Why Innovation?

Innovation and technological advancement are key to growing productivity. Increased productivity leads to economic growth, higher wages, and a higher standard of living. Innovation is vital to growing Oregon’s competitive advantages.

Most advances in innovation happen in the private sector, especially in large businesses, but there are important innovations happening at small- and medium-sized businesses as well. Research and development can be risky. Most new ideas and products don’t pan out. But businesses need to innovate. Innovation gives businesses a competitive advantage and those that can recognize market opportunities and innovate quickly and effectively are more likely to grow and succeed, especially in an ever-more global 21st Century economy.

Cultivating an innovative business environment in Oregon will bring more jobs—and higher paying jobs—to Oregonians. Oregon is already home to many innovative businesses and industries. Oregon’s High Technology industry group is very competitive, growing, and the largest source of innovation in the state. Innovation goes beyond High Technology, though. Business Oregon’s other Target Industry Groups also rely on innovation too to be competitive and grow. Whether it’s engineered wood products—such as cross-laminated timber—in Forestry and Wood Products, or advanced metals and materials in Outdoor Gear and Apparel and Advanced Manufacturing, innovative products are fundamental to growing the competitiveness of Oregon’s industries and economy.

The Innovation Index

The *Oregon Innovation Index* was created to measure the state’s innovation economy and identify opportunities to enhance competitiveness. It is a key yardstick used by Business Oregon to track the state’s success in building an innovation-based economy. An innovation-based economy is one that encourages new ideas, products, and approaches to meet current or emerging demands of consumers. It directly impacts the ability of communities to grow and prosper. “Innovate Oregon’s Economy” is one of Business Oregon’s five key priorities in the agency’s strategic plan.

Business Oregon and the Oregon Innovation Council (Oregon InC), a public-private partnership charged with creating an innovation-based economic strategy, identified key factors necessary for a healthy innovation economy, including: public-private partnerships for research and development, ready access to capital, statewide entrepreneurial networks, and targeted investments in emerging industries where Oregon has a global competitive advantage.
History & Methodology

The first Innovation Index, published in 2004, evaluated nine indicators to track Oregon’s progress. It was updated and expanded in 2007 to include 20 indicators to ensure that each stage of the innovation process, the expected outcomes, and the environment that leads to innovation were being measured. The 2009 Index continued the framework established in 2007 with updated data for each of the indicators. The 2015 Index also included 20 indicators, but five of the indicators established in 2007 were replaced with different indicators, primarily related to science, technology, engineering, and math (STEM) workforce and education. None of the 2018 Index indicators have changed from 2015. The most significant change to the Index is scoring for all 50 states, not just Oregon. This enables us to compare Oregon’s overall performance with other states.

The composite scores of the 2007 and 2009 indices were composed of a weighted sum of the 1-year, 5-year, and national ranking performance for each indicator. The 2015 Index replaced 5-year scores with 10-year scores to better capture secular trends and replaced 1-year scores with performance relative to U.S. average to better capture current performance of states. The composite score in the 2015 Index saw the 10-year trend weighted at 50 percent, national rank weighted at 33 percent, and performance relative to U.S. average weighted at 17 percent. The 2018 Index utilizes the same three scoring categories, but weights have changed. The 10-year trend is now weighted equally to national rank, each at 40 percent. Performance relative to U.S. average is now 20 percent.

The calculation of 10-year trend scores in the 2018 Index has changed with the inclusion of all 50 states. In previous indices, trend performance was simply based on whether indicator values improved, stayed about the same, or declined. Since many innovation indicators showed improvement across the board in most states, the old method of determining performance seemed less useful. As a result, the 2018 Index includes two changes to how 10-year trend scores are calculated. The first change is the 10-year trend score is no longer based solely on percentage change (growth), but also on national rank change. The 10-year trend score is calculated by taking the average of each state’s, 1) compound annual growth rate rank and 2) national rank change rank. The inclusion of national rank change helps to put into perspective whether or not the percentage change resulted in any change in performance of the state relative to its peers.

The calculation of performance relative to U.S. average in the 2018 Index has also changed. In this edition of the Index, standard scores, or z-scores, were calculated for each state to group states that were above one-half standard deviation from the mean, within one-half standard deviation from the mean, and below one-half standard deviation from the mean. Z-scores only work well with normally distributed data and some of the Index indicator data is not normally distributed, usually due to one or two high performing states. In these instances, data was winsorized, where data points above or below two standard deviations from the mean were transformed to equal those limits. A winsorized mean was then calculated and used to produce the standard scores.

There are three possible scores for each indicator in each category for each state: 1, 0.5, and 0. For national ranking, states performing in the top ten get one point, while states ranked 11-25 get one-half point, and those below 25 get zero points. In the relative to U.S. average and 10-year trend categories, points are awarded based on standard scores in the three groups outlined in the previous paragraph. Due to different composite score weights and changes to how the 10-year trend and relative to U.S. average scores are calculated, Oregon’s composite score from the 2018 Index is not comparable to past scores from previous indices.
### Oregon's 2018 Innovation Scorecard

<table>
<thead>
<tr>
<th>Indicator</th>
<th>10-yr Trend</th>
<th>Relative to U.S. Average (latest year)</th>
<th>Latest National Ranking</th>
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<tr>
<td><strong>Invention</strong></td>
<td></td>
<td></td>
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<tr>
<td>Invention Disclosures</td>
<td>↓</td>
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<td>Patent Citations</td>
<td>↔</td>
<td>↑</td>
<td>6</td>
</tr>
<tr>
<td><strong>Translation</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Industry R&amp;D Investments</td>
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<td>↑</td>
<td>7</td>
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<tr>
<td>SBIR/STTR Awards</td>
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<td>↑</td>
<td>10</td>
</tr>
<tr>
<td>University Licenses/Options</td>
<td>↔</td>
<td>↑</td>
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</tr>
<tr>
<td>University Licensing Income</td>
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<td>↔</td>
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<td>Kauffman New Entrepreneurs</td>
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<td>↔</td>
<td>15</td>
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<tr>
<td>New Business Creation</td>
<td>↓</td>
<td>↔</td>
<td>18</td>
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<tr>
<td>University Startups</td>
<td>↔</td>
<td>↔</td>
<td>22</td>
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<td><strong>Economic Prosperity</strong></td>
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<tr>
<td>Manufacturing GDP</td>
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<td>Average Wage</td>
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<tr>
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<td>Educational Attainment</td>
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<td>16</td>
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<tr>
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<td>12</td>
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<tr>
<td>Broadband Access</td>
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<td>↔</td>
<td>23</td>
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<tr>
<td><strong>2018 Innovation Score (out of 100)</strong></td>
<td></td>
<td></td>
<td>66.5</td>
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</tbody>
</table>

*Source: Business Oregon.*

### The Innovation Score

Oregon's 2018 Innovation Score is 66.5. For comparison, the top scoring state in the *Index* was Massachusetts with a score of 68.5. A score of 100 would mean Oregon was nationally ranked in the top ten for every indicator, has an above average 10-year trend score for every indicator amongst all states, and performed above the U.S. average for every indicator. Obviously, a score of 100 would be nearly impossible to attain for any state, given the number and variety of indicators used in the *Index*. As such, the score of 66.5 should not be evaluated as one would for academic grading (90-100 equals an A, 80-89 equals a B, etc.).
The state performed best in the indicator categories of Invention, Translation, and Economic Prosperity. In patents, Oregon continues to outperform for its size, due in large part to an established, competitive high technology industry with strong research and development. Within Translation, Oregon has made strong gains in Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) awards and is performing well in university licenses, options, and licensing income. Oregon’s overall Economic Prosperity has improved as well. Oregon’s percentage of GDP from manufacturing remains the second highest in the U.S. Wages have improved in Oregon, and the gap in average wage between Oregon and the U.S. continues to shrink.

The state performed worst in the categories of Commercialization and Innovative Environment. Oregon ranks a little better than average in venture capital investments, entrepreneurship, and startups, but hasn’t made significant gains in these indicators. While Oregon increased its educational attainment and STEM workforce over the past 10 years, Oregon is average in the number of STEM graduates from Oregon colleges and universities as a percentage of adults age 18-24 and has not improved its ranking. Oregon continues to attract young, educated workers as evidenced by the highest 10-year score in migration of knowledge workers.

The 2018 Index includes scores for all 50 states. The District of Columbia is excluded due to some issues with data availability. Figure 1 shows states by score quintiles, revealing states with relatively high and low innovation scores. Oregon's score of 66.5 ranked third in the U.S., placing it amongst the top performing states. Other top performing states, in rank order, include Massachusetts, California, Utah, Washington, Illinois, New York, New Hampshire, Colorado, and North Carolina.

**Figure 1**

2018 Innovation Index Scores

![Map of 2018 Innovation Index Scores](Source: Business Oregon)
## 2018 Innovation Index Scores by Category

<table>
<thead>
<tr>
<th>STATE</th>
<th>NATIONAL RANK</th>
<th>RELATIVE TO U.S. AVERAGE</th>
<th>10 YEAR TREND</th>
<th>TOTAL</th>
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<tr>
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<td>RAW WEIGHTED</td>
<td>RAW WEIGHTED</td>
<td>WEIGHTED</td>
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<td>9.5</td>
<td>1.9</td>
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</table>

Source: Business Oregon.
Figure 2 breaks down *Innovation Index* scores by state for each scoring category, including raw and weighted scores. Oregon had the fifth highest score in national rank and 10-year trend, and the fourth highest score in relative to U.S. average. This consistency bodes well for Oregon’s innovation economy, as the results point to a state that is already competitive nationally, but also growing its competitiveness over time. Massachusetts and California, the most innovative states according to the *Index* and other similar innovation indices, are very competitive nationally, but score lower in 10-year trend. Likewise, many top scoring states in 10-year trend, such as Alaska and South Dakota, have made great strides in innovation, but have yet to reach a level of competitiveness nationally as states like Massachusetts and California.

Unlike other published innovation indices, the *Index* looks beyond current rankings and scores states on performance relative to U.S. average and 10-year trend. This difference explains why certain states score higher and lower in the *Index* than in other innovation indices. Due to the weighting of the *Index*, the difference is typically attributed to a state’s score in 10-year trend. States with strong 10-year trends tend to show up higher in the *Index* than where they otherwise might in an index based solely on current rankings. This feature of the index essentially rewards states whose innovation economies are becoming more competitive, such as Oregon and Utah. Since Business Oregon is a long-term investor in Oregon’s innovation economy, performance in the long-term is equally important as current rankings and competitiveness.
INVENTION

Invention Disclosures, Patents, & Citations

Key Message
New ideas are generated in Oregon at an increasing rate. In order to maximize value to the state, Oregon needs to focus on developing these ideas into new products and services for new and existing businesses.

Significance
The number of invention disclosures—the first step in determining if an invention should be patented—and patents measure the extent to which intellectual property is created in the state. Patent citations—when an inventor cites a previous patent in a patent application—are a measure of the technical relevance of a patent to later inventions. Commercially feasible research and development (R&D) reflects the innovative abilities of the various public and private research institutions to catalyze new products, jobs and companies.

Performance
Oregon ranked 25th nationally in the number of invention disclosures coming out of the university system in 2015, similar to its rank in 2005. Invention disclosures filed by the state’s research institutions grew slower than average. Disclosures per million dollars in research expenditures is essentially the same as it was 10 years ago (Figure 3).

Oregon ranked 4th in the nation in patents per million persons and 6th in patent citations per million persons in 2017. While the 10-year trends for both indicators are positive, Oregon’s growth in patents per million persons has lagged the U.S. Still, Oregon’s rate remains much higher than the U.S. and is well above average (Figure 4). Growth in patent citations per million persons has significantly outpaced the U.S. in recent years (Figure 5) and, like patents, its rate is higher than the U.S. average. Oregon ranks 6th in the nation in patent citations per million, up 4 spots from 2007.

Source: Association of University Technology Managers, Statistics Access for Tech Transfer.
**Key Message**
Oregon’s competency in forging research and development (R&D) partnerships among universities and private industry gives the state a competitive advantage. Because these R&D expenditures typically leverage federal and private support, bringing new dollars into the state, it is important for the state to continue to enhance this key source of innovation in our economy.

**Significance**
R&D expands the knowledge base of industry and produces new products, which are key to sustained economic growth. New ideas, processes, and products fuel innovation and attract investment in Oregon companies.

**Performance**
Oregon’s R&D spending is driven by private industry, which accounted for 88 percent of total R&D expenditures in 2015. Total R&D expenditures in Oregon increased 84 percent between 2005 and 2015 (Figure 6). Oregon ranked 7th nationally in industry R&D as a percentage of private sector Gross Domestic Product by state in 2015 (Figure 7), rising four spots from 11th a decade ago. Industry R&D growth has outpaced the nation, both in terms of expenditures and percentage of private GDP (Figures 7 & 8).

*Figure 6*

**R&D Performance in Oregon by Sector**

Source: National Science Foundation
## Figure 7

### Industry R&D Performance by State in Millions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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## Figure 8

### Oregon Industry R&D Performance

![Oregon Industry R&D Performance](image)

Source: National Science Foundation.
**TRANSLATION**

**SBIR/STTR**

**Key Message**
The SBIR and STTR (Small Business Innovation Research/Small Business Technology Transfer) federal R&D grant programs drive innovation in small businesses. Oregon should continue to focus on increasing its share of these federal grants by enhancing the tools available to small business owners to successfully learn about and apply for SBIR/STTR funding.

**Significance**
SBIR and STTR grants from federal agencies allow entrepreneurs to conduct research and develop new technologies. These programs often provide initial funding to help small companies turn ideas into commercially viable products.

**Performance**
In 2014, Oregon received $47 million in SBIR and STTR awards, an increase of 54 percent from 2004. Oregon SBIR and STTR awards accounted for just two percent of total awards nationally (Figure 9). However, over the past decade, Oregon’s share of SBIR and STTR awards has nearly doubled. Oregon received 64 SBIR awards and 7 STTR awards in 2014.

Oregon ranked 10th among all states in SBIR and STTR awards per $1 million of GDP in 2014. Oregon’s performance in this measure has improved since 2004, when Oregon was ranked 15th in the nation. Oregon had the seventh largest increase in SBIR and STTR award dollars per million in GDP amongst all states from 2004 to 2014 (Figure 10).

![Oregon SBIR/STTR Awards](source: U.S. Small Business Administration, SBIR and STTR Annual.)
Figure 10

Change in SBIR/STTR Award Dollars per Million in GDP, 2004-2014

Source: Small Business Administration and U.S. Bureau of Economic Analysis.
TRANSLATION

University Licensing Income & Options

Key Message
Oregon universities have had increasing success in generating income from licensing new technologies to businesses. Continued focus on this measure will increase linkages between higher education and private businesses that will help commercialize new technologies.

Significance
*University licensing income*—the amount firms pay universities to use their technology—and *options*—the agreement firms make with universities to use their technology—are indications of the commercial viability of university inventions. The number of licenses and options executed in a given year tells how many university inventions appear to have commercial potential. The amount of income universities receive is an indication of the value companies assign to the intellectual property developed at research institutions.

Performance
Oregon ranked 12th in the nation in the number of licensing options executed and 16th in the nation in licensing income in 2015. Licensing income per $1 million in research expenditures in Oregon is close to the U.S. average. University licensing income in Oregon has more than tripled since 2005 (Figure 11). Oregon’s rank in licensing income improved 10 spots from 2005, the third highest increase in the U.S. This indicates that Oregon research universities are generating more income from private sector use of their intellectual property. Likewise, the number of licenses and options executed at Oregon universities in 2015 was two-and-a-half times larger than 2005. This indicates that companies are increasingly integrating university research into their products and services.

![Figure 11](image)

*Source: Association of University Technology Managers, Statistics Access for Tech Transfer.*
COMMERCIALIZATION
Venture Capital

Key Message
Attracting venture capital into the state is vital for innovative Oregon businesses to thrive. Venture capital investments in Oregon have grown in recent years. Continuing this trend will be vital to growing Oregon’s innovation economy.

Significance
Access to capital plays a crucial role in new firm formation and stimulating economic growth. Venture funds and angel investors provide the risk capital many companies need to begin or expand their operations.

Performance
Oregon venture capital investment in 2017 was nearly $273 million, its second highest level over the past decade. Venture capital investment in Oregon grew by 10 percent between 2007 and 2017, far below the total growth rate of investment in the U.S. of 131 percent. While Oregon venture capital investment today is a far cry from its peak in 2000, investment trends in recent years are positive. Comparatively, though, Oregon’s share of venture capital investment in the U.S. has steadily declined, from 0.77 percent in 2007 to 0.37 percent in 2017 (Figure 12).

Oregon ranked 19th in the nation in venture capital investment per $1,000 of GDP in 2017 (Figure 13), up three spots from 22nd a decade ago. Despite ranking in the second quintile, Oregon’s venture capital investment per $1,000 of GDP is below the U.S. average. This is mainly due to a handful of states—primarily California and Massachusetts—that receive large amounts of venture capital investment, driving the U.S. average well above the median for states.

Figure 12
Oregon Venture Capital (VC) Investment

Figure 13

Venture Capital Investment per $1,000 of GDP

COMMERCIALIZATION
Entrepreneurial Activity

Key Message
States that are able to generate and support entrepreneurship will be well-positioned to develop new products and services. Startup firms have the potential to grow rapidly and provide leadership in developing new markets that benefit both emerging and existing businesses around the state.

Significance
Entrepreneurship—the creation of new companies—is often used to measure the extent to which new ideas are introduced into the market. These new ideas are one measure of innovation in an economy. The Kauffman Foundation’s Index of Entrepreneurial Activity calculates the percentage of individuals ages 20 to 64 who start a new business.

Performance
In 2017, Oregon ranked 15th in the nation in entrepreneurial activity. This is down from a ranking of 12th in 2007. Oregon's entrepreneurship rate was essentially the same in 2017 as it was in 2007. The U.S. rate also remained relatively unchanged. Oregon's entrepreneurship rate dropped precipitously over the last recession, falling well below the U.S. rate, but Oregon's rate rebounded strongly in the following economic expansion and has once again topped the U.S. rate (Figure 14).

Figure 14

Kauffman Index of Entrepreneurial Activity

Source: Ewing Marion Kauffman Foundation, Kauffman Index of Entrepreneurship Series
COMMERCIALIZATION
New Business Creation

Key Message
Startup firms have the potential to grow rapidly and provide leadership in developing new markets that benefit both emerging and established industries around the state. The nationwide decline in the rate of new business creation highlights the need to encourage entrepreneurship and foster new business creation.

Significance
New businesses create new jobs, which expand and strengthen economies. They introduce new, innovative practices to the marketplace that lead to new and improved products or services. A high rate of new business creation is an indication of an innovative, dynamic, and entrepreneurial economy.

Performance
The rate of new business creation nationwide is near its lowest point in 20 years. States are doing well to maintain their new business creation rates, let alone grow them. In 2016, Oregon ranked 18th in the nation in the number of new establishments per 1,000 employed in the state (Figure 15) and exceeded the U.S. average. Oregon’s rate of new business creation in 2016, 12.0, was lower than its rate in 2006 of 12.81, which resulted in a loss of 5 spots in national ranking. The U.S. rate also fell slightly from 11.2 to 11.1. Despite performing better than average in new business creation, Oregon lost ground in this measure over the past ten years.

COMMERCIALIZATION
University Startups

Key Message
University startups are a good indication that commercialization of university research is paying off. Streamlining the process which transfers university research to new business ventures will increase Oregon’s ability to attract new investment and encourage collaborative partnerships between researchers and entrepreneurs.

Significance
University startups—companies formed from university research—measure the number of new businesses that are created as a direct result of university intellectual property. This measure demonstrates the strength of Oregon’s university system in commercializing research and fostering entrepreneurship.

Performance
Oregon ranked 22nd nationally in university startups per $100 million in sponsored research in 2015. Oregon’s rate of 1.55 startups per $100 million was slightly below the U.S. average of 1.63. Oregon has not made significant gains in the number of university startups over the past 10 years (Figure 16). Oregon’s national rank dropped five spots in this measure between 2005 and 2015, while its compound annual growth rate of 4.6 percent ranked 33rd in the country.

Figure 16
Oregon University Startups

Source: Association of University Technology Managers, Statistics Access for Tech Transfer.
ECONOMIC PROSPERITY
Manufacturing GDP

Key Message
Oregon’s high value-added manufacturing is a vital source of innovation in the state and gives Oregon a distinct competitive advantage. Manufacturing drives industry R&D in Oregon, the U.S., and throughout the world. It is important for the state to maintain and grow this key source of innovation in our economy.

Significance
Manufacturing accounts for about 70 percent of all industry R&D worldwide and in the U.S. Manufacturing R&D leads to the development of new, innovative products that generate additional demand, enabling manufacturers to compete and succeed in the global economy. Manufacturing GDP demonstrates Oregon’s strength in innovation and the skill and productivity of its workers.

Performance
Oregon derives more of its GDP from manufacturing than any other state, but one (Figure 17). Oregon’s manufacturing percentage of GDP is nearly twice as high as the U.S. average. In terms of GDP, manufacturing is the largest industry in Oregon, accounting for one-fifth of total GDP in the state. Oregon’s 1.2 percent compound annual growth rate for manufacturing percentage of GDP between 2007 and 2017 was the second highest in the country. The U.S. rate was -1 percent, with only six states posting positive rates of change over the last ten years.

Figure 17
Manufacturing Percentage of GDP, 2017

Source: U.S. Bureau of Economic Analysis, Regional Economic Accounts.
ECONOMIC PROSPERITY

Average Wage

Key Message
Oregon must continue to focus on growing the wages of workers statewide. One of the key drivers of wage growth is human capital development. A skilled and educated workforce creates value for Oregon companies, thereby contributing to average wage growth.

Significance
Average wage measures trends in the average annual pay of workers in Oregon. This measure is limited to workers covered by unemployment insurance, which excludes self-employed workers. Wages have been adjusted for inflation.

Performance
Oregon made strong gains in average annual wage between 2007 and 2017, climbing from 24th in the U.S. to 20th. This was the third largest increase in the rankings nationally. While the average wage in Oregon still trails the U.S. average, it is now 92 percent of the U.S. average compared to 89 percent in 2007 (Figure 18). Oregon's high ranking change along with the sixth highest compound annual growth rate, gave Oregon the fourth highest score for 10-year trend amongst the states.
ECONOMIC PROSPERITY
High Technology Employment

Key Message
Oregon has a well-established high technology industry group, which commercializes new ideas and generates high-wage jobs. More and more, companies, both large and small, are dependent on technological innovation to compete in the global economy. Thus, it is important to maintain the state’s competitive advantage in high technology industries.

Significance
Technology sector industries—as defined by the 2017 State New Economy Index—are an important part of an economy because they are key engines of innovation and a source of high-paying jobs. States with a critical mass of jobs in technology-generating industries tend to attract other businesses and workers with a high degree of inventiveness, and help to increase the competitiveness of all traded sector industries.

Performance
Oregon ranked 9th nationally in percentage of high technology jobs in 2015, improving its ranking by 4 spots since 2005. Oregon’s high technology industry group includes over 82,000 manufacturing and service jobs that accounted for 5.6 percent of Oregon’s private sector employment in 2015 (Figure 19). High tech jobs grew a little faster than average in Oregon between 2005 and 2015 with a compound annual growth rate of 3.2 percent compared to 2.6 percent nationally. High tech jobs in Oregon are at their highest percentage of private employment since 2000, when high tech jobs accounted for 6.3 percent of jobs. Unlike the 1990s, though, job growth in Oregon high tech in recent years has been fueled by high tech services, such as internet publishing, computer systems design, data centers, and software publishing, rather than computer and electronic products.

Source: The Information Technology & Innovation Foundation, State New Economy indices.
ECONOMIC PROSPERITY

Exports

Key Message
Oregon’s relatively high ranking in exports and proximity to China and other emerging markets demonstrates the state’s competitive advantage in developing global markets and providing customers worldwide with high quality, innovative products and services.

Significance
Export-oriented companies have a multiplier effect on the local economy. As these companies work to meet the demand for their products, they rely on local firms to supply goods and services, which benefit the state’s economy. Exports create additional demand for traded sector goods and services, which in turn create jobs, spur innovation, and increase wages in Oregon.

Performance
In 2017, Oregon exported $21.9 billion worth of goods to 200 countries and territories around the world. Oregon ranked 13th in the nation in exports as a share of GDP in 2017. Exports as a share of GDP is higher than average in Oregon at 9.3 percent compared to 8 percent for the U.S. (Figure 20), making exports comparatively more important to Oregon’s economy than the average state. Unfortunately, exports as a share of GDP has slowly declined in Oregon since 2007. Oregon slipped 5 spots in national rank between 2007 and 2017 and had the 37th ranked compound annual growth rate.

Figure 20
Exports as Percentage of GDP

Sources: U.S. Bureau of Economic Analysis, National & Regional Economic Accounts, and http://wisertrade.org, data from U.S. Census Bureau, Foreign Trade Division.
INNOVATIVE ENVIRONMENT

Educational Attainment

Key Message
Educational attainment is an important indicator of the human capital that is available in Oregon. The role of education in creating a successful innovation environment cannot be overstated. Investments in Oregon’s educational system—kindergarten through graduate school—and continued in-migration of highly educated workers benefit the state in the form of a highly skilled workforce.

Significance
Educational attainment is a key driver of the innovation economy. Innovation cannot occur if educated people are not plentiful in Oregon companies, universities, and other innovation incubators.

Performance
Educational attainment is rising faster than average in Oregon. In 2016, Oregon ranked 16th in the nation in percentage of adults with a Bachelor’s degree or higher. Over the past 10 years, Oregon has improved steadily in this measure (Figure 21). Oregon received the fourth highest 10-year trend score amongst states in the Index, with the fourth highest improvement in national rank and ninth highest compound annual growth rate.

Figure 21

Educational Attainment - Bachelor’s Degree or Higher

Source: U.S. Census Bureau, American Community Survey, 1 Year Estimates.
INNOVATIVE ENVIRONMENT

STEM Workforce

Key Message
Growing Oregon’s science, technology, engineering, and mathematics (STEM) workforce is vital to the state’s economic competitiveness and growth. STEM workers are the professionals spearheading research and development of innovative products and services and are increasingly in demand by Oregon’s innovative companies.

Significance
STEM workers are at the center of an innovation economy. Oregon’s research and development capacity and competitiveness is directly connected to STEM. Growing the STEM workforce, both through in-migration of knowledge workers and increasing the number of STEM graduates from Oregon universities, is key to attracting and growing innovative businesses.

Performance
Oregon STEM employment ranked 18th in the U.S. in 2017 as a percentage of total employment. This was an improvement from 2006 when the state was ranked 21st. Oregon’s STEM employment is growing faster than average, increasing by 18 percent between 2007 and 2017 compared to the U.S. average of 15 percent. At 12.7 percent, STEM employment concentration in Oregon is similar to the U.S. average of 13.1 percent. Looking at STEM employment in all states (Figure 22), it’s interesting to see a slightly negative correlation between STEM employment concentration and growth. The top 9 states by STEM employment concentration all grew STEM jobs at a slower rate than the U.S. average.

Figure 22

STEM Employment Concentration
(Bubble Size Equals Total STEM Employment)

INNOVATIVE ENVIRONMENT
STEM Graduates

Key Message
States with high numbers of STEM graduates are amongst the most innovative economies in the U.S. States recognize this and the number of STEM graduates nationwide are rising. States that increase the number of their STEM graduates will likely grow their innovation economies faster than states that do not.

Significance
The innovation economy needs a high quality STEM workforce to succeed and grow. States can grow their STEM workforce through in-migration or by creating STEM graduates at state universities. States with high numbers of STEM graduates, though, tend to have more innovative economies than states with low numbers of STEM graduates. The innovation ecosystem created by large numbers of STEM graduates offers a significant competitive advantage for those states.

Performance
Oregon ranked 24th in STEM Bachelor's degrees conferred as a percentage of the population age 18 to 24 in 2016, the same ranking it held in 2006. Oregon's ratio was 16.05, a little higher than the U.S. average of 15.13 (Figure 23). Oregon increased its total STEM graduates by 52 percent from 2006, but this trailed the U.S. average of 62 percent and ranked 34th amongst states. Comparatively, Oregon has not gained competitiveness in STEM graduates as a percentage of college-aged adults.

Figure 23

STEM Graduates by State
(Bubble Size Equals Total STEM Bachelor's Degrees Conferred, 2017)

INNOVATIVE ENVIRONMENT
Migration of Knowledge Workers

Key Message
States and their businesses compete for talent. States that are the most successful in attracting U.S. knowledge workers increase their educational attainment and develop a competitive workforce, which leads to higher incomes and lower unemployment.

Significance
Educational attainment is a major factor in determining a population's income and unemployment. Highly educated people are more likely to have higher incomes and lower unemployment than those who are less educated. Knowledge workers are attracted to states that offer high-paying jobs and a high quality of life. They are also more involved in the innovation economy, as many innovation jobs require a Bachelor's degree or higher.

Performance
Oregon ranked 12th in the nation for migration of U.S. knowledge workers in 2016. This ranking is based on the educational attainment of U.S. in-migrants to states from all other states from the prior year. Oregon has been very successful attracting knowledge workers to the state in recent years (Figure 24). Oregon had the highest 10-year trend score for migration of knowledge workers in the nation, with a compound annual growth rate of 1.18 percent and rank change of 15 between 2006 and 2016.

Figure 24
Change in Migration of Knowledge Workers in U.S., 2006-2016

Rank
- Top Ten (9.4-12.9%)
- Second Ten (7.2-8.4%)
- Middle Ten (5.7-7.0%)
- Fourth Ten (4.0-5.0%)
- Bottom Ten (-0.1-4.0%)

Source: U.S. Census Bureau, American Community Survey One Year Estimates
INNOVATIVE ENVIRONMENT
Broadband Access

Key Message
Oregon’s ability to develop and maintain broadband internet access is vital in a business environment that emphasizes global markets and internet-dominated communication. States that are able to increase the speed and reliability of internet connections will create more opportunities for advanced technologies and job growth.

Significance
Broadband—defined in the Index as fixed connections with 25 megabits (Mbps) for downloads and 3 Mbps for uploads and mobile connections with 5 Mbps/1 Mbps—access allows for faster transmission of data, which is critical for businesses that rely on the internet to communicate with customers, suppliers, and colleagues. Broadband access facilitates knowledge dissemination and collaboration by reducing the costs associated with telecommunications and business transactions.

Performance
Oregon ranked 23rd in the U.S. in broadband access in 2016. 91 percent of Oregon’s population has access to broadband internet connections. Oregon’s broadband access rate is slightly lower than the U.S. average of 92 percent, and lower than Washington, Utah, Nevada, and California, but higher than Idaho (Figure 25). Oregon’s 10-year trend score in broadband access was the 19th highest in U.S., which was above average, but not by much.

Figure 25
Broadband Access, 2016
Percentage of Population with Access to Fixed 25 Mbps/3 Mbps and Mobile 5 Mbps/1 Mbps

Source: Federal Communications Commission
Acknowledgements

The Innovation Index was developed by Business Oregon's Strategy and Communications Division in partnership with the Innovation & Entrepreneurship Division. The Index was prepared and produced by Michael Meyers, Economist, and Jill Cuyler, Research Analyst, with assistance from Kate Sinner, Innovation and Entrepreneurship Manager; Mark Brady, Innovation Strategist; Kimberly Herb, Energy Program & Policy Coordinator; and Nathan Buehler, Marketing and Communications Manager.

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