustainable scale. Most stakeholders interviewed felt state support was spread too thin, and not at a scale that could build long-term capacity. They underscored this by noting some competitive grant programs seem to fund activities at a municipal or county level rather than at an ecosystem level, which may actually encourage duplication of limited resources rather than collaboration; or as one interview said "small grants tend to create dependent children."

[39] According to Mark Skinner of RIAN, a venture development organization is "a spatially-based, business-driven, nonprofit organization that supports regional prosperity by speeding the commercialization of science, technology, and innovation through expert business assistance and direct risk capital investment into a portfolio of local entrepreneurial ventures with high growth and/or employment potential

[40] Based on the I&E experience of this consulting team in over 20 other states and four countries, Oregon appears to have a greater propensity to fund a broad array of small organizations to provide similar services which makes it difficult scale or replicate models exceeding performance goals. Other states tend to provide sustained funding for regional "I & E infrastructure" support and combined it with programmatic grant funds for specialized services.

CONTINUITY: Sustainability of the I&E ecosystem was the single greatest weakness identified in interviews. With measurable economic impact of a high growth startup beginning 5-10 years after founding, getting to a critical mass of companies in job-producing stages requires both patience and continuity of I&E support. This is especially critical for building innovation capacity and supporting new R&D intensive companies. A significant number of interviewees expressed concern that frequent program changes at Business Oregon, and especially at the Oregon Innovation Council, have been counter-productive to the long-term view needed to build effective ecosystems. The Oregon Growth Board was viewed as having a more consistent funding strategy, which was reflected in investors' perceptions that state support was improving.

Table D-2 summarizes perceptions of how well I&E enablers are performing. Compared to the perceptions around assets, opinions are less favorable, especially with regard to capacity and continuity issues.

Table D-2. Overall Perceptions of Oregon's I&E Ecosystem Enablers

	I & E Culture	Ecosystem Connectedness and Institutional Capacity	Continuity of Support
Industry Type			
R&D Intensive Products	○	○	○
Technology-Based Services	◑	◑	○
Consumer Products	◑	◑	○
Geographic Characteristic			
I & E Hub	○	◑	○
Mid-Scale Region	◑	◑	○
I & E Supported Region	◑	○	○
Stakeholders			
Entrepreneurs	◑	◑	NA*
Investors	◑	◑	◑
Service Providers	◑	○	○
Research Institutions & Organizations	○	○	○

○ viewed as a weakness/need ◑ viewed as improving ● viewed as a strength

Threats to Oregon's I&E Ecosystem

There is an array of external threats that range from uncertainty with respect to federal policies and budgets, to implications from trade agreements, to R&D spending in other countries that are not covered in this analysis. This project looks at threats with regards to the State's role is supporting a high performing I&E ecosystem. Interviews noted four primary threat factors:

Oregon's size: As a small and less densely populated state, there are unique challenges to growing an innovation and entrepreneurial ecosystem.

- Oregon has difficulty developing the quantity of new companies to support sector-oriented investment capital or specific R&D expertise. These types of assets will require reach beyond Oregon to develop networks and tap into additional resources. To help build necessary connections, state support should recognize and reward initiatives with an outward focus.
- Developing the appropriate size of I&E regional ecosystems. Having enough scalable companies to attract investors and talent requires a robust pipeline with hundreds of innovation-driven startups. For a state Oregon's size, this requires regions to be larger than traditional economic districts.

A weak university-industry commercialization connection: The weakest link in Oregon's innovation capacity is the commercialization pathways between universities and industry where there is a well-documented "valley of death" between R&D funding and private investment. Without addressing this gap, Oregon will not develop the pipeline of new discoveries and products that is commensurate with the level of research being conducted. The downstream impact of an anemic pipeline will also impact the number and quality of R&D Intensive companies that start and grow in Oregon.

A lack of support for larger strategic initiatives. Oregon's "think small" entrepreneurial culture may be inhibiting larger, more strategic innovation plays. Oregon's statewide I&E support appears to be focused primarily on smaller grant programs with little or no capacity to take advantage of opportunity-driven initiatives in key industries or build competitive research centers of excellence. Basically, stakeholders noted no equivalent of the Strategic Reserve Fund for larger scale I&E opportunities. The preliminary proposal for university cost-match for federal funds would help address part of this issue, yet that would not address opportunities to attract private sector projects.

Performance expectations not aligned with the dynamics of an I&E Ecosystem. While this analysis did not evaluate individual programs, interviews across the state consistently noted that the state's focus on jobs as the primary measure of I&E performance "caused bad behavior" and sub-optimized efforts. This was especially true with concept and seed stage programs where significant job creation does not occur until five to ten years

after assistance or funding. The development of stage-appropriate metrics will be critical to measure and understand the short and long-term impact of I&E investments.

Opportunities for Oregon's I&E Ecosystem

Interviewees provided an array of recommendations for how Oregon can enhance its innovation and entrepreneurship capacity and performance. There was considerable agreement among the different stakeholders about the path forward. The most common suggestions are highlighted below:

Capital

- A consistent and adequate source of early commercialization gap funds and accompanying technical assistance support from proof of concept through prototyping stages. The reauthorization of the University Venture Development Fund tax credits would fall into the first stage of this funding.
- Enhanced support for cost-sharing for federal research grants for both universities and signature research centers.
- Support for a debt financing mechanism for early stage goods producing companies, especially for costs associated with prototyping and early production support.

Regional and Industry Sector Capacity

- Support for a statewide system of regional ecosystem builders (see best practice section for further detail). The role that EDCO has played in Central Oregon was noted in interviews throughout the state as an effective model.
- Support for the expansion of sector-specific accelerator models, especially existing efforts with track records that have strong networks outside the state. Bend Outdoor Worx was often cited as an example of a desired sector-accelerator model.

Facilities and Infrastructure

- An opportunity-based fund (similar to the strategic reserve fund, rather than a grant program) that would support facility, equipment and technology needs for R&D intensive initiatives or projects.
- Strong state support for connectivity infrastructure: High-speed broadband (digital infrastructure) and transportation infrastructure (e.g., high-speed rail) as well as enhancements to product distribution corridors.

Tax Policies to Spur Private Investment

- A reinvestment tax credit, similar to other states, that would provide capital gains relief for an Oregon resident that sold their company and reinvested gains back into another Oregon company, or for accredited investors investing in an Oregon startup.
- A refundable R&D tax credit for smaller companies that would use the credit to immediately reinvest back into the company for to accelerate their time to market.

Statewide Coordination of I&E Investments

- A 10-year vision and accompanying budget that stresses the continuity of support for key assets and enablers:
  - An I&E working committee comprised of key funders to drive closer coordination of state, philanthropic, and government funds for targeted I&E initiatives, especially efforts focused on ecosystem building, and filling specific asset gaps such as those identified in the Capital Scan.
  - The revitalization of the Oregon Innovation Council as a strategic thought leader for innovation and entrepreneurship with active industry engagement.

Part E: Overall SWOT Summary

The story of I&E performance and growth within the state is both compelling and concerning. On the positive side:

- Significant advancements have been made across Oregon in the past 15 years. The array of programs and services to support entrepreneurs have multiplied outside of the Portland region, most notably in Central Oregon and the South Willamette Valley.
- Almost all regions across the state have grown manufacturing and technology jobs, as well as their STEM workforce—assets that help drive innovation and entrepreneurship.
- Pockets of strong sector-based networks and organizations are propelling the growth and capitalization of startups in key industries, notably outdoor, food & beverage, and technology services.

On the less positive side:

- Investments in innovation capacity, particularly commercialization funding and support for R&D-intensive companies, are inadequate. This is especially concerning for the future pipeline of innovations that are used by other Oregon industries.
- Startups are not growing at a rate that would be expected for the level of new business creation. For example, while Oregon ranked well above average for the number of tech startups, it ranks #46 in the number of jobs per startup.[41]
- I & E initiatives and policies appear to be more ad hoc programs than driven from a clear statewide strategy where programs have logical sequencing along the I&E continuum. Stakeholders from all backgrounds felt that this limited the capacity, effectiveness, and sustainability of programs.

In addition to general strengths and weaknesses, several critical ecosystem characteristics were revealed through this assessment.

- As startups mature, their needs become more sector-specific.
- The footprint or service regions of programs matter: regions need to be large enough to support a vibrant pipeline of high growth companies. (Generally much larger than small business service areas.)
- Scaling and enhancing the effectiveness of ecosystems requires focused and intentional coordination: the mere presence of resources is not enough to produce the desired impact.
- Connections to networks outside of Oregon are critical for the growth of startups.

[41] Wu, J John and Robert D. Atkinson, How Technology-Based Start-ups Support US Economic Growth, November 2017

Overall Summary of Comparative Data

- The innovation and entrepreneurial performance within Oregon has increased, yet similar patterns across the U.S. means that Oregon's position relative to other states has stayed the same—with overall performance just slightly above average.
- Compared to 6 peer states (Arizona, Colorado, Minnesota, Oklahoma, Utah, and Washington) Oregon's performance falls in the middle with Utah, Washington and Colorado consistently outperforming Oregon.

Figure E-1. Summary of Oregon's Performance Compared to the U.S. and Peer States

Areas of Strong Performance	Above Average Performance with Declining Trend Lines
▪ Industry performed R&D ▪ University active licenses ▪ Survival rates of startups	▪ SBIR/STTR Awards ▪ STEM and management/finance workers ▪ Inventor patents (Patents awarded to individuals) ▪ The attraction of knowledge workers from outside of Oregon ▪
Areas of Average or Below Average Performance with Improving Trend Lines	**Areas of Weak Performance**
▪ University invention disclosures and startups ▪ Startup job growth (average growth of employment five years after founding) ▪ The density of startups that become high growth (the percent of startups that scale) ▪ Venture capital funding ▪ High-tech jobs and STEM jobs	▪ Overall startup activity (number of new companies forming each year) ▪ Non-industry (University) R&D ▪ Companies that grow to significant size, as measured by initial public offerings

Insights from Interviews

Over 40 interviews were conducted, obtaining input from 52 entrepreneurs, investors, sector leaders, service providers, and university R&D offices. These interviews explored insights on the advantages and disadvantages of commercializing technologies and starting companies, as well as perceptions on what's needed in the future to enhance the state's I&E ecosystem. Figure E-2 summarized these interviews.

Figure E-2. Summary of Interview Themes and Suggested Support

Interview Themes	Suggested Public Support
Core assets have been put in place that are fostering new startups – now is the time to connect them and build out programs that focus on scaling and growing what's been started.	▪ Focus future grant programs on connecting existing assets and expanding growth-stage services. ▪ Expand ecosystem building models that have been successful in Central Oregon and elsewhere in the U.S. ▪ Broaden connections outside of Oregon; establish more national and international networks.
There is repeated concern that Oregon's innovation capacity is declining and it is more difficult to start and grow an R&D intensive company.	▪ Develop a comprehensive set of commercialization funds that can accelerate the movement from proof of concept to a valid product prototype. ▪ Reauthorize University Venture Development Funds (UVDF) tax credits or enact a similar program. ▪ Continue and expand the state's matching fund program for concept stage products.
Oregon is a state that "makes things." Programs and resources should reflect the goods-producing nature of Oregon I&E industries.	▪ Ensure business loan programs align with needs of startups in consumer products and tech-based manufacturing. ▪ Support facility expansions of incubators and post-incubation facilities for R&D intensive industries.
Oregon has embraced entrepreneurship, yet the overall culture is one that "thinks small." This was regarded as affecting the scalability of companies, the level of investment capital, and the scale at which the public sector supports I&E.	▪ Enhance marketing of efforts that celebrate and recognize successful Oregon-based companies. ▪ Change the dialogue from Oregon as a "Small Business" state to one of an "Entrepreneurial State." Language matters. ▪ Systematically engage existing companies with startups to encourage corporate investment and engagement (as both collaborators and customers.)
Oregon lacks a clear vision and shared I&E strategy, which is impacting the continuity of support and the ability to build scale and impact.	▪ Develop a clear 10-year statewide strategy for innovation and entrepreneurship with appropriate metrics. ▪ Strategically connect funding from philanthropy, government, and industry to address priority gaps. ▪ Establish state funding mechanisms that provide more continuity of support. ▪ Ensure transparency of how state I&E decisions are made.
We're missing opportunities to align I&E assets with our potential to be a leader for national and global issues.	▪ Position Oregon as a leader in areas where the state has comparative advantages. Align Oregon's leadership in policy with our capacity to provide the technology and solutions. (e.g., climate change).

SWOT Summary of ASSETS and ENABLERS

When insights from data and interviews were combined, there were some consistent themes with regards to the state's I&E **assets and enablers** as described in Section A.

Figure E-3. SWOT Summary of ASSETS and ENABLERS

<table>
<tr><th>TECHNICAL ASSISTANCE & PROGRAMS</th><th>CAPITAL</th></tr>
<tr><td>Accelerators, co-working spaces, incubators and other technical services have grown across the state, especially for sectors that have relatively short time to market.
Signature research centers (SRCs) continue to be the primary source of technical expertise for R&D intensive industries, underscoring their value as a critical intermediary between research and industry.
The connections to national/global networks that create access to markets outside of Oregon still require further development.</td><td>Capital, especially seed and angel, has grown statewide with more funds outside of Portland. However:
Size of deals tend to be smaller than competitor states.
Early stage funding remains inadequate for R&D-intensive (deep technology) sectors.
Early working capital is a key challenge for consumer products.</td></tr>
<tr><th>TALENT</th><th>INFRASTRUCTURE</th></tr>
<tr><td>Overall, talent was not viewed as a key gap and most companies felt Oregon was an easy place to attract technical talent. However:
The state continues to have problems with building out executive teams in R&D Intensive sectors.</td><td>While incubators have been established, growth stage services are lacking.
Post-incubation space for R&D Intensive companies is inadequate, including funds to help buildout shared tenant improvements.
Broadband still remains an issues in targeted areas of the state.</td></tr>
<tr><th>CULTURE</th><th>CAPACITY & CONNECTEDNESS</th></tr>
<tr><td>There is a perception that Oregon’s culture does not support innovation, risk-taking and high growth companies.
“Small business” and “niche market” culture was viewed as inhibiting companies, capital and state support.
A lack promotion and recognition of Oregon success stories underscore the anti-business perceptions.</td><td>Funding levels and the regional level at which programs operate are not building sustained capacity.
Support for innovation capacity needs to reflect its long-term timeframe.
Programs are perceived as being spread too thin and not regionally or programmatically connected. (E.g., funding programs to launch companies without support for next stage growth).</td></tr>
<tr><th colspan="2">CONTINUITY</th></tr>
<tr><td colspan="2">Interviews noted a lack of continuity with regards to state support; in terms of overall investment amounts and frequently changing I&E programs and/or their parameters. Since innovation and entrepreneurship is a long-term strategy, intermittent disruptions can cause programs to lose ground and underperform.</td></tr>
</table>

SWOT Highlights: Innovation Capacity

Innovation capacity is the ability to take science and research ideas and translate them into useful products, technologies and/or services that solve problems.

Key Take-Aways

Data and interview insights point to:

- A mix of strong private sector R&D with lower than average levels of public (university) R&D.
- A lack of consistent and adequate gap/proof of concept funds at all stages of commercialization has produced a weak commercialization pathway for university research and inventors starting an R&D intensive company.
- While levels of public R&D are low, the rate at which research is translated into economic impact (licenses and startups) is above average, indicating a level of commercialization efficiency that could be enhanced with further investment.
- A lack of strategic support for investments for physical and capital infrastructure, that if in place could increases the stickiness of companies after they launch.

Figure E-4. Innovation Capacity Highlights

	Research & Development (Creating Ideas)	Commercialization (Turning ideas into products/services)
Advantages/ Strengths	▪ Private sector R&D expenditures ▪ The number of ideas being patented ▪ Active licenses for each million of research expenditure	▪ SBIR matching funds and Phase 0 Program ▪ Presence of and assistance from Signature Research Centers
Areas with Average or Improving Performance	▪ Growth of invention disclosures, and licenses from universities	▪ Growth of spinouts from universities ▪ Growth of university accelerator programs outside of Portland.
Disadvantages/ Needs	▪ Overall non-industry R&D expenditures ▪ Lack of cost matching to pursue large federal grants and initiatives ▪ Widespread training and technical assistance to help research entities understand commercialization pathways (Oregon Corp) ▪ Replacement of UVDF funds if tax credits are not reauthorized	▪ Lack of scale and continuity for gap funding at Pre-SBIR stages and for product validation for companies not on an SBIR path ($50,000 - $150,000) ▪ The separation of gaps funds from technical assistance providers ▪ Post-incubation space and equipment ▪ A lack of strategic funds, focused on priority sectors that allows for field testing and prototyping

SWOT Highlights: Entrepreneurship Capacity

The state's **entrepreneurship capacity** refers to a region's capabilities and conditions for forming and growing innovation-driven enterprises.

Key Take-Aways

- Oregon is doing better at starting companies than scaling them, especially tech services and consumer products which are supported by an array of capital and accelerator programs across the state.
- Oregon's ability to start R&D intensive or deep technology companies is less competitive, primarily due to the lagging support for innovation capacity.
- While Oregon's concentration of STEM talent is above average, this is not translating in high growth companies, and the trend line for attracting educated workers is flattening.
- There are strong models of regional and sector-specific ecosystem builders that show promise for statewide scaling, which can be deployed to help scale companies that have started.

Figure E-5. Entrepreneurship Capacity Highlights

	Developing and Forming Businesses	Scaling and Growing Businesses
Advantages/ Strengths	▪ The array of accelerators, incubators and signature research centers supporting startups ▪ The concentration of STEM workers	▪ Collaborative environment among investors and service providers ▪ Migration of knowledge workers (easy to attract technical talent)
Areas with Average or Improving Performance	▪ Growth of seed and angel stage capital throughout the state. ▪ The number of new startups forming each year; including university startups. ▪ Survival rates of startups.	▪ Improvement in the ability to find and attract C-level talent ▪ Pockets of sector-based mentoring programs
Disadvantages/ Needs	▪ Prototyping and early working capital funds for goods-producing startups ▪ Early stage investment capital for R&D intensive companies	▪ Low performance in the percentage of startups that scale or become high growth, especially those that reach IPO stage ▪ A lack of support for venture development organizations that connect regional assets from concept to growth stages ▪ A lack of systematic connections to national and global networks that support targeted industries

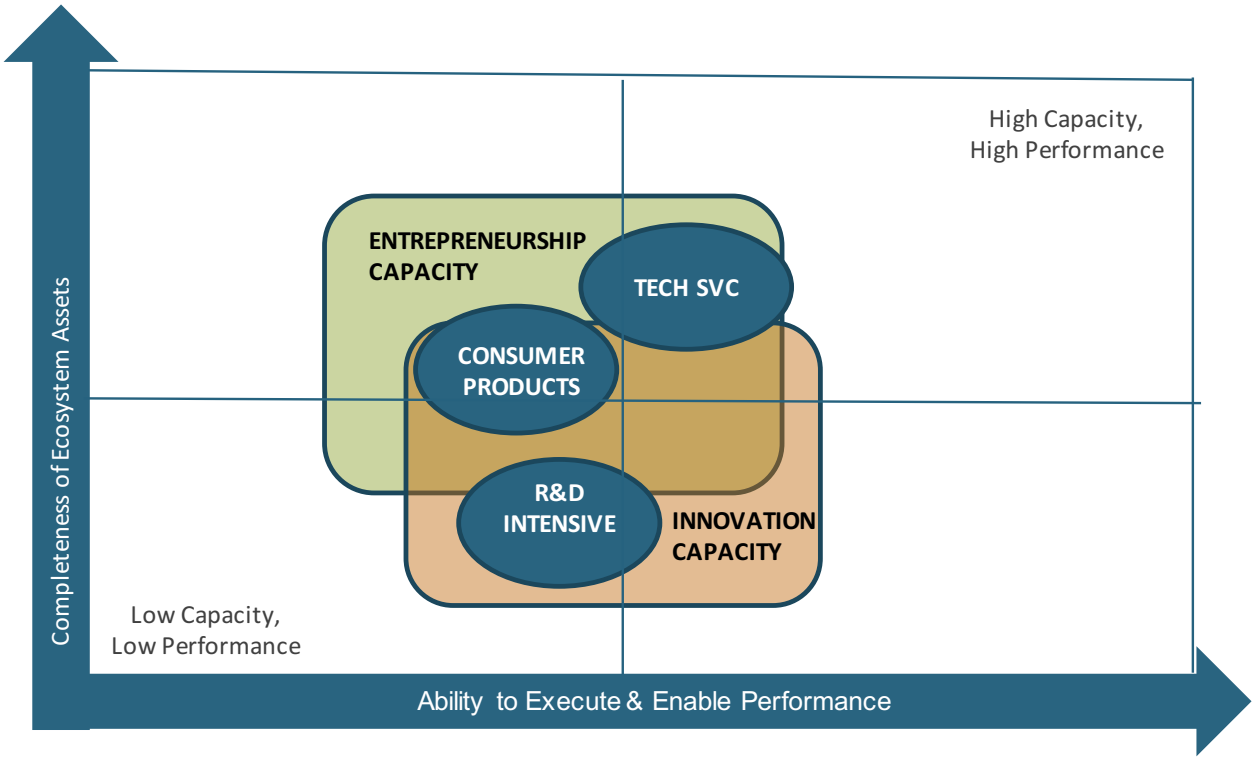
Summarizing Oregon's Innovation and Entrepreneurship Capacity

Successful I&E ecosystems can be defined as having both high capacity (abundant assets and resources) and high performance (adequate connectivity and capacity) for innovation and entrepreneurship. This corresponds to research showing that it takes more than presence of assets alone to have a successful I&E ecosystem.[42]

> ***Entrepreneurship*: Oregon does a good job of starting companies that are not research and science based, yet it struggles with growing firms.**
>
> ***Innovation:* Oregon overall capacity for commercializing science and research is lagging; yet what capacity it has, appears to be fairly efficient at producing economic benefit**.

Simply put, Oregon has more entrepreneurship assets than innovation resources, especially for tech services and consumer product startups. Yet, the innovation resources appear to be slightly more connected and leveraged than the assets to start and grow companies as shown in Figure E-6.

Figure E-6. Summary of Oregon's I&E Capacity and Performance



[42] Isenberg, Danie, What an Entrepreneurial Ecosystem Actually Is, May 12, 2014

Opportunities for Oregon's I&E Ecosystem

Oregon's ecosystem analysis uncovered opportunities to enhance innovation capacity, entrepreneurship capacity and overall system capacity.

Enhancing the Innovation Capacity

Establishing more intentional commercialization pathways. There appears to be an immediate need to increase commercialization funding and technical support to strengthen the connections between universities and industry, as well the pathway for R&D intensive companies and individual inventors to bring products to market. Specifically, there is a need for funds and technical support to move research from proof of concept to product prototypes.

Building competitive strengths and strategically supporting R&D Intensive industries. Building a competitive advantage in innovation and maximizing the growth impact of new companies often requires a set of larger, more focused strategic plays as the I&E ecosystem matures. OMIC (Oregon Manufacturing Innovation Center) is an example of larger-scale investments in public-private R&D centers. In addition to periodic investments in centers of excellence, there is also a need to make strategic investments in "scaling pathways" for innovation-driven sectors. For example, bioscience companies in OTRADI have grown to a stage where they need post-incubator space. The State could provide investments in targeted facilities enhancements or equipment that fill small, strategic gaps not covered by private development and which benefit multiple companies. The risk to the state is low since companies that reach this stage tend to have significant traction. Other states have established specific funds (similar in structure to Oregon's strategic reserve fund) to support large scale projects/initiatives that build a competitive advantage.

Improving the mechanics of how grant or investment programs operate. Interviews noted previous programs that underperformed did so more because of the mechanics related to execution rather than the intent or need. Best practices research noted high performing innovation programs employ a similar set of operating principles including: review of program awards by experts outside of the state, funds released based on reaching milestones, and technical assistance that accompanied monies disbursed. These were supported by stage appropriate metrics which measured more than jobs.

Enhancing the Entrepreneurship Capacity

Scaling regional and sector-based models that build capacity and connectedness. Data indicate that Oregon is better at starting companies than growing them. Interviews underscored this finding. Best practice research suggests that regional or sector models with high impact tend to have a dedicated connector role (In

competitive states, Utah's USTAR program, Colorado's Advanced Industries effort and Oklahoma's i2E and OCAST programs all support connector roles). This role facilitates a more intentional level of collaboration leading to an increase of how well and how fast entrepreneurs can find the right resources at the right time. Interviews noted both regional and sector initiatives that serve as such models, with the desire to expand them statewide.

Filling targeted capital gaps. Oregon is a state that makes things, from tech hardware to craft beverages. The Capital Scan report identifies production financing and working capital as a gap that affect multiple industry sectors within the I&E ecosystem. Interviews noted variations between the needs of consumer products and deep technology (R&D intensive) companies. Further work with industry organizations in consumer products (e.g., Oregon Outdoor Alliance and Built Oregon) and organizations and investors working with R&D-intensive manufacturing sectors (e.g., VertueLab, Oregon Venture Fund, OTRADI) would help to identify debt financing tools to fill early production/working capital needs.

Expanding programs that connect rural communities to I&E activities. How rural regions participate in and benefit from innovation and entrepreneurship initiatives differs from their urban counterparts. Examining how other states are connecting rural industries as co-creators and first customers of innovation can help target state investment in ways that ensure rural areas benefit from I&E investments.

Enhancing Overall Capacity and Impact

Creating more sustainable funding mechanisms for state support. Oregon's tax and revenue structure makes it difficult to consistently carve out lottery fund dollars to support initiatives that are competing for a small percentage of the state's discretionary funding. Business Oregon should examine how other states are using funding mechanisms outside of lottery or general funds to finance I&E investments.

Establishing I&E performance metrics that align with the continuum of stages within the ecosystem. Since jobs is a resulting impact that can take years to manifest, states and regions across the country use a more diverse set of I&E impact measures than Oregon does. These accepted measures can help Oregon refine its metrics to be more comparable to national practices.

Maximizing how philanthropic, government, and industry resources are coordinated and leveraged. There is an opportunity for the state to not only develop a long-term I&E strategy, but to also connect that strategy to funding and priorities of philanthropic and industry partners. Oregon's philanthropic community and industry organizations often play two roles: developing deeper insights to key challenges (e.g. the Capital Scan) and piloting new programs—essentially playing the role of concept

funder by de-risking new ideas (e.g., venture catalyst initiative). Connecting strategies and funding would allow Business Oregon to use limited resources to scale promising models, thereby increasing the likelihood of success and performance of supported initiatives. While Business Oregon participates in specific initiatives with other funders, it is unclear if there is a systematic approach that connects key funders and facilitates a coordinated support for I&E priorities.

Section 2. Best Practice Briefs

This section contains three best practice briefs that provide additional information on key gaps or challenges identified in the SWOT analysis. These briefs include:

- **Establishing more intentional commercialization pathways, especially connections between universities and industry**. This brief explores how other states have developed a comprehensive approach to combining gap funds and technical assistance to move research from proof of concept to product prototyping and validation stages.
- **Scaling regional and sector-based models that build capacity and connectedness.** This brief examines the role of ecosystem/network building roles that enhance the access to and effectiveness of entrepreneurial assets.
- **Creating more sustainable funding mechanisms for state support**. This brief examines how other states are using funding mechanisms outside of general funds to support state investments in innovation and entrepreneurship.

The briefs were chosen by Business Oregon and a project review team of external stakeholders based on the following criteria:

- The data analysis indicated a weak or declining performance for Oregon;
- Interviews of stakeholders in Oregon supported data findings;
- There was a role for state investment or support; and,
- There were identifiable practices in other parts of the country that Oregon could further explore.

The purpose of these briefs is to:

- Provide additional descriptions and information on the gaps identified by the data analysis: What specifically does this issue address and why is it important to Oregon's I&E Ecosystem?
- Identify standards of practice or current thinking within the innovation and entrepreneurial community that is driving the effectiveness of similar programs.
- Provide examples, both inside and outside of Oregon, that serve to illustrate best practice principles and provide the basis for further exploring strategy alternatives.

Inclusion and Diversity. The final brief is a summary of approaches being used to increase the participation of women and people of color as entrepreneurs, investors, and mentors. This brief specifically explores:

- Collaboration or collective efforts being deployed by regions to foster systemic change and dialogue as well as creating shared tools; and,
- Examples of how individual organization are working to enhance specific entrepreneurship and investment goals.

Part A. University-Industry Commercialization Gap Funding and Technical Assistance

SWOT Finding: Data and interviews indicate that Oregon faces challenges in terms of commercializing university research, specifically from the invention disclosure stage to the SBIR stage or point at which ventures are attractive for private investment.

Interview Recommendations: The interviews with Oregon stakeholders highlighted critical features needed for the capacity of universities, research centers, and innovation-based accelerators to move translational research into licensable technology and spinouts. There are three interrelated stages of commercialization that we focus on: (1) translational research, (2) early proof of concept, and (3) technology validation.

Best practices examined in this brief: This brief examines commercialization best practices for gap funding and technical assistance**.** Because there are different models in that work in different states, we are not prescriptive in terms of the model itself. Instead, we focus on directional best practices that could be applied to a variety of models.

What is University-Industry Commercialization?

University-industry commercialization is the process of transferring technology from university research and invention through licenses and other mechanisms to companies, typically startups, to further mature those technologies and refine product-market fit.

There is a gap between basic research (mostly from federal funds) and product validation where the private sector is willing to invest in a new product or technology. Often called the proof of concept gap or the valley of death, states increasingly play a role in helping to create this research-to-market bridge.

In this brief, we explore university-industry commercialization as the process of transferring technology from university research and invention into initial product applications with market potential.

Why is it important?

A long-term trend in university technology transfer and commercialization is the greater reliance on startups and small companies to shepherd new technologies toward commercialization. By comparison, larger companies tend to acquire technology that has demonstrated product-market fit and reached certain levels of revenue generation.

Strengthening the university-industry commercialization pathway enhances the number of new discoveries and technologies that result in new products being brought to market, as well as new companies and corresponding jobs. Regions with active commercialization

channels become attractors for entrepreneurs and innovation-driven enterprises and investors.

Summary of Oregon Commercialization SWOT Findings

Data indicates that Oregon faces challenges in terms of commercializing university research. Therefore, we conducted interviews with university accelerators, technology transfer offices, and signature research centers to gain insights into these challenges.

There is a shared concern among interviewees that Oregon is not adequately supporting a commercialization continuum, which will negatively impact the pipeline and capacity of commercialized research. Specific comments from interviews included:

- The recognition of modest efforts in place (e.g. University Venture Development Fund) and plans underway to increase commercialization funds are viewed as positive, yet not at the scale to have sustained impact.
- The importance of supporting sector-focused commercialization brokers or facilitators that act as a conduit between universities and industries—the role of signature research centers (SRCs).
- The need for early stage gap or proof of concept funds to be managed by and closely aligned with those providing the technical assistance to ensure a market lens. Funds separated from those providing assistance was viewed as being much less effective and nimble.
- Having continuity of support. Research-intensive industries are addressing large issues and can take a decade to reach market. Yet the impact of their work has the potential to be significant. Short or disrupted support of programs not only slows progress but can negatively impact the progress made to date.
- The identification of specific bottlenecks. For example, the OTRADI bioscience incubator has a waiting list and has been at capacity since opening its doors in 2013.[43]

The interviews outlined critical features needed for the capacity of universities, research centers, and innovation-based accelerators to move from translational research to marketable technologies. This capacity was broken down into three stages, each requiring stage appropriate capital and technical assistance.

- **Translational Research: Providing the initial market lens for university research**
  - Capital: Early proof of concept or translational funds, such as the University Venture Development Fund, that provides small grants to move promising technologies to later translational stages, with a goal of producing invention disclosures and patentable work.

[43] Fox, Jennifer. (undated). Growing the Startup and Scale-up Bioscience Industry in Portland. Shared via email.

  - Assistance: National Science Foundation Innovation-Corps (startup bootcamp) type training for faculty and researchers to enhance the understanding of the commercialization process, learning to conduct use-inspired research with the "lens of the market" in mind.
  - Perceived gaps: Concerns about future UVDF funds (A need to refine and reauthorize) and I-Corp type program applied to an array of sectors (proposed Oregon Corp Initiative)

- **Early Proof of Concept: Developing the pipeline of promising technologies**
  - Capital: Innovation or early gap funds that can move promising research to a SBIR stage. Funds should be connected to commercialization assistance with a goal of either licensing or preparing new startups to apply for SBIR/STTR funding.
  - Assistance: Commercialization assistance with customer discovery and product development pathways to identify specific market and funding opportunities.
  - Perceived gaps: Explorer or pre-SBIR funds ($25,000 - $100,000) that provide targeted assistance with concept development.
- **Product/Technology Validation: Creating marketable technologies**
  - Capital: Matching SBIR funds that bridge timing issues with federal grants and pays for targeted commercialization expenses not covered by SBIR (e.g. Patent applications, business and marketing plans, physical costs of expansion in Oregon, etc.).
  - Assistance: In addition to continued technical assistance, providing grant administration support helps minimize overhead costs and allows for greater focus on the technology. Companies that receive SBIRs and similar funding need assistance with grant reporting, bookkeeping, and other functions that benefit from a shared administration process.
  - Perceived gaps: The continuation of OBDD's matching grant program that provides matching validation funds.

Each stage needs to build a bridge to the next level of technology development. Capital at each stage should be connected to innovation assistance programs and be agile in their deployment.

University-Industry Commercialization Best Practices

Based on our review of best practice literature and discussions with experts outside of Oregon, we identified several principles for improving university-industry commercialization:

- Incorporating a market lens early in the commercialization process.
- Utilization of qualified external reviewers for grant funding decisions.
- Staging gap capital based on achievement of objective milestones.
- Aligning gap funding and technical assistance/advisory services to ensure "smart money" deployment of state funds to the best teams and technologies.

Another important consideration is that given limited resources at the state level, the ability to build capacity and scale in a way that genuinely makes a difference requires a specific focus. Thus, a focus on specific sectors, technologies, or missions tends to be a best practice that leads to actual impact.

Incorporating a Market Lens Early in the Commercialization Process

A key success factor is to incorporate a market lens early in the commercialization process. University faculty and staff can be trained to do commercialization assessments, third parties can be hired to evaluate technologies for market potential, and business-savvy intermediaries can be used to help evaluate commercial potential. For example, Maryland's Technology Development Corporation (TEDCO) hires "site miners" who are embedded at the universities that can keep a pulse on technologies with high commercial potential. These site miners are brought in for their specific business acumen and over time become skilled at identifying technologies that are good candidates for proof of concept funds.

Additionally, training researchers to put a market lens on their research means that they can begin to consider design tradeoffs at an earlier stage. There is often a tradeoff between technical potential and economic potential. While researchers may naturally be oriented to develop technologies at the technical frontier, the market may only demand and be willing to pay for a lower-cost solution.

Utilization of Qualified External Reviewers for Funding Decisions

Regardless of who ultimately deploys capital (whether universities, SRCs, Business Oregon, etc.), it is a best practice to implement external review into the grantmaking and other capital deployment decisions. There should also be weight placed on the assessments of organizations that provide technical assistance and advisory services since they are uniquely positioned in the ecosystem to observe technologies and teams.

Staging Gap Capital based on Achievement of Objective Milestones

Funding, whether private or public, should be tied to objective milestones. This is common for private investments and has been implemented by states like Maryland and Utah.

Aligning Gap Funding and Technical Assistance/Advisory Services

There are natural synergies of aligning gap funding alongside technical assistance and advisory services. Gap funding can be more effective if funding decisions are based in-part on the knowledge of the individuals who are directly providing services to entrepreneurs. Service providers are well-positioned to know the key details about teams and technologies that may not show up in an application such as the team's strengths and weakness and the general trajectory of the technology.

Adapting to the Realities in the Industry-University Commercialization Process

There are constraints that bind the university-industry commercialization process. State programs and policies geared toward enhancing university-industry commercialization must take these constraints into account. From a human capital perspective, we consistently heard that university professors tend not to follow their technologies out into the marketplace, at least not in a full-time capacity. Professors tend to maintain their primary responsibilities within the university system, and it is more common for professors to take a part-time or consulting role with the spinout that is focused on commercializing the technology. While it may be important to provide professors with opportunities to follow their technologies if desired, it is not the most likely path.

It is also the case that it helps to have someone focused on the business full-time, especially once proof of concept is established. Given these realities, there are a couple of different human capital models that are common for spinouts. Two common sources of leadership are post docs and current or former business leaders who are looking for a new project, but who may be willing to accept equity in lieu of a salary. According to a director at TEDCO, an institution with more than two decades of experience in this realm, the best model for spinouts in their experience is when there is a faculty member focused on technology and a separate business lead focused on the startup.

Another important trend is that rather than license early stage technologies, large established companies are relying on startups and small companies to move technologies forward to where product-market fit has been established and there is at least some history of revenue. There are always exceptions, but this was a consistent message from our interviews with experts outside of Oregon. Thus, it is of the utmost importance to reduce any barriers to spinning out university technologies through mechanisms such as licensing and knowledge transfer to startup companies.

Other Factors

We also noticed that it is common for state I&E programs to have a specific focus industry or technology sector. One could also envision a program oriented around a specific mission. Given limited resources at the state level, the ability to build capacity and scale that truly makes a difference requires a specific focus. By a state "putting a stake in the ground," it allows crowding in of resources by other partners such as philanthropic organizations, universities, other startup support organizations for synergistic investments.

Examples of University-Industry Commercialization

This section highlights several examples of state approaches to university-industry commercialization that exemplify many of the best practice principles described above.

Utah Science Technology and Research (USTAR) Initiative: USTAR is the state of Utah's comprehensive technology-based economic development agency and is a strong

example of how to bring together many of the best practices described earlier. USTAR was established in 2006 with the vision of building a robust innovation ecosystem in the state. Specifically, USTAR's mission is "to accelerate the commercialization of science and technology ideas generated from the private sector, entrepreneurial and university researchers in order to positively elevate tax revenue, employment and corporate retention in the State of Utah."[44] USTARs activities are also aligned with a handful of deep technology sectors.

USTAR describes four "key tasks" or program elements on their website:

1) Support technology entrepreneurs and innovators through training, funding, incubator and accelerator programs
2) Broker technology transfer by connecting capital, management and industry
3) Address market gaps in Utah's technology ecosystem
4) Strengthen Utah research capacity

USTAR accomplishes its work through satellite locations around the state and a competitive grant-based program run through the main USTAR office. Grants are available for proof of concept through prototyping. USTAR initially provided grants primarily to universities to support research and recruit world-class researchers to the state's two public research universities. This focus has evolved over time and is now further down the development pipeline with grants going more directly to entrepreneurs.[45] Typically grants range from $100,000 to $300,000 for work that must be completed within 18 months. According to a grant director, USTAR spends about $3 million per year on private sector startup grants and a similar amount each year on university commercialization grants.

Exemplifying best practice, USTAR grants are milestone driven. Only a portion of the grant is provided at the outset and the remainder is dispersed after grantees meet specific milestones. This means that some grantees do not get all the planned funding when they do not meet milestones, freeing up funds for other projects. Grants provided to universities also contain funding to ensure the project incorporates a market lens (I-Corp type training).

In order to deploy funds, grants are initially screened by USTAR staff. Then, the grants that pass initial screening (about 150 per year) go to an external review team out of state with both technical expertise and business expertise in the specific domain.

At a session at SSTI's 2018 conference,[46] USTAR representatives explained that the effectiveness of their program is a result of the combination of the strategic grant funding

[44] https://ustar.org/about
[45] In 2016, the state legislature re-wrote the charter of USTAR to facilitate this evolution.
[46] The Secrets of Utah's Innovation Success Story (December 4, 2018). SSTI 2018 Conference. https://ssti.org/2018conferencebrochure

and space such as incubators and accelerators as well as people such as mentors and advisors. The university technology offices have also been very active in marketing their startups to investors. For example, there are specific funds for university staff to go to the Bay Area for meetings with investors.

To facilitate monitoring and evaluation of the portfolio of grantees, companies must report impact for 5 years after grant. In the past two years, pre-seed Utah companies supported by USTAR raised more than $123 million in follow-on funding, sold more than $22 million in commercialized products, and created more than 400 new, high-paying jobs in Utah.[47]

Technology Development Corporation of Maryland (TEDCO) - Maryland Innovation Initiative (MII): In 2012, TEDCO started the Maryland Innovation Initiative based on lessons learned in two decades of experience as a state-funded technology development intermediary. TEDCO manages a fund and has five research universities in the state of Maryland that can apply for these funds to commercialize technologies. The state puts up about $5 million each year and universities must contribute a nominal amount to participate. The program focuses on two phases: (1) proof of principle studies that demonstrate the technology works and (2) the commercialization phase for companies that have licensed a technology from a university.

This program encourages universities and provides resources to incorporate a market lens at an early stage. It also combines the grant funding with technical assistance and connects companies with a network of consultants that can help on projects for 40 or 400 hours. TEDCO also funds people called "site miners" who are hired by universities but paid for through the MII program. Site miners work with university TTOs and roam the hallways and look for commercial opportunities. They help investigators put together proposals for the MII program. They also help faculty members connect with the appropriate business partners in the state. The MII program even requires that all proposals have a "site miner" included. During the review process, site miners come to the review meeting and present the cases. Over time, site miners become specialists in this process.

With the scale provided by TEDCO, universities then created their own resources and programs to help companies apply for TEDCO funds. For example, the University of Maryland had a seed grant program to provide small amounts of funding for prototyping and value proposition development so that professors could polish their technology to make it viable for TEDCO (or SBIR) funds.

Colorado Proof of Concept Grant: This state of Colorado grant program is used to identify promising technologies discovered by research institutions and connect the technologies to the private sector where development can be accelerated. Grants of up to

$150,000 are exclusively available to research institutions in support of pre-commercial research (proof of principle, IP protection, prototypes) and commercialization preparation (market assessment and start-up formation). Technologies must be aligned with specific focus industries including aerospace, advanced manufacturing, bioscience, electronics, energy, infrastructure engineering, and technology and information. This grant is part of a larger program of capital-focused programs referred to collectively as the Advanced Industries Accelerator Grant Program. In addition to the proof of concept grant, there is early-stage capital, retention grants, grants for innovation capacity building through infrastructure and workforce, and financial assistance for export development.[48]

University-Industry Commercialization Metrics

Monitoring and evaluation of university-industry commercialization initiatives can be challenging due to long-lead times between when resources are provided and when outcomes occur. While job creation for companies receiving assistance is a logical choice for programs that are ultimately geared toward helping companies mature and create jobs in the state, the typically long gap between the time when capital and/or technical assistance is provided and when job growth outcomes occur makes this metric of limited utility.[49] A timelier metric that tends to precede job growth is **additional funding attracted**. This is already used by Signature Research Centers to monitor impact for the state.

At even earlier stages, tracking the number of **active/executed licenses** and **spinout companies formed** are important to understand the technology transfer function, as well as the distribution of those activities as it aligns with strategic focus areas.

An additional approach, that has been deployed for state and federal I&E programs, are **technology readiness levels** (TRLs). TRLs generally range from 0 to 9, are fairly linear in nature, and are used to assess where a technology is in the technology development process. It is feasible to ask program participants and administrators to track TRL data, but there may be an administrative burden as well as a lack of clarity around where to place technologies given that technology development is not linear. **Commercial readiness levels** (CRLs) are a related approach that are designed to capture milestones associated with the commercialization process. Massachusetts Clean Energy Center, New York State Energy R&D Authority, and the federal Advanced Research (ARPA-E) are examples of programs that have experimented with or are currently using CRLs in practice.[50]

For specific programs like state SBIR matching programs, some states like North Carolina have tracked the success rate of their SBIR matches in terms of obtaining Phase 2 federal

[48] Colorado of Economic Development and International Trade (undated). ADVANCED INDUSTRIES ACCELERATOR GRANT PROGRAM APPLICATION GUIDELINES.
[49] TEDCO is a counterexample. They are able to successfully use job creation metrics when reporting to the state legislature. This is likely a result of their scale and long history of working in this space.
[50] For example, refer to MassCEC's commercial readiness level descriptions at http://files.masscec.com/COMMERCIAL%20READINESS%20LEVELS.pdf

funding compared to national average success rates. Assessments like these are useful but not conclusive. They suffer from a lack of data about all applicants not participating in the state matching program.

Implications for Oregon

At a high level, the federal government tends to fund basic research. The role of the state tends to be in the area that bridges federal research with industry, specifically in areas where there is underinvestment by the private sector, but where investment would lead to public benefits in the form of long-run job creation. State resources can also bring a level of scale to providing capital and technical assistance for I&E activities that would not be possible through other funding sources.

Because public universities are within the purview of state policymakers, there is certainly a role for the state in working to create conditions and programs that enhance university-industry commercialization and the link with economic development in-state. While it is important to acknowledge that many technologies commercialized by companies in Oregon do not emerge from universities, the university-industry pathway is something that the state can directly work to enhance and is in the state's realm of influence.

The best practice operating principles described in this section provide directional guidance to Oregon on how to approach programming and policies focused on university-industry commercialization. It also provides specific examples to dive deeper where needed.

From a review of the new policy option package narrative for the "University Innovation Research Fund", it appears that as currently written it may be targeted more broadly to leverage federal funding sources, whether translational or not. This package may strengthen Oregon's research pipeline, but unless further tailored, it does not appear to directly address gap funding and technical assistance needs at the post-invention stages specifically described in this brief.

Part B. The Role of Ecosystem/Network Building in Innovation and Entrepreneurship

SWOT Finding: Oregon has made considerable progress in putting individual I&E assets like accelerators and capital in place yet, data shows we perform better at starting companies than scaling them. Most regions, however, are not yet performing as a cohesive system, and therefore not optimizing their potential economic impact.

Interview Recommendations: With many assets in place, Oregon now needs to turn its focus on amplifying capacity—to develop robust ecosystems that can take assets and resources to the next level. As one serial entrepreneur noted "*we need regional and sector-based caretakers: somebody or some organization, with the role to connect and leverage resources.*"

Best practices examined in this brief: Ecosystem and network building models that are increasing capacity and effectiveness of their I&E assets.

Summary of Ecosystem Building Functions

Often the first decade of support for innovation is based on building individual assets and resources, proceeded by intention efforts to connect and scale assets that enable entrepreneurs to readily find, navigate and optimize the right resources at the right time. As Oregon's I&E ecosystem matures, this next level of capacity building becomes critical.

Ecosystem builders are the catalysts, connectors, and changemakers that turn parts into a cohesive system so that entrepreneurs can access, utilize and benefit from the resources around them.
Kauffman Foundation

Who are ecosystem builders?

Ecosystem builders are people and/or organizations that promote the effectiveness and sustainability of I&E ecosystems by cultivating meaningful collaboration among resources and amplifying the energy and enthusiasm around entrepreneurship.

Why are they important?

Ecosystem builders allow for the "fast flow of talent, information, and resources so that entrepreneurs can quickly find what they need at each stage of growth. As a result, the whole is greater than the sum of its parts."[51] This is especially important for companies in post-launch stages when they are focused on accessing and growing markets. (One of Oregon's key weaknesses identified from the data and interviews in SWOT analysis.)

[51] https://www.linkedin.com/pulse/ruralrise-role-rural-entrepreneurial-ecosystems-tina-metzer/

What are the outcomes and benefits of ecosystem builders?[52]

As with many economic programs, it is difficult to attribute specific economic outcomes to a single program, organization or role.[53] In ecosystem building roles, outcomes are measured by the enhancement to the overall regional or sector ecosystem. These include:

- Accelerated growth of young companies (measurable revenue, investment, and job impact);
- An increase in resident and attracted capital;
- More diversity among entrepreneurs and service providers;
- System efficiencies that allow for existing resources to do more; and,
- Enhanced reputation of a region or sector that further attracts entrepreneurs and investors.

Background on Ecosystem Building

In basic terms, I&E ecosystems tend to be described as having entrepreneurs who start new businesses, capital that finances new ventures, people and institutions with knowledge and resources to help entrepreneurs, and talent that can help companies grow. As the SWOT analysis identified, having such assets in and of themselves do not make an ecosystem. It is the connections, capacity, and continuity (the "enablers") that drive system performance and create shared goals, standards of practice, and accountability.

There are an increasing number of studies evaluating I&E processes and performance to understand the barriers that prevent systems from achieving optimal results. They note many communities have the elements of an I&E ecosystem, but they remain disconnected and fail to produce desired results. Daniel Isenberg points out that assets such as entrepreneurial education programs or co-working spaces are helpful, but there is no systematic evidence that, as individual programs, they contribute to an increase in growth-oriented ventures unless they are part of connected system of resources.[54] This research[55] describes system barriers as:

- Exclusive or inaccessible networks,
- Disconnected technical assistance programs,
- A culture that discourages risk and new ideas,
- The inability to readily find talent and professional expertise, and

[52] A summary of results gathered from references footnoted throughout this brief.
[53] In addition to outcome and output metrics, it is recommended that qualitative data is collected from regional or sector programs to track whether partners attribute regional enhancements in part to ecosystem building roles.
[54] Daniel Isenberg, What an Entrepreneurial Ecosystem Actually Is, May 12, 2014
[55] Conclusions reached from reports authored by the Kauffman Foundation, the Aspen Institute, Case Foundation, Babson College Entrepreneurial Ecosystem Project, E-Ship Summit, and TechStars.

- Entrepreneurs having little voice in policy decisions or program development.

What Sets One I&E Ecosystems Apart From Another?

While the knowledge and resources required by entrepreneurs are diverse, **strong ecosystems are defined as those that allow entrepreneurs to quickly find knowledge and resources they need to succeed.** The Kauffman Foundation notes in that in a successful ecosystem, resources are not just more abundant, they are more visible and accessible. In another examination of over 25 entrepreneurial ecosystems, researchers concluded that it is often connections among individuals and institutions that allow knowledge and resources to flow to entrepreneurs quickly.[56]

In the past several years, the Kauffman Foundation has conducted hundreds of discovery discussions to understand the needs of entrepreneurs and those who champion entrepreneurs. In their 2018 Playbook, the foundation states, *"These conversations reaffirmed our commitment to advancing entrepreneurial ecosystems as a model for economic development. That model focuses on how the whole of a community is far greater than the sum of its parts. It means starting with what a community has and connecting the pieces. More than ever, we believe ecosystem building can transform communities of varying sizes, demographic and socioeconomic contexts, and geographies, and create more sustainable economies everywhere. We also learned, however, that people building ecosystems can't succeed on their own. Doing it well requires a comprehensive approach, interlinked networks, collective learning, and institutional support."*

Defining characteristics. An examination of findings from the Kauffman Foundation, Case Foundation, Aspen Institute, and others[57], and articles from serial entrepreneurs (as footnoted throughout this section), point to several key characteristics of a strong I&E ecosystem:

- A nurturing entrepreneurial culture that is defined by the community energy and enthusiasm for entrepreneurship. (Does the region or sector welcome or embrace entrepreneurs?)
- Visible and inclusive on-ramps or access points that are easy to access regardless of an entrepreneur's background, experience, or ideas. (How easy it is to find your way in? How welcoming are networks to diverse backgrounds?)
- Connected networks with multiple intersections or collision points between people, ideas, and resources that allow entrepreneurs to quickly find missing pieces. (How easy it is to navigate resources and exchange ideas?)

[56] Maria E Meyers and Kate Pope Hodel, Beyond Collisions: How to build your entrepreneurial Infrastructure, December 2017

[57] Kauffman Foundation: https://www.kauffman.org/entrepreneurial-ecosystem-building-playbook-draft-2/introduction; Case Foundation: https://casefoundation.org/program/global-entrepreneurship/; Aspen Institute; https://www.aspeninstitute.org/tag/entrepreneurship/

- A shared strategy and "honest collaboration" steeped in trust where organizations co-create, share credit, and collaboratively implement their strategy. (Is there a sense of shared responsibility?)

What is an Ecosystem/Network Builder and Their Role?

While there is no single formula that creates cohesive I&E ecosystems, there are ways to make ecosystems perform more effectively. There is a growing body of evidence that ecosystem or network builders play an essential role in overcoming system barriers. This premise was supported by interviews for this project where Oregon entrepreneurs and stakeholders noted the importance of system-wide connectors and facilitators: and provided examples of initiatives that embody these roles.

Ecosystem builders are champions for entrepreneurs, typically entrepreneurs or investors themselves. The following are commonly used descriptions of ecosystem/network builders:

- Champions and conveners that promote entrepreneurs, organize the ecosystem, and build awareness.[58] They advocate for local entrepreneurs and their companies, bring them together in collaboration, challenge them to grow, and push everyone forward. While these champions and conveners vary in background, they work with a pay it forward attitude to help entrepreneurs and companies.
- They are "system entrepreneurs", who work to elevate the whole community to achieve its potential. They play multiple roles, including system architect, champion, advocate, convener, cajoler, traffic cop, air traffic controller, and storyteller.[59]
- They are a keystone species that bridges gaps in the ecosystem: they cross-pollinate people, ideas, and resources across barriers. Keystones empower others to lead by inviting and encouraging. The more leadership is shared and multiplied, the more entrepreneurs will benefit from diverse connections and mutually beneficial collaborations.[60]

While every region or sector is different, the roles required to develop a systems-based understanding of needs and solutions and then foster action are relatively consistent across models. Ecosystem/Network builders tend to play the following roles:

- Facilitating a collective regional or sector strategy for entrepreneurship.
- Identifying specific gaps in the ecosystem (such as seed funds or a sector-specific accelerator program) then convening appropriate partners to take ownership and spin-off solutions.
- Establishing a collective pool of mentors and convening partners on a regular basis to build trust and help guide entrepreneurs to appropriate resources.

[58] Jim Schell, How to Make Your Community's Economy Sizzle: A Handbook for Reshaping Your Entrepreneurial Ecosystem and Creating Jobs in the Process, 2017
[59] 2018 E-Ship Summit https://www.camoinassociates.com/eship-summit-challenge-ecosystem-builders
[60] https://www.kauffman.org/entrepreneurial-ecosystem-building-playbook-draft-2/iii-how-do-we-create-entrepreneurial-ecosystems

- Working to build on-ramps and access points for entrepreneurs with varying backgrounds.
- Collecting and measuring the collective impact of the I&E ecosystem.
- Creating venues to share best practices and work more collectively.

Ecosystem Building Best Practices Principles

Ecosystem building best practices are not so much a structured "plug and play" model, but rather a set of operating principles for how I&E ecosystems can be supported in various environments. These principles include:

- The role of catalyzer/connector is explicitly funded as a value-added function—it is somebody's job to foster interactions and build networks.
- The role operates from an organization that has community/sector standing and is viewed as a facilitator or bridge builder. Stakeholders within these regions or sectors identify who plays this role, and back it with a meaningful level of buy-in.[61] In other words the network is already under development and has shown traction, and public support then helps to sustain and amplify results.
- There is consistent funding that recognizes ecosystem-building functions are foundational and that creating a supportive culture takes time. Limited or one-time grants are often inadequate.
- Regional or sector footprints operate at a scale large enough to provide and sustain an active pipeline of startups with high growth potential.[62]
- There are metrics that measure systems enhancements and network connections as well as entrepreneurial outcomes.

Examples of Ecosystem and Network Building Models

Most ecosystem/network builders are a part of regional or sector-based efforts that reflect the unique needs of their market or are driven from entrepreneurial organizations with a broad network-building mission. In some cases, states have established regional hubs that are integrated into a coordinated statewide network.

Regional or sector-specific initiatives

Most ecosystem building initiatives have been created at a regional or industry sector level. Both applications operate in similar ways: with a position or small team playing a catalyzer and connector role.

Regional approaches: These efforts typically reside within an economic development or nonprofit organization that helps to catalyze a shared regional entrepreneurial strategy, identify regional assets and entrepreneurs, build a functional network among providers,

[61] The consulting team's observations of multiple projects support the premise that regionally identified champions are more sustainable than state-run grants programs that attract the develop of new networks trying to obtain funding.

[62] *Daniel Isenberg and Vincent Onyemah,* Fostering Scale Up Ecosystems for Regional Economic Growth, 2016

and assist entrepreneurs with connections to resources. An example in Oregon include Central Oregon's Venture Catalyst housed in EDCO.

Sector approaches: These efforts provide support for growing and integrating resources within a specific industry sector, assembling mentors and professional services, building connections to investment resources to understand sector specific needs, and establishing accelerator and peer-based programs. Examples in Oregon include the Oregon Outdoor Alliance and their partnership with Bend Outdoor Worx or Built Oregon.

Statewide entrepreneurial network

Like regional and sector-based applications, there are also examples of ecosystem building roles within entrepreneurial organizations that have a statewide footprint. While these groups may provide direct services to entrepreneurs (education, mentoring, and investment), their stated mission also includes connecting resources and building networks within and outside of their state in order to provide expanded doorways for entrepreneurs. They can also facilitate best practices serving as statewide conveners of regional and sector-specific efforts. In Oregon, examples of these organizations include TiE Oregon and the Oregon Entrepreneurial Network.

Structured state-wide networks of regional I&E hub organizations

States like Ohio, Pennsylvania, Kentucky and others have used state funding to support regional hub organizations in their work as a network connector and facilitator for more than a decade. In Pennsylvania, the Ben Franklin Partnership Initiatives (established in 1989) spends approximately $14 million per year to support four primary I&E hub organizations and ten satellite offices in a coordinated statewide effort. Most of this funding supports gap funds, mentoring services, and accelerators; however, another portion is used to support their regional ecosystem building role. (The specific budget breakdown was not available.)

In Ohio, the Third Frontier Program, the state's long-term innovation strategy, uses a portion of its funds through the ESP program (entrepreneurial support program) to fund a set of regional hubs much like Pennsylvania. In Central Ohio (Columbus region), Rev1 Ventures is the designated I&E hub organization. In addition to providing seed funding and business mentoring, they serve the role of developing the region's I&E infrastructure. For example, they have worked with The Ohio State University to create targeted gap funds and business assistance to build stronger bridges for their commercialization program. In the past 5 years, the number of technologies accessed has increased eight-fold, gap funding has more than tripled, and the number of spinouts have increased by four-fold. Rev1 also facilitates a working partnership with the Columbus Partnership (a business organization of leading firms) and local governments to pool funding and develop collaborative programs and multi-stage capital funds across a 10-county region to address specific issues related to starting and scaling companies. These leveraged resources have been attributed to the significant improvement in Columbus' entrepreneurial performance where over $737million

of investment capital has been attracted and $1.4 B of direct economic impact has occurred. Columbus now ranks #3 nationally in scalable startups and #1 in the density of startups classified as high growth. During this time, the diversity of women and minority founded startups increased to over 38% of funded companies.[63]

An Example of Regional Ecosystem Building in Oregon

For over a decade, regions like Boulder, Colorado, and Austin, Texas have been identified as entrepreneurial hotspots. Over the past five years Bend, Oregon has been added to this list.[64] Our interviews across the state consistently pointed to Bend and Central Oregon as an example of a highly effective entrepreneurial ecosystem. In 2017, Jim Schell wrote a book comparing Bend to regions like Boulder and examining what led to its success.[65] This is further supported by data that shows that Bend has more than twice the state average concentration of new businesses.[66]

Interviews with those in Central Oregon readily acknowledged that the region's strong collaboration and linked resources stem from a core set of leaders that have tirelessly championed the network for over a decade. As Jim Schell pointed out in his book about reshaping entrepreneurial ecosystems, "Any project worth doing required a champion, Champions assemble teams, and it takes teams to get things done." In Central Oregon, Schell points to the leadership of the regional economic development organization EDCO and its president Roger Lee. Much like Brad Feld's role in Boulder, Lee did not do most things on his own. Instead he worked to assemble a team of entrepreneurial leaders and champions that have built interconnected resources and created a culture that has gained national attention.

This collaboration within the community has developed resources such as Cascade Angels, Seven Peaks Ventures, the Stable of Mentors, Founders Pad, and others. It has grown the Bend Venture Conference into the biggest Pacific Northwest investment event. For over a decade, EDCO has continuously supported this network through a committed *venture catalyst position* that has responsibility for connecting the dots and spinning off new opportunities. This position has been funded through a combination of philanthropic, government, and private resources.

From July 2014-June 2018, with a budget of less than $200,000 per year, this ecosystem builder role in EDCO has connected over 380 high growth entrepreneurs to resources, helped companies access $50 million in investment capital, and produced $81 million in new

[63] A full impact report can be found at https://www.rev1ventures.com/impact-report/.
[64] John Cook, Can Bend become the next Boulder? October 2014; Forbes Best Small Place for Business & Careers, 2016; Milkin Institute Best Performing Cities Index; Blogs from Geekwire and Busted Cubicle.
[65] Jim Schell, How to Make Your Community's Economy Sizzle: A Handbook for Reshaping Your Entrepreneurial Ecosystem and Creating Jobs in the Process, 2017
[66] http://cascadebusnews.com/bend-entrepreneurs-registered-businesses-per-capita-large-city-oregon-2017/

company revenue.[67] While attribution for this impact is spread among the partners within the ecosystem, the partners themselves credit the ecosystem builder role of EDCO for accelerating the pace and enhancing the quality of available resources. Another benefit of a highly connected network is improved on-ramps for entrepreneurs with diverse backgrounds. Cascade Angels in Bend reported that over 50% of founders in their investment portfolio were women or entrepreneurs of color and 25% of their CEOs were women. This is well above the national average.

Ecosystem/Network Building Metrics

Measuring network or ecosystem performance (as opposed to individual program metrics) requires both systems and process measures alongside impact metrics. Figure 2-1 lists ecosystem building metrics being used by programs across the country.

Figure 2-1. Ecosystem Building Metrics

Best practice characteristics of a highly effective Entrepreneurial ecosystem	Metrics being used to measure ecosystem effectiveness
A nurturing and supportive entrepreneurial culture	▪ The number of mentors actively working with entrepreneurs ▪ The amount of resident capital being invested in companies ▪ Number of entrepreneurs engaged in program and policy development
Intentional interactions that bring entrepreneurs together with mentors, investors, and other resources	▪ The number of events or programs that bring resources together (as opposed to individual services)
On-ramps for people with diverse backgrounds	▪ The diversity of entrepreneurs receiving services ▪ The diversity within funding portfolios
A shared strategy and collaboration steeped in trust	▪ The presence of a regional entrepreneurial strategy with organizations participating in its funding and execution ▪ The number of cross-referrals among programs
Overall Ecosystem Impact	▪ Number of entrepreneurs served ▪ Dollars of resident capital used for investment ▪ Amount of funding attracted by startups ▪ Revenue and job growth of companies served

Implications for Oregon

Research suggests that strong I&E systems are driven not by how many resources are available, but by how-well they work together. The amount of funding to support regional or sector-based models is relatively modest, especially when compared to the significant

[67] Metrics reported by EDCO, December 2018

benefits they produce. While funding for these projects vary, starting points for regional or sector-based efforts examined in this brief appear to be in the range of $150,000 - $200,000 per year (per region or sector). Larger statewide coordinated models like Ohio and Pennsylvania spend considerably more.

As Oregon's I&E landscape matures, ecosystem building functions provide an opportunity for the deployment of state resources to scale and enhance effectiveness from the resources that have been put in place over the past decade. Since ecosystem/network building efforts can be applied at the regional and sector level, it can build capacity within geographies as well as key sectors.

Part C. State Funding Mechanisms for Innovation and Entrepreneurship

SWOT Finding: Building a robust I&E ecosystem takes multiple decades. Therefore, the continuity and scale of I&E funding strongly influences the impact or performance of state investment, especially in areas where public sector support provides targeted bridge funds or acts as a catalyst to attract private sector investment and support.

Interview Recommendations: Oregon needs to establish a more diverse or consistent revenue source for core I&E investments that do not depend exclusively on general and/or lottery funds.

Best practices examined in this brief: Funding mechanisms used by other states to support I&E initiatives that can serve to augment or replace of lottery and general funds.

Overview

State funding in Oregon for I&E programs comes primarily from lottery, general funds, and the Education Stability Fund. In the 2017-19 legislative session, funds dedicated to programs categorized under an I&E umbrella[68] included:

- Approximately $18.2 million per biennium of lottery funds allocated to the Oregon Innovation Council through Business Oregon base budget, which includes support for signature research centers, SBIR program, and grant initiatives.
- Approximately $6.6 million for support of the Oregon Manufacturing Innovation Center (OMIC); with $3.6 million from Lottery funds, and $3 million one-time moneys transferred to OBDD from the *Connect*Oregon Fund in the Department of Transportation for infrastructure.
- Approximately $1 million for the Regional Accelerator and Innovation Network (RAIN) serving the South Willamette Valley and Mid-Coast region.
- Approximately $20-30 million to the Oregon Growth Account (OGA) for investment purposes in venture capital funds, growth funds, and equity funds within and outside of Oregon. In recent years, the OGA has made total annual commitments of between $13M and $28M.
- Approximately $1 million to the Oregon Growth Fund (OGF) for investments in smaller funds, including angel conferences, nonprofit lenders, and first-time venture capital funds

[68] Business Oregon also funds other small business and general entrepreneurship programs which are not included since the majority of companies serve are not IDEs. This list also excludes sector-based programs which may contain innovation aspects as part of a broader objective.

According to the SSTI, the national organization of state and regional innovation and entrepreneurial organizations, most states fund I&E initiatives, exclusively or in part, through general funds. There are, however, other mechanisms that are used to augment general funds. Included in this brief are highlights on the uses of:

- Bonds,
- Tax increment financing on income tax payments related to innovation industries,
- Tax incentives, and
- One-time or periodic payments from specialized or settlement funds.

Bonds

States such as Ohio, California, Texas and Maine use bonds to help fund innovation and entrepreneurship efforts. These efforts tend to focus on supporting R&D intensive industries that require significant investment in equipment and technology. (Note: The Oregon Innovation Council currently has authority to issue bonds under ORS 284.746.)

MAINE: As a small state, Maine provides perhaps the most useful information for Oregon about how bond funding is used in tandem with general funds: Specifically, as it relates to R&D facilities like OTRADI and OMIC, or high opportunity grants which in Maine would be covered, in part, under programs funded from bond revenues.

For almost two decades, Maine voters have approved multiple bonds totaling more than $200 million focused on capital investment for R&D infrastructure and deep technology[69] companies. Maine also allocates approximately $21 million each year in general funds. The latest bond was for $50 million passed in June 2017; $45 million allocated to the Maine Technology Institute (MTI) to support the development of capital assets in seven targeted innovation sectors, and $5 million to the Maine Venture Fund, the state's quasi-public venture capital fund that invests in early-stage companies. In Maine the allocation of funds uses a competitive process managed by the Maine Technology Institute, the state's science and technology authority. In Oregon, the closest organization would be the Oregon Innovation Council.

Bond funds have been used to support a combination of projects that are directed at companies, universities, and research or industry-based nonprofits (similar to Oregon's signature research centers). These efforts funded key aspects of innovation infrastructure including equipment, technology, and building improvements. The funds have been instrumental in developing capacity to support unique R&D intensive industries in Maine including marine sciences and cleantech.

[69] Deep technology startups are commonly defined as companies that are founded on a scientific discovery or true technological innovation. Also referred to in this report as R&D Intensive industries.

Ohio: Ohio's Third Frontier program has issued over $1.2 billion in general obligation bonds since 2002 to fund innovation efforts throughout the state (with limits of no more than $225 million per year). In Ohio, bond revenues can be used for "Research and development in support of Ohio industry, commerce, and business, which shall include, without limitation, research and product innovation, development, and commercialization through efforts by and collaboration among Ohio business and industry, state and local public entities and agencies, public and private education institutions, or research organizations and institutions, all as may be further provided for by state or local law, but excluding purposes provided for in Section 15 of Article VIII, Ohio Constitution."

Third Frontier funds have been used for a broad array of I&E efforts including university research, commercialization funds, entrepreneurial services, seed and angel funding, and other related activities. Funds covered both capital and operating costs.

Tax Increment Financing Models

Colorado: Colorado's I&E programs are operated through their Advanced Industries Accelerator Program that includes proof of concept and early stage capital funds, grants for industry R&D collaboratives and projects, and an export accelerator program to help industries grow new markets.

The program is supported through a combination of funding that includes $5.5 million from gaming revenue targeted for bioscience companies, and tax increment financing for cleantech and other advanced industries with disruptive technologies. The tax increment financing is based on the premise of taking a portion of revenue growth derived from a specific source and reinvesting funds back into that source (e.g. think gas tax for roads).

Colorado's tax increment financing takes 50 percent of a rolling three-year increment in income tax withholding from specific innovation industry codes as detailed in state statue § 39-22-6043 (primarily biotechnology and cleantech). It uses this increment to fund programs for seven targeted innovation industry sectors. When this program was established, the state also contributed general funds that are no longer available. This tax increment financing method provides $5 - $9 million each year. Together with gaming revenues, this provides a base of approximately $14 million per year for the four advanced industries programs. Because tax increment financing is cyclical, a portion of funds can be carried forward. According to Colorado's program administrator, approximately $4 million is currently kept in reserve.

The Use of Tax Incentives

There is an array of tax incentives used to promote specific I&E behaviors or outcomes. The two most commonly used incentives for innovation and entrepreneurship are R&D tax

credits and investment tax credits (primarily focused on angel investments in early stage companies). Oregon's R&D tax credit expired in 2017.

R&D TAX CREDITS

R&D tax credits are used to promote private sector activity that leads to the development of new technologies and scientific discoveries. Over 35 states have some type of R&D tax credit. The range in the designs and benefits vary as to how they affect a company's tax bills: they can apply to reductions in franchise taxes, sales and use taxes, income taxes, payroll taxes or simply the overall tax obligations.[70] Research as to the degree they produce positive impact is mixed with some reports indicating a high level of spillover effect and other showing a modest level of impact based on the type of credit evaluated.

While Oregon's R&D credit expired in 2017; there may be merit in exploring a modified version focused on credits for small and young companies that struggle with early commercialization funds.

As the 2017 review of Oregon tax credits reported, Oregon companies with less than $5 million in sales accounted for almost 80% of the number of tax credit claims, yet only $2 million out of the total $15.2 million in credits issued. The great majority of credits went to large firms.[71] The Legislative Revenue Office also concluded that while Oregon's tax credit fell in the middle of the pack among states, it cost very little to administer, and was simple for businesses to use.

Given criticism of R&D tax credits disproportionately benefiting large companies, some states have modified their R&D tax credits to have a greater benefit for smaller and younger companies (a modification listed in Oregon's review of the tax credit). This is primarily accomplished by limiting what size companies receive credits or making the credit refundable for small or young companies. Examples of R&D tax credits focused on small or young firms include:

- Arizona: where the R&D tax credit is refundable to companies with no more than 150 fulltime employees. Total credits capped at $5 million per year.
- Delaware: that recently made its R&D tax credit refundable.
- Virginia: that offers a refundable R&D tax credit for expenses under $5 million.
- Maryland: where R&D tax credits are refundable for small businesses with less than $5 million in R&D expenses to the extent that the tax credits exceed the income tax liability for that year.

INVESTMENT AND DONOR TAX CREDITS

Investment tax credits have been used by states to foster the development of angel and venture capital by encouraging more resident capital (investors that are residents of the state). While the results of these tax credits have been largely measured by the increase in

[70] Analysis by SSTI, 2017
[71] Oregon Legislative Office, Research Report 2-17, Review of Tax Credits, February 8, 2017

follow-on funding or funds under management, an equally important aspect is the ability for credits to encourage investments in companies with high growth potential but that might not fit the return levels or time profile of traditional venture capital.

Data and interviews from the SWOT analysis indicate that Oregon struggles with growing companies after they have been launched. Interviews noted that companies in sectors such as outdoor gear or food and beverage do not always meet terms of angel and venture funds, and that individual investors are often sources of start-up capital. For this and other reasons, Oregon may wish to explore:

- *Tax credits for investments in companies within selected industry sectors with revenues and/or employment below a specified threshold.*

  States with investment tax credits typically provide a 25-35 percent credit with a per investment cap. Carry forward and other provisions vary by state. Some states provide credits to investments in individual companies as well as qualified funds. Some states, like Tennessee offer additional credits for investments in targeted geographies. The Angel Capital Association provides a list of states with investment tax credits, plus reports on the impact tax credits may produce. State examples with hyperlinks to statutes or descriptions include:

  - Arizona, Arkansas, Colorado, Connecticut, Georgia, Illinois, Indiana, Kansas, Kentucky, Maine, New Mexico, New Jersey, North Dakota, Ohio, South Carolina, Tennessee, and Wisconsin.

- *Reduction in capital gains for a sale of an Oregon business that is reinvested into another Oregon business* within a specific time period.

- *Reauthorizing tax credits such as the* University Venture Development Fund (UVDF) to provide universities with matching funds towards translational and commercialized research, with the potential of expanding tax credits to include donor-based funds and managed authorized organizations such as signature research centers.

Other Funding Sources

SETTLEMENT FUNDS

Michigan funds its 21st Century Jobs Trust Fund through an annual appropriation of $75,000,000 from their **Tobacco Settlement** monies. This represents approximately 6% of the state's $1.24 B in tobacco settlement payments. In September 2018, Bill 1108 was introduced to extend this payment to the Trust Fund through 2023. Details for the uses of the 21st Century Jobs Trust Fund are detailed in Public Act 215, passed in 2005.

AUCTION OF PREMIUM TAX CREDITS

Some states fund specific programs by allocating premium tax credits which authorities can then auction or sell to other entities such as insurance companies. This is similar to how Oregon's Film & Video Office administers its credits.

Colorado allocated $50 million in premium tax credits to fund the Venture Capital Authority that makes investments in early stage companies, with a mandate to place 50 percent of these investments in rural and underserved urban areas.

ESCHEAT FUNDS

Escheat funds are funds of unclaimed property or assets, primarily from residents with no apparent heirs, where the state holds assets while attempting to locate heirs. In Oregon, the State Lands Department administers this program containing approximately $500 million in assets. A significant portion of assets (up to 50%) in each state accumulate over time. States like **North Carolina** have taken limited draws from their state Escheat Fund to seed or expand innovation efforts.

Implications for Oregon

In addition to the general/lottery fund allocation in OBDD's base budget, the state has an opportunity to fill critical gaps in Oregon's I&E ecosystem through additional revenue streams. Areas for further exploration include:

- Bonds that could support technology, facilities and equipment needs for innovation-based industries as noted in the SWOT analysis. Oregon has the potential to exercise its bonding authority for innovation to address needs such as:
  - Upgrading and expanding the capacity of research collaboratives (e.g., OTRADI, ATAMI, and others);
  - Providing strategic investments in larger project-based opportunities that attracts and leverages private investment (e.g., OMIC); and
  - Establishing grants to companies for capital investments used in prototyping products and scaling production.
- Tax increment financing to support early stage needs of innovation-based industries that created the tax base from which the funds were derived. This funding could help address gaps including:
  - Proof of concept and early stage gap funds;
  - Ecosystem-building grants to develop coordinated statewide sector-based networks and accelerator programs; and
  - Export and market assistance funds to help companies with costs associated with national and international market research, customer development and trade shows.

- Options such as the auction of premium tax credits to seed early-stage working capital funds.

Part D. Diversity, Equity and Inclusion (DEI) Considerations for Innovation and Entrepreneurship

In this brief we explore activities that organizations within I&E ecosystems are taking to support diversity, equity, and inclusion (DEI) as they seek to provide greater opportunities for women and ethnically/culturally diverse individuals. Forward Cities defines **Inclusion** as existing "when under-connected individuals are participating and/or being actively recruited and engaged in ways that build social capital across diverse networks. Inclusive innovation ensures that the local innovation ecosystem is also intentionally fostering the growth of innovative organizations led and owned by minorities, women, and other under-connected groups." We specifically focus on efforts that create on-ramps and supports for women and entrepreneurs of color.

In the report *Delivering Through Diversity*, McKinsey and Company offers statistically significant results on how companies with more diverse leadership teams outperform companies with less diverse leadership teams on key financial metrics such as profitability and value creation.[72] They report that companies in the top-quartile for ethnic/cultural diversity on executive teams were 33 percent more likely to have industry-leading profitability and 27 percent more likely to have superior value creation.

Another economic benefit for racial and gender equity can be measured in quantifiable benefits of people of color and women earning more income, starting more businesses, and accessing private investment. For example, research conducted by the W.K. Kellogg Foundation and Altarum estimates that wage parity (equal earnings among races) would generate an additional $1 trillion in earnings, which would translate to an additional $800 billion in spending.[73] Despite the body of evidence that shows the advantages of diversity, barriers for women and entrepreneurs of color still remain, as illustrated by the statistic that in 2017 women founders only received 2 percent of venture capital investment, down from 4 percent a decade ago.[74]

Current DEI Practices

The economic advantages for DEI, as well as the metrics that indicate the challenges still faced, are influencing how institutions focused on entrepreneurship and innovation are creating more inclusive on-ramps. We examined three issues and the related actions being

[72] Hunt, Vivian, et al. McKinsey and Company. "Delivering through Diversity." January 2018. Accessed: https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Organization/Our%20Insights/Delivering%20through%20diversity/Delivering-through-diversity_full-report.ashx.
[73] Turner, Ani. Altarum and W.K. Kellogg Foundation. "The Business Case for Racial Equity: A Strategy for Growth." 2018. Accessed: https://altarum.org/sites/default/files/uploaded-publication-files/WKKellogg_Business-Case-Racial-Equity_National-Report_2018.pdf.
[74] http://fortune.com/2018/01/31/female-founders-venture-capital-2017/

used by various organizations across the country that can serve as a starting point for further exploration.

- How groups of organizations (**community collectives**) that are working together to foster a shared understanding about why DEI matters and developing collaborative tools and programs to increase access and support across the I&E ecosystem.
- How specific **entrepreneurship programs** are creating the on-ramps and skills development for women and entrepreneurs to successfully start and grow scalable companies.
- How organizations are increasing the level of **investment capital** available to women and entrepreneurs of color.

Community Collectives

Providing the capital, technical assistance, mentors, and other resources entrepreneurs use often involves multiple support organizations. In some regions, organizations have recognized the limit of a single institution's support and have created collectives to address entrepreneurs' range of needs. The goal of these collaboratives is to achieve more diverse participation and benefits through collective action.

In the examples listed, collectives are typically managed by one lead organization with dedicated staff to coordinate the network of partners involved. This lead organization often receives philanthropic grants or external money to support this staff requirement. Partner organizations also commit resources or collaboratively fundraise for the resources needed.

Executive leadership and managerial staff are usually engaged from partner organizations to foster buy-in to a shared DEI mission and to implement the strategic priorities of the collective. Partner organizations meet regularly and include cross-sector representation with organizations such as nonprofits focused on I&E incubation and/or acceleration, industry associations, private companies, city agencies, financial institutions, colleges and universities, philanthropic organizations, and investors. Some collectives have formal memorandums of understanding in place to detail shared investments, data-sharing agreements, and other key aspects of the partnership.

Three examples of a collective approach demonstrate this practice:

- **Entrepreneurship Collective: St. Louis.** In 2016, BioSTL received the Kauffman Foundation's Inclusion Challenge grant to create the Entrepreneurship Collective. This is a partnership of regional entrepreneurial support organizations, funders, and industry leaders who work collaboratively within the regional ecosystem to increase race and gender equity in early-stage, tech-based entrepreneurship. The grant supported BioSTL's efforts to establish intentional DEI processes for encouraging more diversity among tech-based entrepreneurs, investors, and mentors. The Collaborative started with 12 organizations and now represents 75 organizations with 150 active participants. Since forming the collaborative, activities have included

regular forum discussions and a large summit to explore DEI opportunities and challenges, the identification of pilot projects and establishment of implementation teams, the development of DEI training and a toolkit, and focused events with investors.

In an interview with BioSTL, they shared their lessons about their role in building a community collaborative around DEI.

- This work cannot be done as a side project; it requires intentional commitment from leadership and a dedicated staff.
- Establishing the right connections took a lot more time than anticipated (and they are still building them). It is not so much about having organizations in the same meeting, it is about the trust and working relationships among organizations that happen on a daily basis.
- Just like innovation itself, DEI requires a long-term process, and expectations for results in two or four years are unrealistic; instead having shared short- and medium-term milestones helps.
- Success is a resulting fundamental value shift where DEI is automatically thought about in outreach, design, and all other actions or processes.

- **InnovateNC (North Carolina):** InnovateNC is private–public partnership between Forward Cities[75], the North Carolina Department of Commerce, and the Office of Science, Technology & Innovation. The goal of this collaborative is to support innovation-led economic growth in regions across the state to promote greater economic inclusion. Regions are supported to:
  - Form a cross-sector innovation council,
  - Complete a system map to determine the opportunities and gaps within the local innovation ecosystem,
  - Identify investment opportunities, and
  - Then fund local pilots and raise additional investment and social venture capital to scale high-impact enterprises.

  Throughout the program, regions are also supported through a process to determine the local and state-wide policy alignment.[76] What makes this program stand out is the systems mapping that is completed through an explicit DEI lens at the beginning of the process and the DEI results then inform all of the investment, pilot, and programming opportunities. The cross-sectoral nature of this effort also promotes ongoing conversations across regional partners on current racial and gender disparities within the local entrepreneurial ecosystem and builds collective buy-in to implement collaborative DEI actions in the future.

- **City Alive (Albuquerque, NM)**: City Alive is a public–private partnership focused on people of color who want support to grow their entrepreneurial ideas. City Alive

[75] Forward Cities is a national learning network of cities committed to advancing inclusive innovation and economic development in their communities: http://www.forwardcities.org/.
[76] InnovateNC. Fostering Inclusive Innovation Economies Across North Carolina. Accessed: http://innovatenc.org.

collaborates with several partners, including national federal laboratories, educational institutions such as the University of New Mexico, financial institutions, nonprofits, and city agencies to provide access to a range of services to start-ups, microenterprises, main street businesses, and second-stage companies ready for scale or new markets.[77]

City Alive has created a collective of organizations to build a shared vision of what DEI means to Albuquerque's entrepreneurial ecosystem and the region's economic potential. Further, the cross-sector partners have implemented coordinated programs to meet the unique needs of entrepreneurs of color in their community. Examples of City Alive's programs include the following:

- The Navigators: This program engages Albuquerque residents directly in developing culturally sensitive, community-based solutions for entrepreneurs. The Community Navigators engage immigrant, minority, women, and Native American entrepreneurs to develop and implement tailored business plans. The Tech Navigators engage entrepreneurs of color and female entrepreneurs within the high-tech industry to determine the best support structure to launch and grow their innovations.
- Co-Op Capital: This loan fund allows borrowers to apply for loans in partnership with a trusted organization. This technique determines loan applicants' eligibility based on nontraditional metrics to increase entrepreneurs' access to capital.
- InnovateABQ: City Alive leveraged $8.5 million in funding for the InnovateABQ construction project. The InnovateABQ building—located in downtown Albuquerque—provides a location for researcher, innovators, and entrepreneurs to meet and collaborate.

Increasing Access to Investment Capital and Mentors

Access to investment capital, especially equity capital, remains a significant challenge for women and entrepreneurs of color. Current studies highlight the disparities in private investment, particularly for female entrepreneurs.[78] The examples highlighted here have resources available for direct investment or are investing in programs that provide direct investment to entrepreneurs of color or female entrepreneurs. Financial investment varies. Some organizations provide seed funding for entrepreneurs to test their ideas while others are committing series A funding for start-ups. Investment is critical; however, support beyond money is characterized as best practice. As a result, in some cases, funding is paired with direct access to business mentors, technical assistance, and/or exposure to larger I&E networks.[79]

[77] City Alive. Accessed: http://cityalive.org.
[78] ProjectDiane2018. digitalundivided. Accessed: http://projectdiane.digitalundivided.com.

[79] Existing Oregon organizations that focus on underrepresented groups include MESO, Ascent, Women's VC Fund, Craft3; Cascade Angels, Portland Seed Fund, Oregon Venture Fund, and VertueLab are examples of organization in

Rev1 Ventures (Ohio): Rev1 Ventures is a start-up hub that supports high-growth start-ups with targeted services, capital funding support, and network connections to test and grow new ideas. The hub also connects corporate partners with start-ups, expanding start-ups' potential consumer base and providing corporations an opportunity to increase their innovation through new technologies. Rev1 has an Inclusive Entrepreneurship program that includes dedicated outreach, deal flow, funding, and promotions for start-ups that are founded by or led by women, people of color, or veterans. Thirty-eight percent of recently funded start-ups through Rev1 are founded or led by women, people of color, or veterans.[80] One of Rev1's funding mechanisms is X-Squared Angels, an Ohio-based angel group that invests in women-led start-ups. The hub works with angels, venture capital firms, corporate and community funding partners, and the Ohio Third Frontier, a technology-based economic development initiative out of the Ohio Development Services Agency. An interview with Rev1 Ventures provided several noteworthy lessons:

- Executive leadership is in strong support of DEI as a lens for how work is conducted, rather than positioning it as a side program.
- They work to develop connections with organizations that serve entrepreneurs of diverse backgrounds. Rev1 Ventures has had a long-standing role as being central Ohio's I&E ecosystem builder (see ecosystem best practices). Because of this role, it has relatively strong working relationships with a variety of organizations, providing the base level of trust for developing more intentional DEI programs.
- Even with a strong networking building role in place, intentional DEI efforts have taken considerable time to develop and are still not at desired levels.
- Rev1 recognizes its role as one of catalyst and connector helping other support organizations, such as X-Squared Angels, connect with entrepreneurs.
- Their DEI model includes not just founders but key technical positions. Knowing that talent is critical for start-ups' growth, they also partner with organizations that provide targeted skill development such as coding and work with underrepresented populations to develop these skills. This opens doors to community partners with greater access to diverse entrepreneurs.
- Their ability to provide comprehensive services, not just investment funds, means that they see entrepreneurs early in the process and can apply their mentoring services to help them become investor ready.

All Raise: All Raise is a national nonprofit organization dedicated to increasing the number of women funders and founders.[81] This organization runs various programs to reach two goals: (1) double the percentage of female partners at U.S. tech venture funds with a fund size of more than $25 million and (2) increase the percentage of venture funding going to

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the state with specific metrics tied to inclusion; and new groups are being established-- XXcelerate, Backstage Capital.

[80] Rev1 Ventures. Inclusive Entrepreneurship. Accessed: https://www.rev1ventures.com/entrepreneurs/inclusive-entrepreneurship/.

[81] All Raise. Dedicated to Diversity in funders and founders. Accessed: https://www.allraise.org.

companies with a female founder. They offer a suite of programs to build capacity for women to be successful investors (they also have programs for female founders). Their investment capital programs include the following:

- Helping women become general partners in equity funds: One avenue is their *Women and LPs*: a series of events to increase women's connection to limited partners.
- Providing mentorship for new investors through *VC Champions*, a mentorship program for female and underrepresented individuals in the venture capital industry.
- Connecting women investors and founders through *Female Founder Office Hours*, a 1:1 mentoring and small group discussion platform for fellow founders and venture capitalists to build trust and ask anything about fundraising or company building within a judgment-free space.

Note: In interviews conducted for this project, Cascade Angels stood out in terms of the number of diverse founders in their portfolio.

Connections to National Programs: An increasing number of national efforts exist to increase capital access for entrepreneurs of color. Business Oregon can play a role in ensuring the state's I&E support organizations and entrepreneurs know about these efforts and can help augment local pools of capital. The following are a few examples.

Entrepreneurs of Color: This initiative is funded through JPMorgan Chase's Small Business Forward program. Entrepreneurs of Color funds are invested through local Community Development Finance Institutions to support businesses owned by people of color through loans and technical assistance. JPMorgan Chase has partnered with the Ralph C. Wilson Jr. Foundation, Fifth Third Bank, the Kresge Foundation, and W.K. Kellogg Foundation to increase the level of resources available to these entrepreneurs. Entrepreneurs of Color funds have been created in Detroit through the Detroit Development Fund; in San Francisco through Working Solutions, ICA Fund Good Jobs, and Pacific Community Ventures; and in the South Bronx, New York, through the Excelsior Growth Fund.[82]

America's Seed Fund—Intuitional Partnerships: The National Science Foundation operates an Institutional Partnerships initiative within the America's Seed Fund to provide financial support to current SBIR/STTR Phase II awardees that are working to[83]

- Foster partnerships between the academic and small business communities,

[82] JPMorgan Chase & Co. News. "JPMorgan Chase Expands Entrepreneurs of Color Fund to Drive Inclusive Economic Growth in South Bronx and San Francisco." Accessed: https://www.jpmorganchase.com/corporate/news/pr/entrepreneurs-of-color-fund-south-bronx-san-francisco.htm.
[83] National Science Foundation. NSF 12-069. "Dear Colleague Letter: Supplemental Opportunity for Small Business Innovation Research and Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) for CREST/HBCU-RISE Collaborations (Phase IIA)." Accessed: https://www.nsf.gov/pubs/2012/nsf12069/nsf12069.jsp?org=NSF.

- Increase participation of underrepresented groups in both academic and small business research,
- Promote commercialization efforts of the product identified in the Phase II project, and
- Encourage members of underrepresented groups to pursue careers in science and engineering.

***NOTE about Social Venture and Impact Funds**. This brief did not examine the increasing role that Impact Investment funds play. Oregon's philanthropic community, through foundations like Meyer Memorial Trust and the Oregon Community Foundation, and innovation-based technical assistance organizations like VertueLab are exploring impact investment opportunities. Business Oregon's connections and complementary support of these efforts would further enhance DEI efforts.*

DEI-Focused Programs

I & E-based organizations are also deploying activities that specifically focus on support of women and entrepreneurs of color. These efforts are occurring in long-standing venture development organizations, as well as more mission-based organizations focused exclusively on a targeted population of underserved geography. Together, these organizations provide an assortment of on-ramps for entrepreneurs.

Programs within venture development organizations: Organizations such as BioSTL, Rev1 Ventures, and City Alive cited above all offer accelerator or advisory services to entrepreneurs and/or researchers. St. Louis Bioscience is an example of how a traditional venture development organization is approaching diversity and inclusion activities.

- **Bioscience (St. Louis, Missouri)**: St. Louis Bioscience (BioSTL) supports bioscience developments from the laboratory to commercialization and company formation. Funding for the organization was committed by Washington University in St. Louis, BJC HealthCare, and the St. Louis Life Sciences Project to provide seed investments and associated support for local bioscience start-ups. Through the Inclusion Initiative, BioSTL identifies high-potential women and people of color to become bioscience entrepreneurs and provides them a targeted training and a systematic pathway to create viable high-growth ventures. BioSTL accomplishes this through the Entrepreneurial Inclusion Pipeline Programming and through engagement with the St. Louis Equity in Entrepreneurship Collective.[84] Their DEI efforts are managed by a dedicated staff member to maintain the momentum of projects, regularly track and report metrics, and coordinate the growing network of partners.

[84] BioSTL. Inclusion. Accessed: http://www.biostl.org/about/inclusion/.

BioSTL's DEI focus began in 2008 when it discussed ways to increase diversity within the St. Louis entrepreneurial ecosystem with local CEOs, entrepreneurs, and civic leaders. This effort grew into the Entrepreneurs Inclusion Initiative in 2013. The Initiative's programming focused on women, minorities, and immigrant populations interested in STEM-focused business opportunities. Investment from the Blackstone Foundation in 2014 expanded the Inclusion Initiative to strategically "identify, attract, and retain talented women and minority STEM-focused entrepreneurs and provide a systemic pathway for them to create viable ventures."[85]

Mission-Driven Organizations. Across the nation, an array of organizations is focused specifically on entrepreneurial pathways for targeted populations. These organizations are especially adept at providing culturally appropriate pathways for entrepreneurs alongside mentors with similar racial and economic backgrounds. They play a key role in building on-ramps for broader community collaboratives.

Opportunity Hub: Opportunity Hub (OHUB) in Atlanta is focused on providing the African American community with opportunities for building tech-based companies by creating accelerator, mentoring, and investment platforms. Their services "help socially and economically disadvantaged communities pursue and gain high demand tech skills and careers, launch high growth startups and access and invest in exclusive investment opportunities traditionally reserved for the rich." In addition to start-up services, OHUB has invested in over 30 companies that have raised over $300 million in follow-on capital, are valued at over $1 billion, generate $75 million in annual reoccurring revenue, and are growing and employ nearly 1,000 people.

LaunchCHA: LaunchCHA is a nonprofit organization that offers business training, support, and resources to underrepresented entrepreneurs in Chattanooga, Tennessee. LaunchCHA's mission is "Empowering underserved communities and individuals through entrepreneurship. A community that builds hope and equity to all individuals through entrepreneurship."

Their primary focus is creating a more diverse entrepreneurial ecosystem in Chattanooga. According to their latest impact report, 71% of LaunchCHA-supported businesses are owned by African Americans, and 65% are owned by women (generating an estimated $11.5 million in annual revenue). Although most entrepreneurs in this program would be classified as main street companies, their model is applicable to all types of industries. Of particular note is their combination of youth and adult programming.

[85] Shaw, Elise, et al. Institute for Women's Policy Research. "Closing the Gender Gap in Patenting, Innovation, and Commercialization: Programs Promoting Equity and Inclusion." 2018. https://iwpr.org/wp-content/uploads/2018/07/C471_Programs-promoting-equity_7.24.18_Final.pdf.

In 2012, LaunchCHA began outreach to the next generation of entrepreneurs by partnering with a local high school to create the High School Entrepreneurship Program. This effort has since expanded to nine local schools in the Chattanooga urban core. Along with the Business Entrepreneurship Academy, both youth and adult programs continue to produce graduates from classes in and around the Chattanooga area. This combination of youth and adult programming provides another layer of mentoring: adults act as role models for both age groups.

Tapping into national DEI grantmaking. The ability to develop and deploy effective DEI programs can be enhanced when they are connected to national networks of peer organizations that are learning and sharing their experiences at the same time. Business Oregon can play a role in helping Oregon-based organizations connect to these national efforts and provide matching funds in grant applications. Such efforts include the following:

- The Case Foundation: The Inclusive Entrepreneurship program partners with social capital networks to increase the level of connections, training, and mentorships for entrepreneurs and works with investors and influencers to change the way capital and media attention support diverse entrepreneurs.[86]
- Ewing Marion Kauffman Foundation: The Inclusion Challenge grant program awards funds to the selected organizations that help female entrepreneurs and entrepreneurs of color achieve higher rates of success. In 2016, the Foundation awarded $4.3 million to organizations in 13 states.[87]

Implications for Oregon

Research points out that entrepreneurs of diverse backgrounds succeed more often when they can relate to their mentors and investors and vice versa. Community collectives, investments and programs, and institutions that want to increase diversity and inclusion share a belief that DEI is critical to growing an innovation-driven economy. More so, these institutions "walk the talk" and demonstrate commitment to DEI by investing staff time and resources in alternative pathways to support local entrepreneurs of color and female entrepreneurs.

There is no single place to start, other than with a recognition that inclusion is a benefit, not a burden. Embracing DEI as a way of doing business is also an organizational cultural change in how enterprises think about and conduct their work. It requires alignment at the

[86] The Case Foundation. Inclusive Entrepreneurship program. Accessed: https://casefoundation.org/program/inclusive-entrepreneurship/.
[87] Ewing Marion Kauffman Foundation. Kauffman Foundation Awards $4.3 Million in Grants to Organizations that Support Women and Minority Entrepreneurs. Accessed: https://www.kauffman.org/newsroom/2016/11/kauffman-foundation-awards-grants-to-support-women-and-minority-entrepreneurs.

strategy, program, and policies levels. This takes time to overcome generations of system bias.

Our conclusions from research and interviews and our directional considerations for Business Oregon include the following:

- The importance of working closely with the philanthropic community that has been instrumental in funding and supporting DEI efforts.
  - There may be specific opportunities to co-convene angel and venture capital, philanthropic capital, financial institutions (such as CDFIs), and local and state resources to develop a shared strategy for financial instruments and impact investment initiatives as a coordinated set of tools being used to enhance inclusion.
- Recognizing there is no single program model, that the combination of community collectives, traditional I&E organizations, and mission-based groups is typically required to begin making systemic change.
- Being supportive of the network building role that is required to be intentional about creating on-ramps for entrepreneurs of diverse backgrounds.
- Playing a convening role or supporting efforts that help organizations in Oregon share best practices and develop shared tools. As an example, what lessons can the Oregon Growth Board learn and help promote from Cascade Angel's success in finding and funding start-ups with diverse founders.

Further Reading on How DEI Impacts Innovation and Entrepreneurship

- Delivering Through Diversity. This report, released in January 2018 by McKinsey & Company, provides statistically significant evidence for the impact of racial and gender diversity on companies' profitability. McKinsey has published several other related reports, including Women in the Workplace 2017, which outlines barriers to executive leadership and practices to support women, particularly the double burden of bias that women of color experience.
- The State of Black Women Founders and The State of Latinx Women Founders. ProjectDiane2018 is a biennial demographic study authored by digital undivided that provides a snapshot of the state of Black Women Founders and the start-ups they lead in the United States.
- The Business Case for Racial Equity: A Strategy for Growth. This 2018 report completed by Altarum and the W.K. Kellogg Foundation documents key disparity metrics by race and ethnicity and illustrates the economic growth potential if wealth, health, and employment disparities declined in the United States.
- The Competitive Advantage of Racial Equity. This report, released in October 2017 by FSG and PolicyLink, demonstrates the business value created through advancing racial equity.

- Women-led companies perform three times better than the S&P 500. This *Fortune* article highlights findings from Quantopian, a company that analyzed the performance of Fortune 1000 companies that had women CEOs between 2002 and 2014 against the S&P 500's performance during that same period.

Glossary of Terms

Ecosystem Terms

Entrepreneurial Capacity: a region's capabilities and conditions for forming enterprises

Innovation Capacity: the ability to take science and research ideas and translate them into products, technologies and services across industries.

Capacity: The scale and capabilities of I&E institutions and organizations to operate at a level to create and sustain impact.

Culture: The underlying public and stakeholder attitude and perceptions about innovation and entrepreneurship.

Continuity: The state of stability and consistent existence or operation of I&E investment over time.

Enterprise and Startup Terms

Deep Technology Startups are commonly defined as companies that are founded on a scientific discovery or true technological innovation. Also referred to in this report as R&D Intensive industries.

Innovation-Driven Enterprises (IDEs): companies that develop or advance new technologies, innovative processes, or business models.

Scalable Company: A company that has the ability to grow significantly over a ten-year period. Kauffman Foundation uses defines scalable companies as growing to 50 or more employees in the first ten years.

High Growth Company: A company that has year over year job growth of more than 25%.

Business Stage Terms

Concept Stage: Entrepreneurs exploring the feasibility, assessing markets and analyzing the risks of developing an idea into a product or service, and

Early Stage: A company that has officially launched and focused on customer acquisition (typically with revenues under $2 million), and seeking initial rounds of investment capital.

Late Stage: A company with a product which has successfully penetrated its initial market and seeking expansion with investors are seeking liquidity

Capital Terms Used by Interviewees

Gap Funding: Funds typically used to help commercialize university research or validate product ideas. Depending on application, funds can be grants, debt, or equity-based.

Late Stage Financing: Investments made in more established startups, typically after commercial manufacturing and sales but before any IPO

Pre-seed/Pre-SBIR Funding. A stage of gap funding that bridges the gap between the end of translational research and the beginning of commercialization funding.

Glossary of Acronyms

DEI:	Diversity, equity, and inclusion
I & E:	Innovation and entrepreneurship
IDEs:	Innovation-driven Enterprises
KIBS:	Knowledge-intensive business services
LQs:	Location quotients
OMIC:	Oregon Manufacturing Innovation Center
OTRADI:	Oregon Translational Research and Development Institute
STEM:	Science, technology, engineering, and math
TIF:	Tax increment financing
UVDF:	University Venture Development Fund

Data Scorecard One-Pagers

Oregon I & E Data One-Pager

Invention and R&D

RANK TREND

Industry R&D Performance

1.1 Business-performed Domestic R&D as a percentage of State GDP

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.029	2	7	3.36%	4.15%

Explanation of Metric

Industry R&D performance is defined as total R&D performed by businesses in each state, regardless of funding source, as a share of state GDP. R&D refers to the work an organization conducts for the innovation, introduction and improvement of its products and procedures. It is a series of investigative activities to improve existing products and procedures or to lead to the development of new products and procedures. Industry R&D performance is one way to compare the private sector's capacity for innovation across states.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	●	●
Arizona	○	◐	●	○	○
Colorado	○	○	○	○	●
Minnesota	○	●	○	○	●
Oklahoma	○	○	○	●	●
Utah	●	●	●	●	●
Washington	●	●	◐	○	○

Improvement compared to the US= Defined as 10-year* annual growth rate of state greater than 10-year* annual growth rate of US.

Acceleration = 3-year annual growth is faster than 10-year* annual growth

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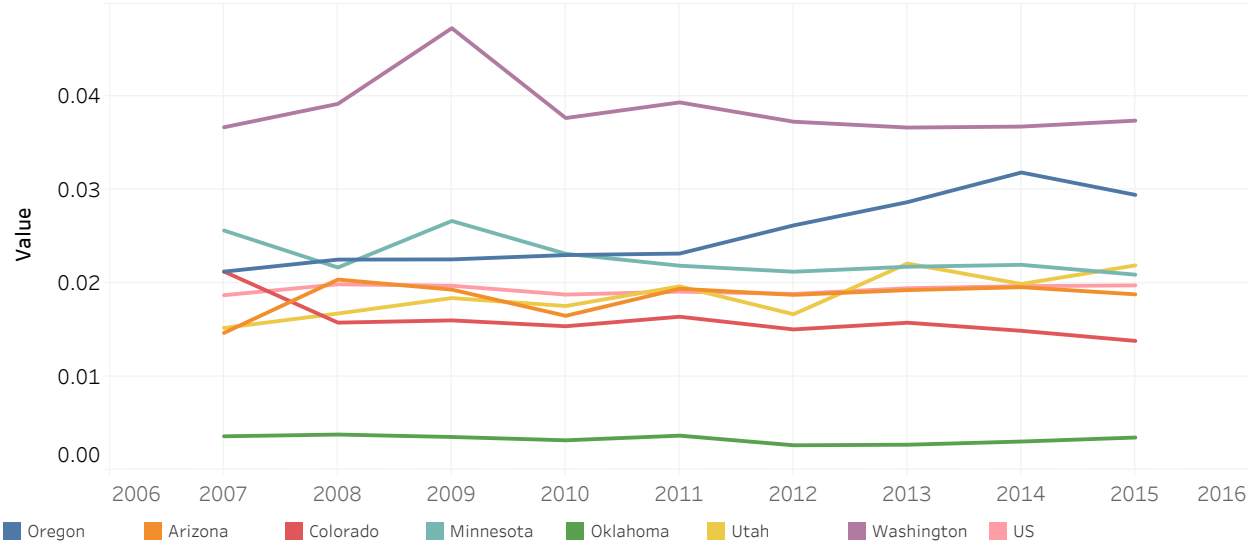
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: NSF

Prepared by Scruggs & Associates and RTI International for Business Oregon
12/20/18

Oregon I & E Data One-Pager

Invention and R&D

RANK TREND

Non-Industry R&D Performed

1.2 Non-industry performed R&D as a percentage of State GDP

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.00	5	35	-1.23%	-4.63%

Explanation of Metric

Non-industry R&D performed is defined as non-industrial research and development as a percentage of state GDP. Non-Industry R&D helps lay the foundation for profitable future private-sector research. A limitation of this measure for state level I&E analysis is that non-industry R&D may or may not be aligned with industry within the state.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon				●	
Arizona				●	
Colorado	●	●			
Minnesota			●	●	
Oklahoma				●	
Utah	●	◐			
Washington	●	●			

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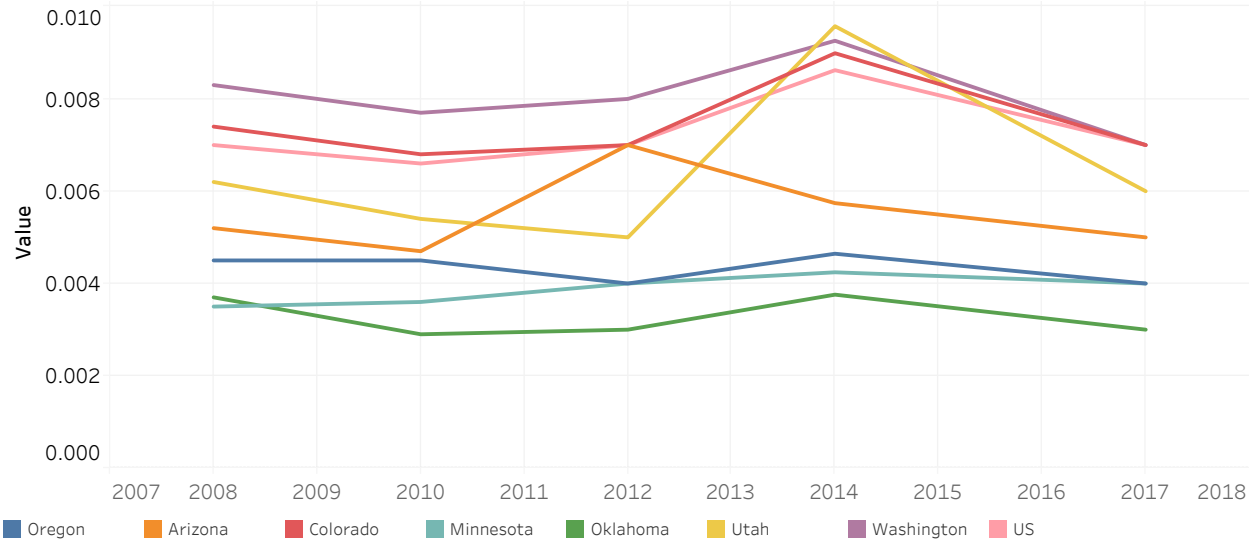
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: ITIF

Prepared by Scruggs & Associates and RTI International for Business Oregon
12/20/18

Oregon I & E Data One-Pager

Invention and R&D

RANK TREND

University Invention Disclosures

1.3 University Invention Disclosures per $1M in Research Expenditure

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.37	4	28	-0.43%	1.21%

Explanation of Metric

University invention disclosures are defined as the number of disclosures per $1M in research expenditure by universities in the state. Disclosures can ultimately lead to patents, which protects the university's intellectual property, encourages new research within the institution, and the adoption of new technologies in the market place. Invention disclosures are an important indicator of the level of innovation and generally trend in line with research and development expenditures.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	○	○	●	○	●
Arizona	●	●	●	●	●
Colorado	○	○	●	○	○
Minnesota	●	●	●	●	●
Oklahoma	○	○	●	○	○
Utah	●	●	○	○	○
Washington	○	○	●	●	●

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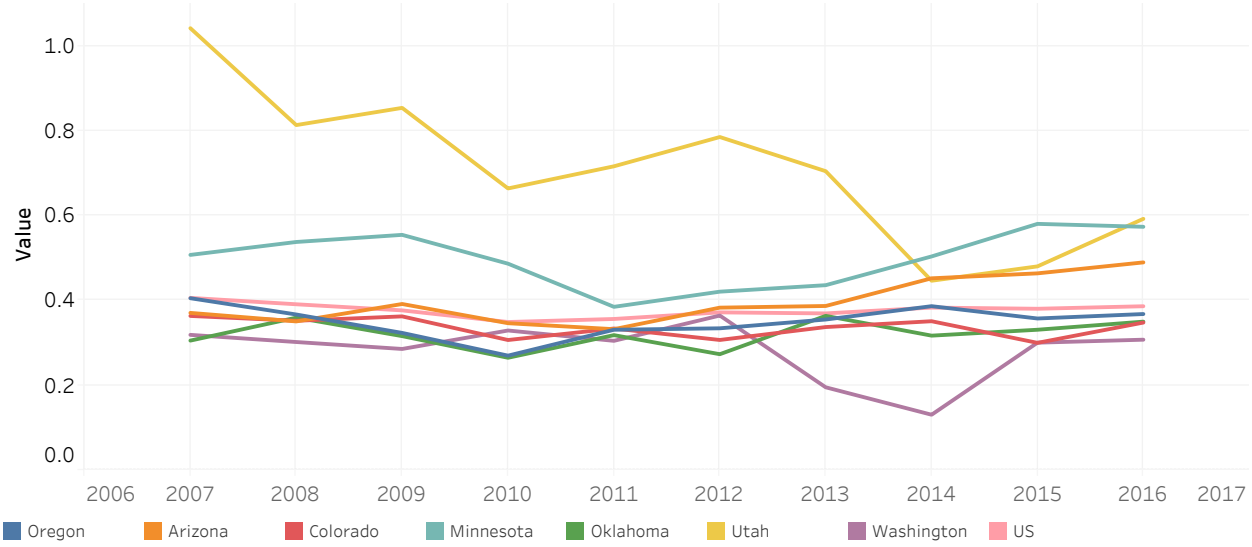
Peer Group Trends

over Last 10 Years*



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Primary Source: AUTM

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12/20/18

Oregon I & E Data One-Pager

Product development

RANK TREND

SBIR and STTR Awards

2.1 SBIR/STTR Funding per $1M of State GDP

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	143.0	3	14	-3.38%	-12.66%

Explanation of Metric

SBIR and STTR funding is defined as total Small Business and Innovation Research (SBIR) and Small Business Technology Transfer (STTR) program funding dollars divided by state GDP. SBIR and STTR programs support R&D and financing of cutting edge technologies. These programs are an indicator of the private-sector's future ability to commercialize innovation derived from federal R&D funding.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	○	○	○
Arizona	○	●	●	○	○
Colorado	●	●	○	○	●
Minnesota	○	●	●	●	●
Oklahoma	○	○	●	●	●
Utah	●	●	●	●	●
Washington	○	○	○	●	●

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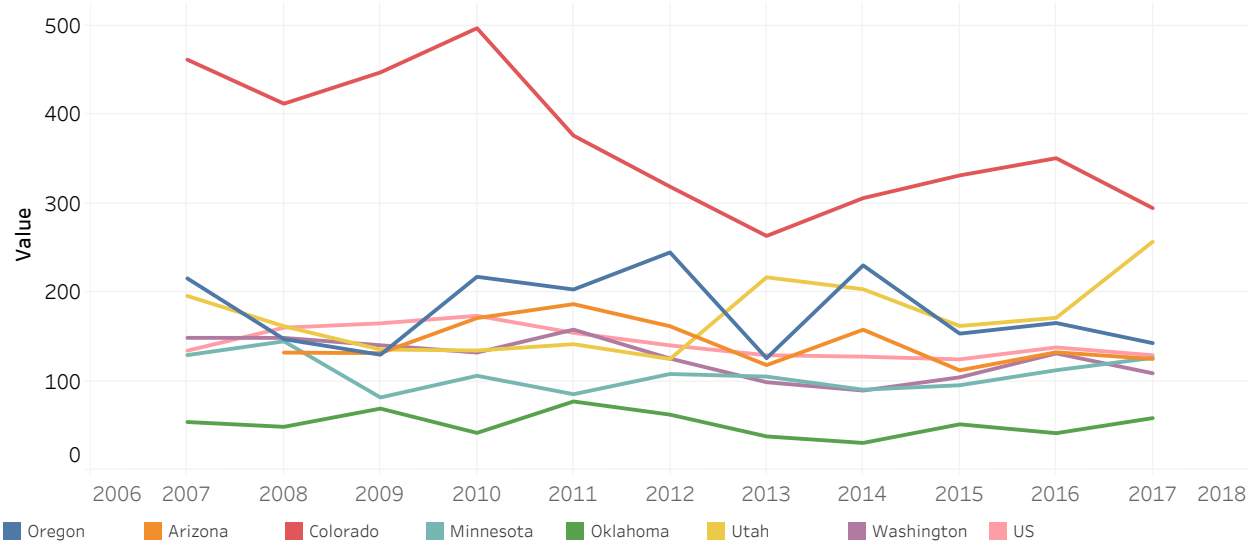
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: SBIR.gov

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Oregon I & E Data One-Pager

Product development

RANK TREND

Inventor Patents

2.2 Independent inventor patents per 1,000 people of workforce age

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.10	5	10	86.87%	-0.40%

Explanation of Metric

Inventor patents are defined as the number of unique inventors who patent technologies per thousand people in the state. The majority of owners of individual patents (those patents not assigned to any organization) are trained scientists, engineers, or students, pursuing independent research. This measure serves as an indicator of innovative activity and creativity of the population in each state because patents serve as the foundation many entrepreneurial ventures.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	○	●	○	○	○
Arizona	○	●	◐	○	○
Colorado	●	●	◐	○	○
Minnesota	●	●	◐	○	○
Oklahoma	○	○	○	○	○
Utah	●	●	●	○	○
Washington	○	●	◐	○	○

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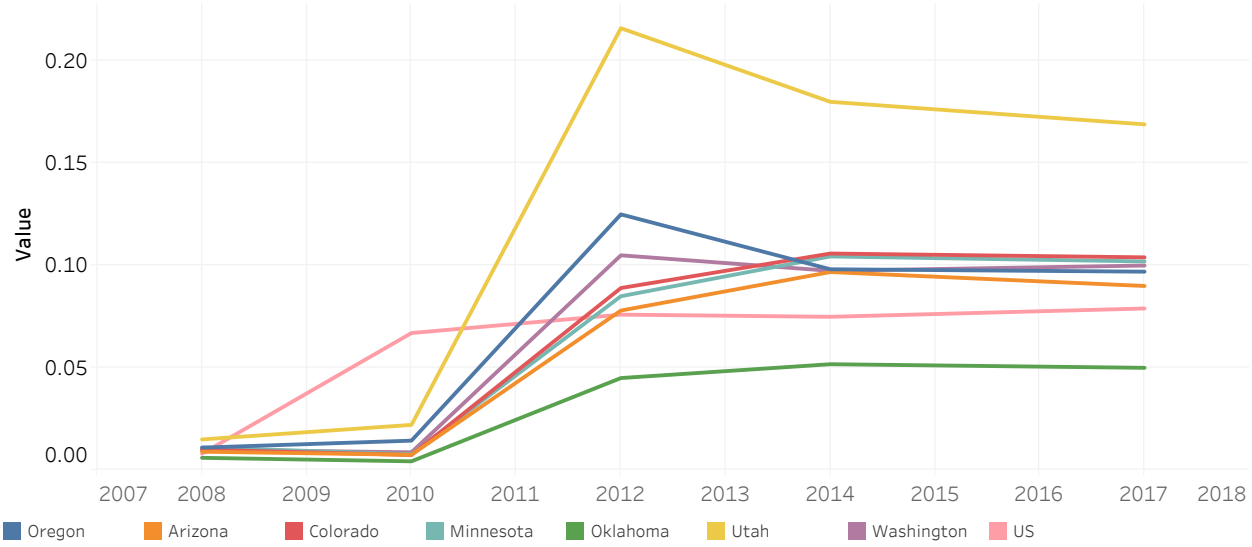
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: ITIF

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12/20/18

Oregon I & E Data One-Pager

Product development

RANK TREND

Active Licenses

2.3 Number of active licenses per $1M of Research Expenditure

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	1.561	1	4	8.96%	4.26%

Explanation of Metric

University active licenses is defined as the cumulative number of active patent, software, and other technology licenses. After a university's intellectual property is protected, usually in the form of a patent application, the technology transfer office determines the best way to transfer that technology to the marketplace. This is often accomplished through a license to a commercial entity to either develop the technology further or get it out to the marketplace in its current state. The number of active licenses is a function of the rate at which licenses are initiated as well as the length of those licenses.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	●	○
Arizona	○	○	○	●	●
Colorado	○	◐	●	●	○
Minnesota	●	●	○	●	●
Oklahoma	○	○	○	○	○
Utah	○	◐	○	●	●
Washington	●	●	○	●	●

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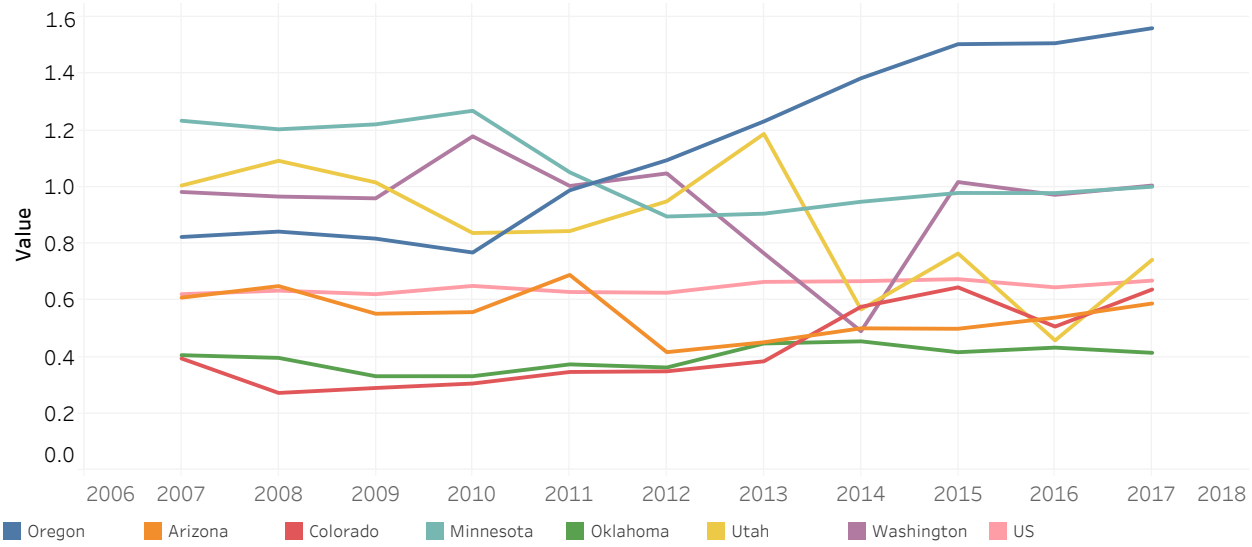
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: AUTM

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12/20/18

Oregon I & E Data One-Pager

Business development

RANK TREND

Venture Capital Investment

3.1 Venture Capital Amount over Nominal State GDP

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.00	4	17	-0.94%	21.05%

Explanation of Metric

Venture capital investment is defined as the dollar amount of venture capital invested in the state divided by state GDP. Venture capital is a high-touch form of financing that is used primarily by young, innovative, and highly risky companies. Over the past 20 years, VC-backed companies have been a prime driver of both economic growth and private sector employment. Venture capital investment is a strong indicator of an economy's ability to grow and scale-up startup firms.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	●	●
Arizona	●	●	●	●	●
Colorado	●	●	●	●	●
Minnesota	●	●	●	●	●
Oklahoma	●	●	●	●	●
Utah	●	●	●	●	●
Washington	●	●	●	●	●

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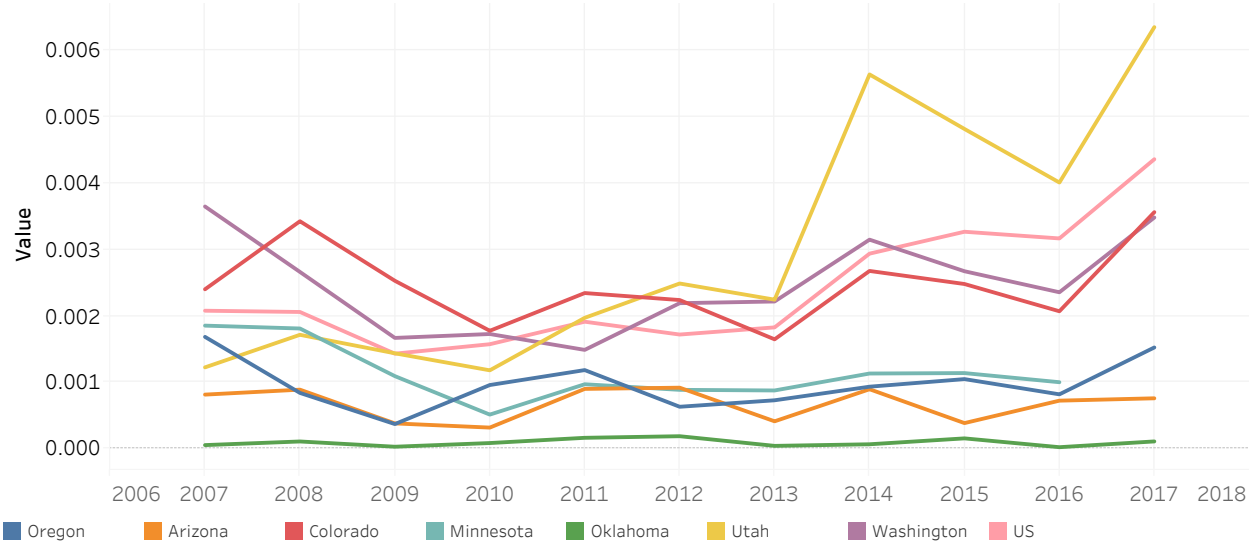
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: SSTI

Prepared by Scruggs & Associates and RTI International for Business Oregon
12/20/18

Oregon I & E Data One-Pager

Business development

RANK TREND

New Startup Firms

3.2 Startup firms per 1,000 firm population

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	76.96	5	15	-2.27%	0.08%

Explanation of Metric

New startup firms are defined as the number of startups per thousand firms. New businesses account for nearly all net new job creation and almost 20 percent of gross job creation, and companies less than one year old have created an average of 1.5 million jobs per year over the past three decades. New startup firms is an important indicator for economic dynamism and growth.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	●	●
Arizona	●	●	●	●	●
Colorado	●	●	●	●	●
Minnesota	●	●	●	●	●
Oklahoma	●	●	●	●	●
Utah	●	●	●	●	●
Washington	●	●	●	●	●

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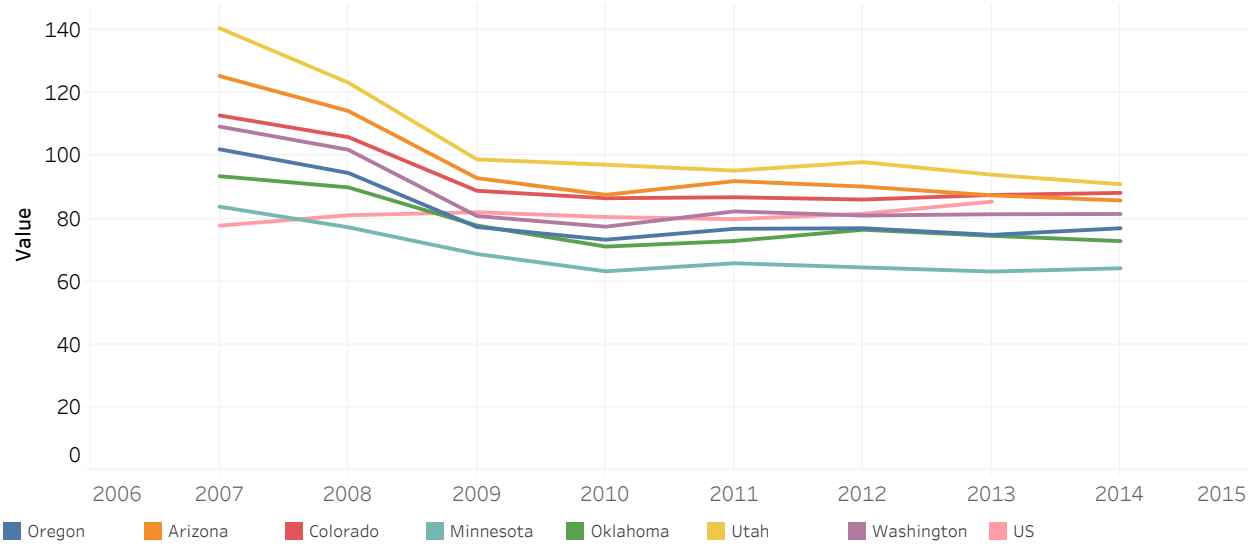
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: Kauffman Startup Activity Index

Prepared by Scruggs & Associates and RTI International for Business Oregon
12/20/18

Oregon I & E Data One-Pager

Business development

RANK TREND

Business Churning

3.3 The number of new startups and business failures, combined, as a share of the total firms in each state

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.18	6	31	-5.66%	-16.83%

Explanation of Metric

Business churning is defined as the number of new startups and business failures, combined, as a share of the total firms in each state. Steady growth in employment masks the constant churning of job creation and destruction, as less innovative and -efficient companies downsize or go out of business, and more-innovative and -efficient companies grow or take their place. While such turbulence increases the economic risk faced by workers, companies, and even regions, it also helps drive economic dynamism.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	○	○	○	○	○
Arizona	●	●	●	○	○
Colorado	●	●	○	○	○
Minnesota	○	○	○	○	○
Oklahoma	○	○	●	●	○
Utah	●	●	○	○	○
Washington	○	○	●	●	○

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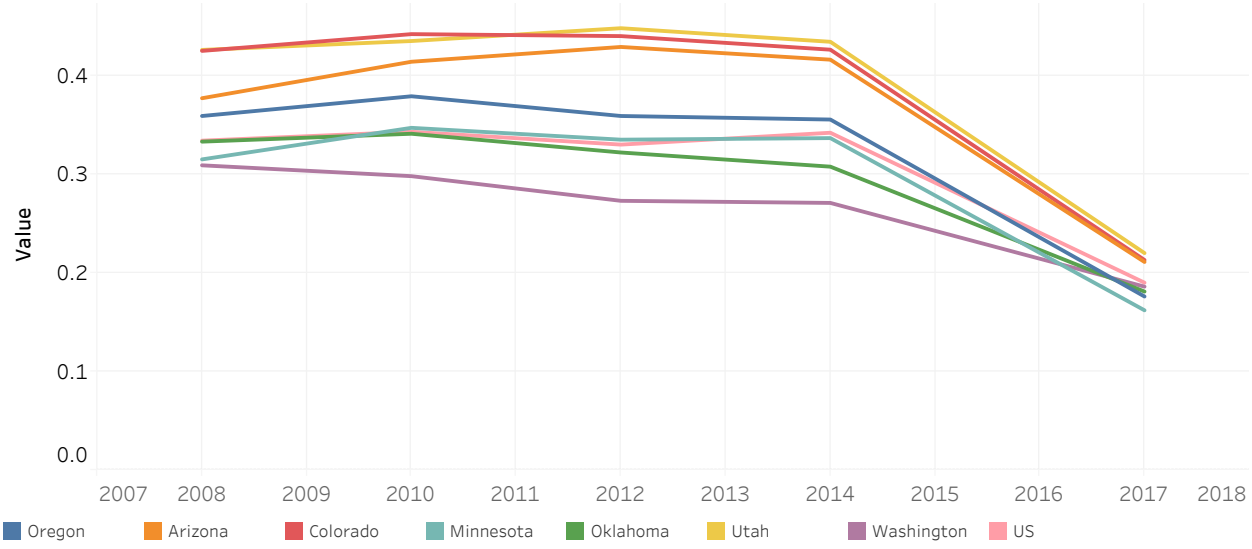
Peer Group Trends

over Last 10 Years*



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Primary Source: ITIF

Prepared by Scruggs & Associates and RTI International for Business Oregon
12/20/18

Oregon I & E Data One-Pager

Business development

RANK TREND

University Startups

3.4 University startups per $1M in research expenditure

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.02	3	16	18.67%	-0.46%

Explanation of Metric

University startups are defined as the number of startups emerging from academic research per $1M in research expenditure by universities in the state. The innovations born out of academic research often lead to the formation of new companies that develop new products, create jobs and spark economic growth. University startups is a key indicator of the capability of universities to translate research into market output.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	○	○
Arizona	●	●	●	●	●
Colorado	○	○	○	○	○
Minnesota	○	○	○	○	●
Oklahoma	○	○	○	●	●
Utah	●	●	●	●	●
Washington	○	●	●	●	●

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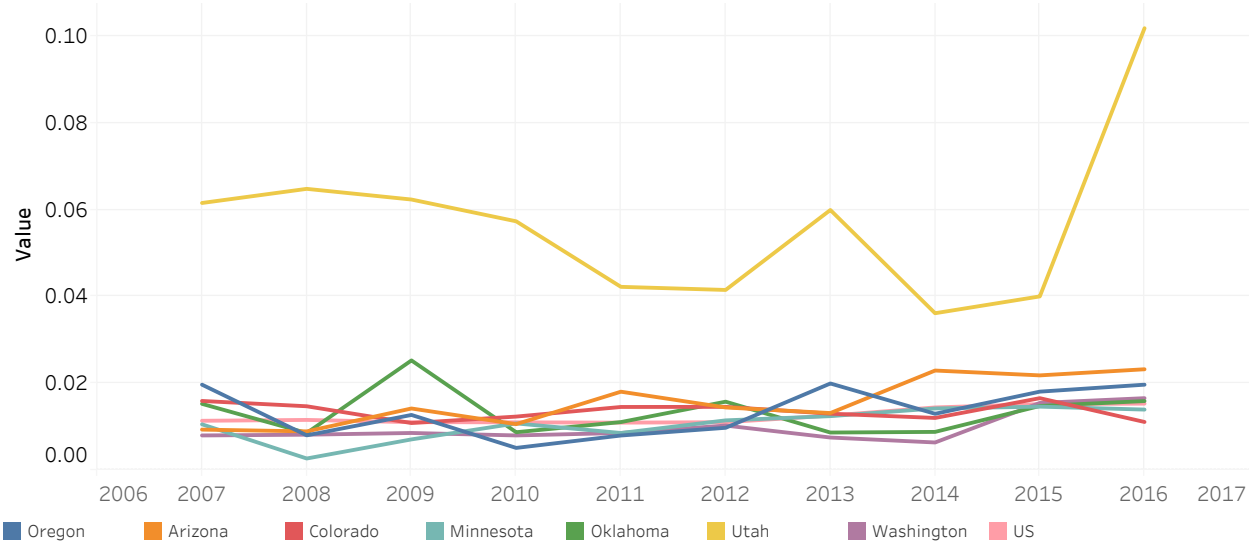
Peer Group Trends

over Last 10 Years*



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Primary Source: AUTM

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12/20/18

Oregon I & E Data One-Pager

Business Scale-up and Growth

RANK TREND

High Growth Density

4.2 High Growth Companies for every 100,000 Employer Businesses

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	70.01	6	18	-2.44%	16.07%

Explanation of Metric

High growth density is defined as the number of high growth companies for every 100,000 private employers. High growth companies account for as many as 50 percent of new jobs created and encourage subsequent employment growth in their related industries. High growth density is an important indicator of economic growth and business strength.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	○	●	○	●	●
Arizona	●	●	○	●	●
Colorado	●	●	○	●	●
Minnesota	○	●	○	●	●
Oklahoma	○	○	○	○	○
Utah	●	●	●	●	○
Washington	○	●	●	●	○

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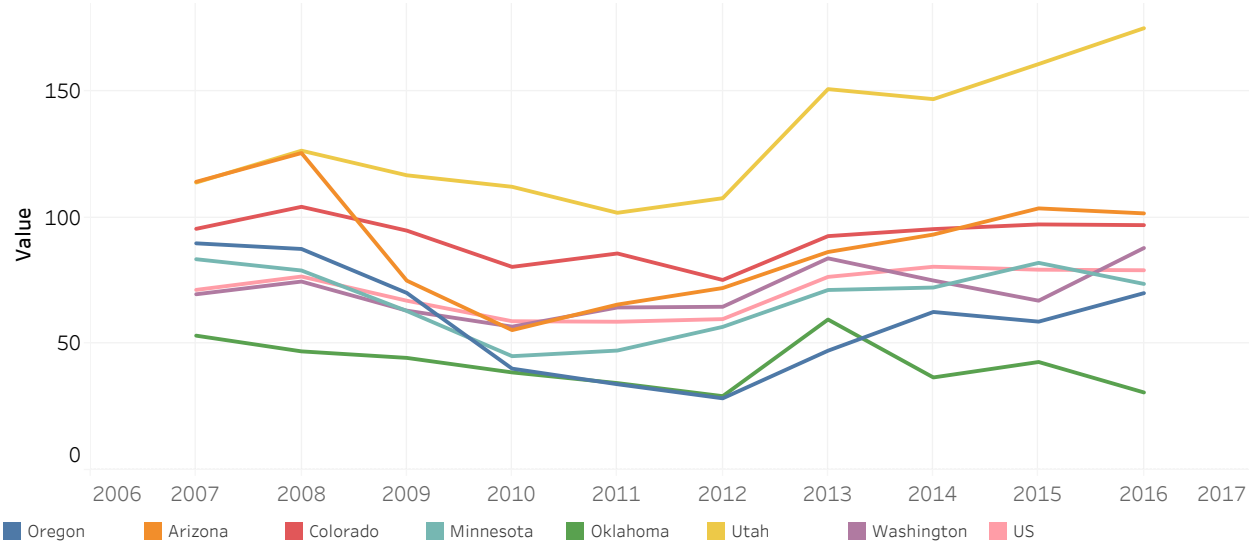
Peer Group Trends

over Last 10 Years*



*10-years if available. Some data sources only available at 8 and 9 year increments

Primary Source: Kauffman Growth Entrepreneurship Index

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12/20/18

Oregon I & E Data One-Pager

Business Scale-up and Growth

RANK TREND

Start Up Job Growth

4.3 Startup Growth Five Years after Founding

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.71	5	12	0.24%	8.51%

Explanation of Metric

Startup job growth is defined as the average growth rate of cohorts of new businesses during their first five years of operation. This measure provides insight into the average growth trajectory of these cohorts. Thus, comparing this measure across states allows one to understand differences in the ability of new businesses to scale across states.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	○	●	○	○	●
Arizona	○	○	●	○	●
Colorado	○	●	○	●	●
Minnesota	●	●	●	●	●
Oklahoma	○	○	●	○	●
Utah	●	●	●	○	●
Washington	●	●	○	○	●

Improvement compared to the US= Defined as 10-year* annual growth rate of state greater than 10-year* annual growth rate of US.

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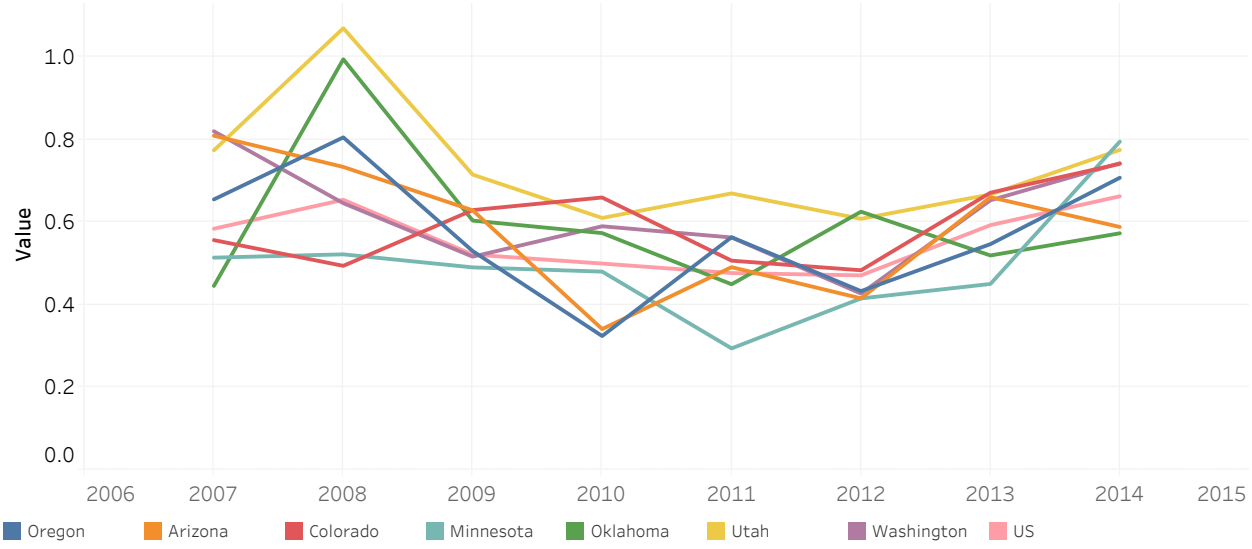
Peer Group Trends

over Last 10 Years*



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Oregon I & E Data One-Pager

Business Scale-up and Growth

RANK TREND

Initial Public Offerings

4.4 A weighted measure of the number and value of initial public stock offerings of companies as a share of total worker earnings

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	4.25	7	46	1.90%	-0.49%

Explanation of Metric

Initial public offerings are defined as a weighted measure of the number and value of initial public stock offerings of companies as a share of total worker earnings. Initial public offerings are the first rounds of companies' stock sold when they make their debut in public markets. While not all companies decide to go public, this measure provides an indication of the frequency and magnitude of initial public offerings which are common at later stages of growth.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	○	○	●	○	○
Arizona	●	◐	●	○	○
Colorado	●	●	●	○	○
Minnesota	○	○	○	○	○
Oklahoma	○	◐	○	○	○
Utah	●	●	○	○	○
Washington	○	○	●	○	○

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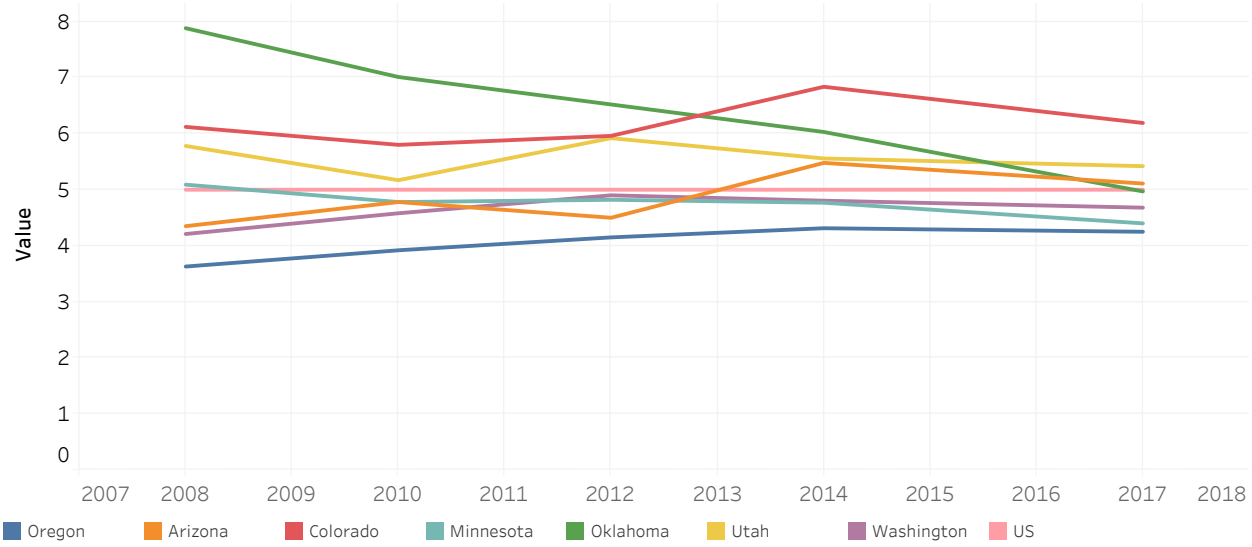
Peer Group Trends

over Last 10 Years*



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Primary Source: ITIF

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Oregon I & E Data One-Pager

Economic Impact

RANK TREND

High Tech Jobs

5.1 Jobs in electronics manufacturing, software and computer-related services, telecommunications, and biomedical industries as a share of total employment

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.056	4	10	3.70%	0.76%

Explanation of Metric

High tech jobs are defined as jobs in electronics manufacturing, software and computer-related services, telecommunications, and biomedical industries as a share of total employment. The high-tech sector remains a key engine of innovation and a source of high-paying jobs, high-skilled jobs.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	○	●	●	●	○
Arizona	○	◐	●	○	○
Colorado	●	●	○	○	○
Minnesota	○	◐	◐	○	○
Oklahoma	○	○	●	○	○
Utah	●	●	●	○	○
Washington	●	●	●	○	○

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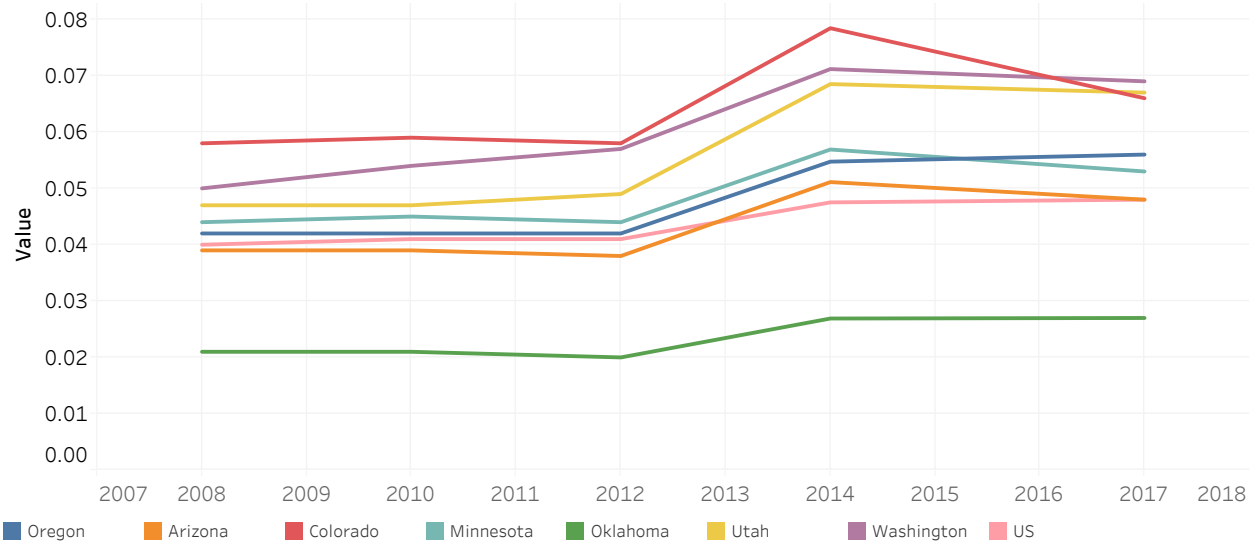
Peer Group Trends

over Last 10 Years*



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Primary Source: ITIF

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Oregon I & E Data One-Pager

Economic Impact

RANK TREND

Establishment Survival Rate

5.4 Survival rate of establishments after five years since founding

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.51	3	16	-0.38%	2.07%

Explanation of Metric

Establishment survival rate is defined as the percentage of startups that are still operating five years since founding (similar to startup job growth). New business establishments make an important contribution to the economy; however, it is inevitable that some of these establishments will eventually fail. Survival of new establishments can be an important indicator of economic health. A limitation is that the measure is blended across a variety of industries and is not limited to the VC-backed startups or startups in scalable industries.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	○	●	●
Arizona	○	○	○	●	●
Colorado	○	○	●	●	●
Minnesota	●	●	●	●	●
Oklahoma	○	●	○	●	●
Utah	●	●	●	●	●
Washington	○	○	○	○	○

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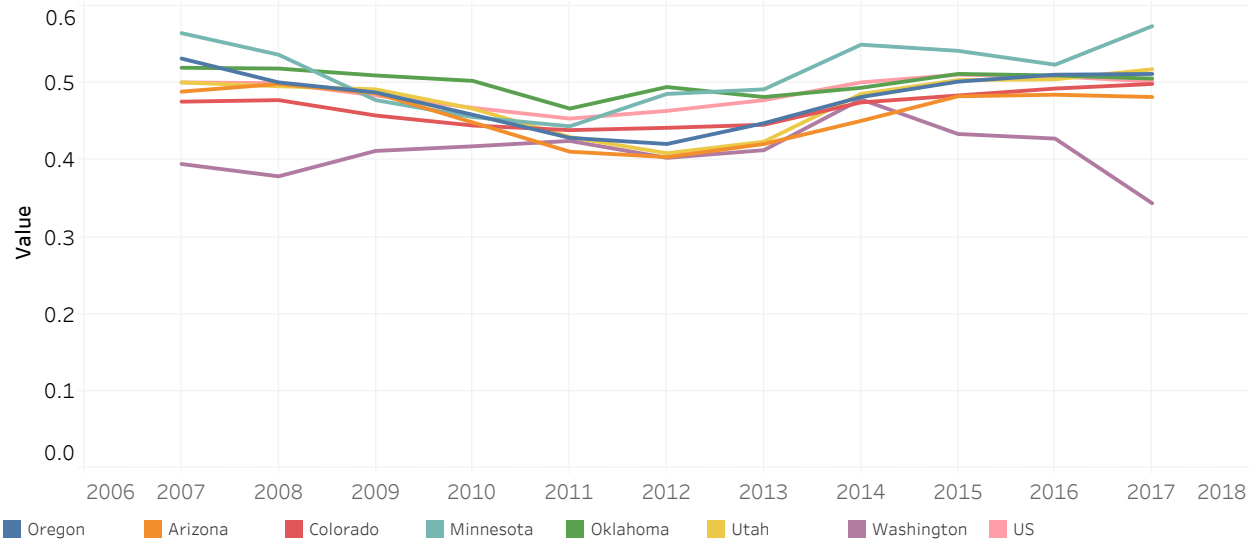
Peer Group Trends

over Last 10 Years*



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Primary Source: Bureau of Labor Statistics

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Oregon I & E Data One-Pager

Cross-Cutting Metrics

RANK TREND

Net Migration of Knowledge Workers

6.1 Total Higher Education Moved from Out of State (Includes abroad) as a Percentage of the Total Population of the State

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.012	3	7	3.51%	1.88%

Explanation of Metric

Net migration of knowledge workers is defined as the number of migrants from out of state and abroad with a higher education degree (bachelor's or above) as a percentage of state population. States compete with one another not only to attract business but also to attract skilled workers who will work for those businesses or start their own. And there is a strong relationship between higher concentrations of well-educated residents and per-capita income growth.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	○	○
Arizona	○	●	○	●	●
Colorado	●	●	●	●	○
Minnesota	○	○	◐	●	●
Oklahoma	○	○	○	○	○
Utah	○	◐	○	●	●
Washington	●	●	●	●	●

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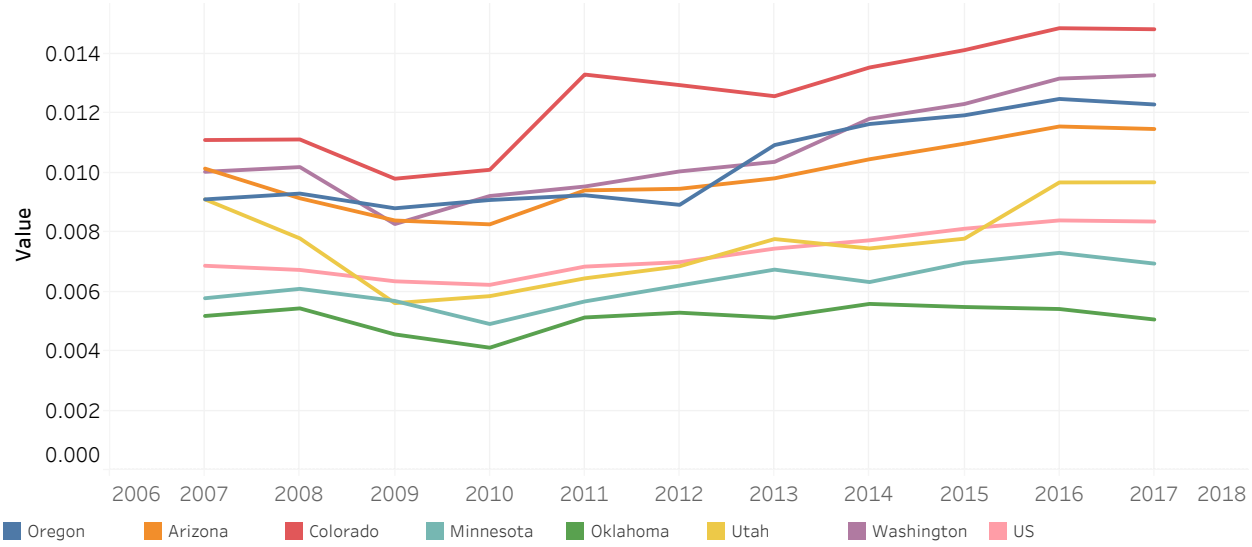

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Primary Source: United States Census Bureau

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Oregon I & E Data One-Pager

Cross-Cutting Metrics

RANK TREND

STEM Jobs

6.2 Percentage Held by STEM Workforce

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.13	5	18	1.75%	1.25%

Explanation of Metric

STEM jobs are defined as the number of professionals working in science, Technology, Engineering and Math (STEM) fields as a percent of the total workforce. Having a labor pool of STEM workers in the state is one important dimension of a state's innovation capacity and talent.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	●	●
Arizona	●	●	●	●	●
Colorado	●	●	●	●	●
Minnesota	●	●	●	●	●
Oklahoma	●	●	●	●	●
Utah	●	●	●	●	●
Washington	●	●	●	●	●

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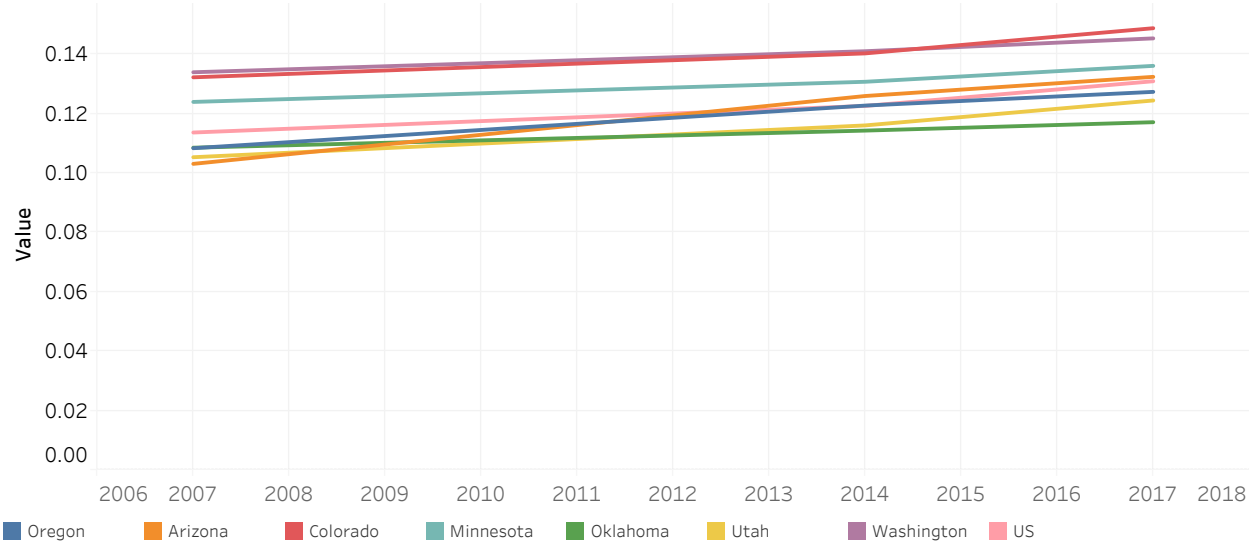

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Primary Source: BLS

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Oregon I & E Data One-Pager

Cross-Cutting Metrics

RANK TREND

Managers, Professionals and Technichian Jobs

6.3 Managers, professionals, and technicians as a share of the total workforce

Oregon Summary Data

State	Value in Most Recent Year	Rank in Peer Group	Rank Overall	Annual Percentage Change (10 years*)	Annual Percentage Change (3 years)
Oregon	0.31	4	15	5.58%	-0.57%

Explanation of Metric

Managers, professionals and technician jobs are defined as these professions share of the total workforce. As the economy becomes more complex and knowledge-based, managers, professionals, and technicians are playing a more important role in the economy. Managers in particular are important class of talent to help companies grow and scale.

Peer State Snapshot

State	Top 3 in Peer States	Top Quartile, All States	Improvement Compared to the US, 10 year	Improvement Compared to the US, 3 year	Acceleration
Oregon	●	●	●	●	●
Arizona	●	●	●	●	●
Colorado	●	●	●	●	●
Minnesota	●	●	●	●	●
Oklahoma	●	●	●	●	●
Utah	●	●	●	●	●
Washington	●	●	●	●	●

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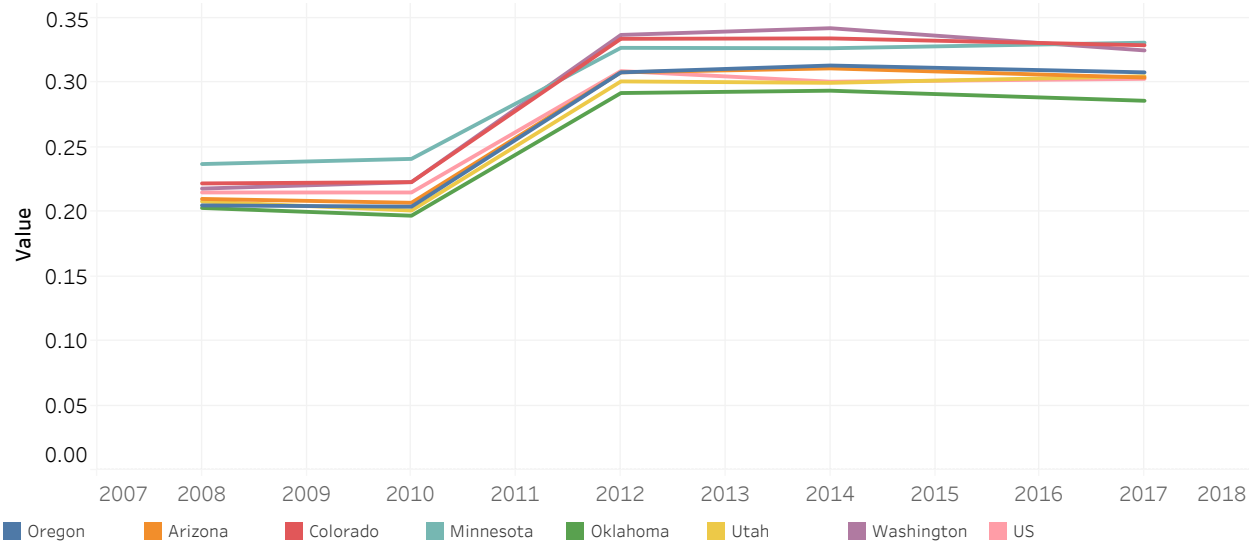

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Primary Source: ITIF

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