ECONOMIC AND FISCAL IMPACT OF SEMICONDUCTOR INDUSTRY EXPANSION IN OREGON

THE START OF OREGON'S "SILICON FOREST"

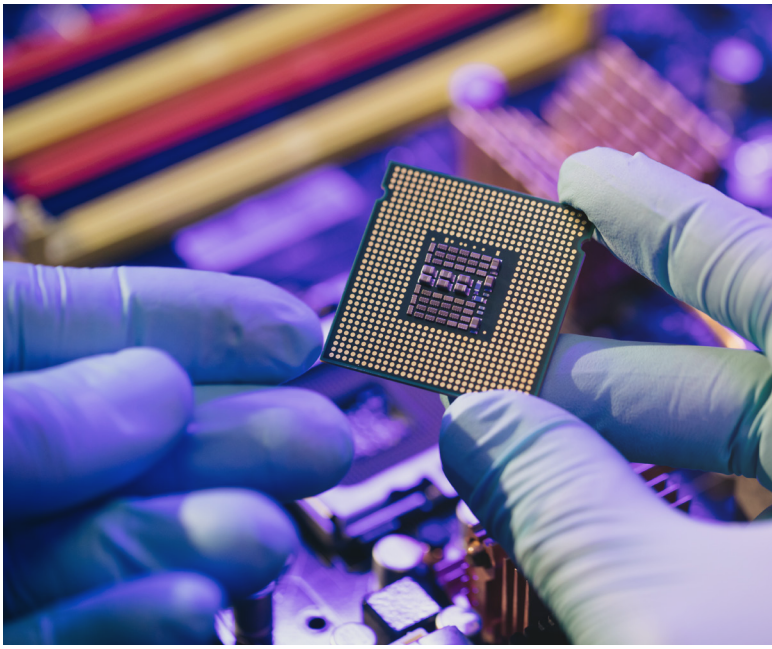
From its earliest days, the forest products industry (timber) dominated Oregon's economy. It was the result of having vast forests when other industries across the state struggled. Oregon has a fundamental logistical disadvantage—its geography. The state is too far from the industrial and consumer centers of America, therefore, industries serving those centers are better off not being in Oregon. But there is one notable exception—industrial equipment and related manufacturing. The industry produces high value, low weight products that are less expensive to ship.

Just as the timber industry began to collapse with falling lumber prices in the 1980s, high technology was being viewed as the future. Efforts to support the industry began with the state legislature, particularly with the special session in July 1984 to repeal the unitary tax—a tax that penalized foreign-based companies from locating in Oregon. Governor Vic Atiyeh traveled to Japan to encourage Japanese semiconductors to open plants in Oregon. Several did just that.

Hewlett-Packard, NEC, Wacker Siltronic, Intel, Spectra-Physics, Kentrox, GAF, and many smaller companies serving the industry found a home in Washington County. The new concentration of companies earned the moniker "Silicon Forest." To this day, Oregon continues to have comparative advantages for semiconductors, including its highly skilled workforce and well established supply chains.

This report explores the semiconductor industry in Oregon, its workforce, and a scenario that models the potential economic and fiscal impacts of an expansion project.

The origins of Oregon's comparative advantage in the semiconductor industry are rooted in efforts to attract high-value manufacturing during the decline of timber in the 1980's.



INDUSTRY OVERVIEW

High-tech manufacturers sit at the center of the traded sector, are highly productive, draw on diverse supply chains of businesses of all sizes, and compensate their workers well. In Oregon, semiconductor and high-tech manufacturers have outperformed national GDP and employment growth trends throughout the last two decades.

The most detailed government data at the state level is available at the computers and electronics subsector. Semiconductors nests within that industry. In order to gauge the importance of semiconductors, we can use an alternative source of data that calculates economic output. Using this measure, Oregon's concentration in semiconductors is 48 percent higher than the national average. Therefore, when comparing states at the computers and electronics subsector, Oregon is even more heavily concentrated in semiconductors than the data suggests.

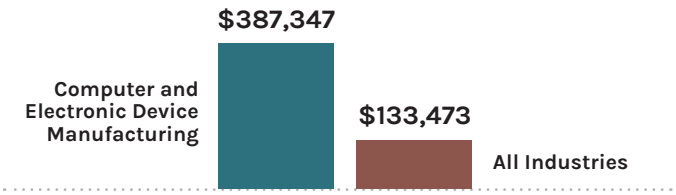
Location quotients (LQ)—based on GDP or jobs—gauge the strength of an industry relative to the same industry across the nation. An LQ equal to 1.0 would imply that Oregon has the same share of GDP or jobs as the U.S. average. LQs greater than 1.0 denote an economic specialty and indicate that GDP, jobs, or both are more concentrated than the U.S. average in that location. For example, an LQ of 1.5 indicates a 50 percent higher concentration than the U.S. average.

Oregon leads the U.S. in computers and electronics manufacturing job concentration. All other selected states have LQs at or below 1.0 meaning that their workforce in computers and electronics manufacturing is less concentrated than the national average. Oregon's workforce is hyperconcentrated in this high-tech manufacturing sector, with an LQ of 2.74. This translates to the workforce being 2.74 times more concentrated than the national average.

High-tech manufacturers sit at the center of the traded sector, are highly productive, and compensate their workers well.

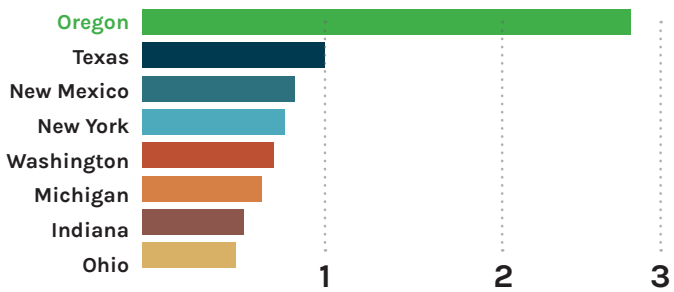
Oregon's computers and electronics workforce generates GDP three times higher per worker than all other industries.

Exhibit 1. Average GDP per Job in Oregon



Oregon's computers and electronics workforce is almost three times more concentrated than the national average.

Exhibit 2. Location Quotients for Computers and Electronics Manufacturing



OREGON'S COMPARATIVE ADVANTAGE

Since the 1990's, Oregon's computers and electronics manufacturing sector has contributed a higher share to state GDP than any other state. Oregon's economy is concentrated in semiconductor and high-tech manufacturing and research and development, leading to high-quality jobs and economic development within the state.

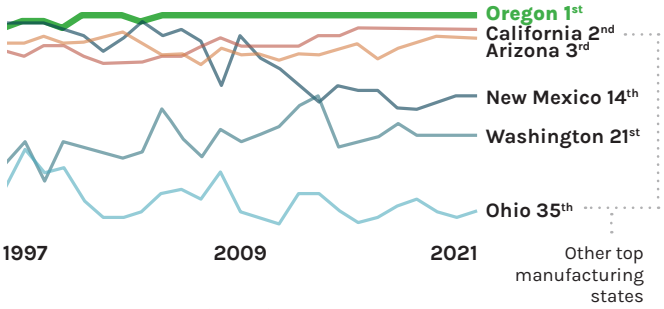
Oregon's computers and electronics industry has consistently ranked the highest of any state over the past 20 years in terms of the share of the industry's contribution to state GDP. Put differently, the computers and electronics sector is more important to the Oregon economy than any other state. This should not be taken as a permanent condition, however, as demonstrated by the fall of New Mexico from the top in the late 1990's to a rank of 14 today.

Overall employment in the computers and electronics industry has declined in the last few decades due to gains in productivity. However, in recent years, Oregon's computers and electronics employment has risen by eight percent while the U.S. employment in the industry has decreased by four percent.

Oregon has been a national leader in semiconductor and high-tech manufacturing for decades.

Oregon has ranked first in the nation for the past two decades.

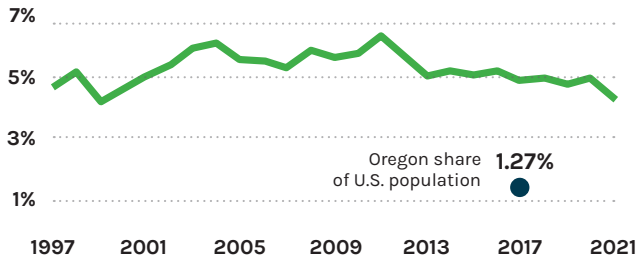
Exhibit 3. Rankings for Computers and Electronics Manufacturing as a Share of State GDP



Source: U.S. Bureau of Economic Analysis, 1997-2021

Oregon's share of the U.S. computers and electronics GDP has remained 3 times higher than its share of the population.

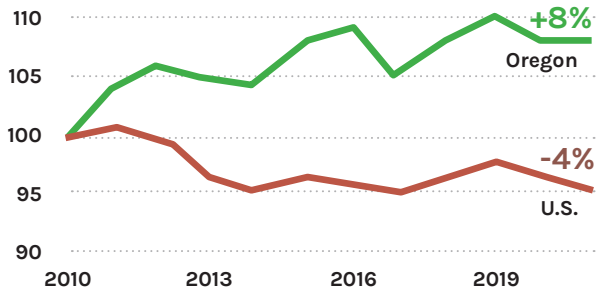
Exhibit 4. Oregon's Share of U.S. Computers and Electronics Manufacturing GDP 1997-2021



Source: U.S. Bureau of Economic Analysis, 1997-2021

Despite long-term declines in the industry, Oregon's computers and electronics employment has risen by 8% since 2010.

Exhibit 5. Computers and Electronics Manufacturing Relative to 2010



Source: U.S. Bureau of Economic Analysis, 2010-2021

WORKFORCE OVERVIEW

Oregon has approximately 37,200 employees working in computers and electronics manufacturing, 27,300 of which work in semiconductor and related device manufacturing.[1] About 45 percent of workers identify as Black, Indigenous, or People of Color (BIPOC), 23 percent are women, and 67 percent have a bachelor's degree or more. Semiconductor manufacturing offers opportunities for upward economic mobility with high-paying and high-quality jobs for workers across educational attainment levels and all races and ethnicities.

Wage premia for this industry exist across genders, races, ethnicities, and levels of educational attainment. Controlling for educational attainment, workers in high-tech electronics (HTE) manufacturing earn more than other subsectors in manufacturing. White and BIPOC workers earn more in HTE manufacturing than all other industries at all levels of educational attainment. For example, an average BIPOC worker with an associates degree earns 43 percent more in HTE manufacturing than an average worker in all industries.

Semiconductor manufacturing requires a mix of both high-skilled labor with graduate or professional degrees in conjunction with a workforce who may not need advanced degrees but instead, pursue comprehensive, on-the-job training with their employer.

Oregon's semiconductor manufacturing industry workforce is more diverse compared to the statewide workforce. Forty-five percent of workers in the industry identify as BIPOC (27 percent identify as Asian, seven percent identify as Hispanic, and two percent identify as Black), whereas only 20 percent of people identify as BIPOC in Oregon's overall workforce. The share of Asian, Hispanic, and Black workers in semiconductor manufacturing is higher than their corresponding shares of the overall statewide workforce.

Public and private sector partners are working together to train and upskill Oregon's high-tech manufacturing workforce.

PARTNERSHIP HIGHLIGHT

Portland Community College collaborated with industry and government leaders to build the Oregon Manufacturing Innovation Research Center Research & Development (OMIC R&D, above) to prepare the next generation of Oregon's semiconductor workforce for upward economic mobility.

Wage premia for this industry exist across gender, race and ethnicity, and levels of educational attainment.

Exhibit 6. Median Wage by Educational Attainment

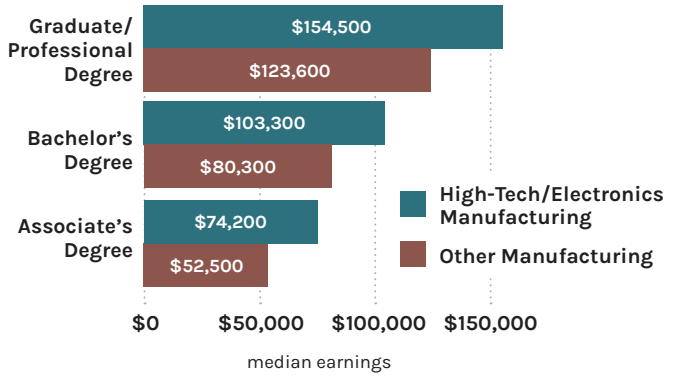
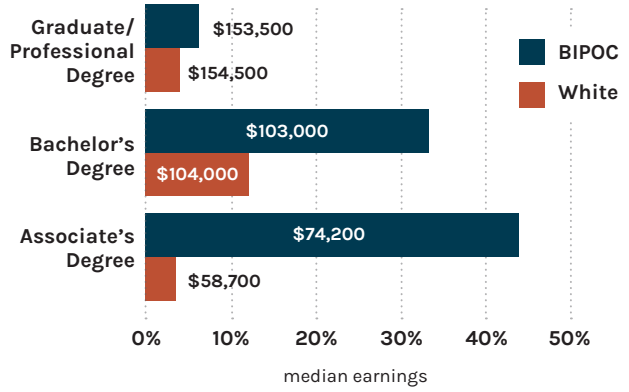


Exhibit 7. Median Wage Premium Compared to All Industries



1 *Bureau of Labor Statistics. (2021) QCEW, ENU41000105334413 and ENU41000105334. Accessed at: bls.gov/data*

ECONOMIC AND FISCAL IMPACTS OF SEMICONDUCTOR INDUSTRY EXPANSION

NEW SEMICONDUCTOR CAMPUS SCENARIO

Assumes a semiconductor company builds a new campus in Oregon.

SCENARIO HIGHLIGHTS

- 3.5 million SF facility
- Total cost of $9.25 billion
- Directly employs 8,500 people
- Avg. compensation $160,000 (including benefits)

PHASE 1

1 to 1.5 million SF facility

- Costs **$3.25 billion** (campus HQ = $250 million; 1 mod = $3 billion)
- 4 years of construction
- Operations begin **year 5**
- Directly employs **3,500** (HQ = 1,000; mod 1 = 2,500)

PHASE 2

1 million SF facility

- Costs **$3 billion**
- 3 years of construction starting year 7
- Operations begin **year 10**
- Directly employs **2,500**

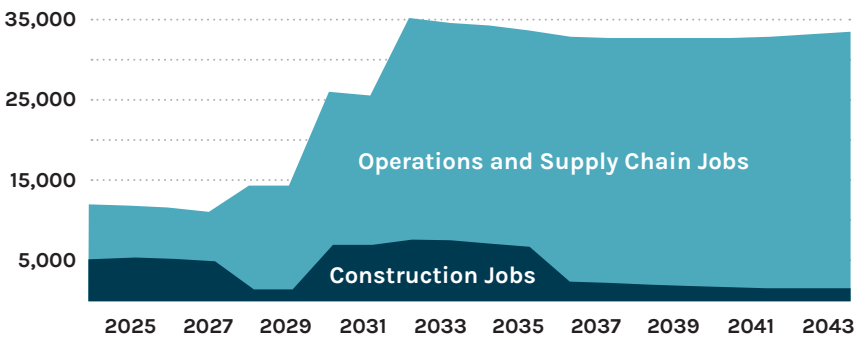
PHASE 3

1 million SF facility

- Costs **$3 billion**
- 3 years of construction starting year 11
- Operations begin **year 14**
- Directly employs **2,500**

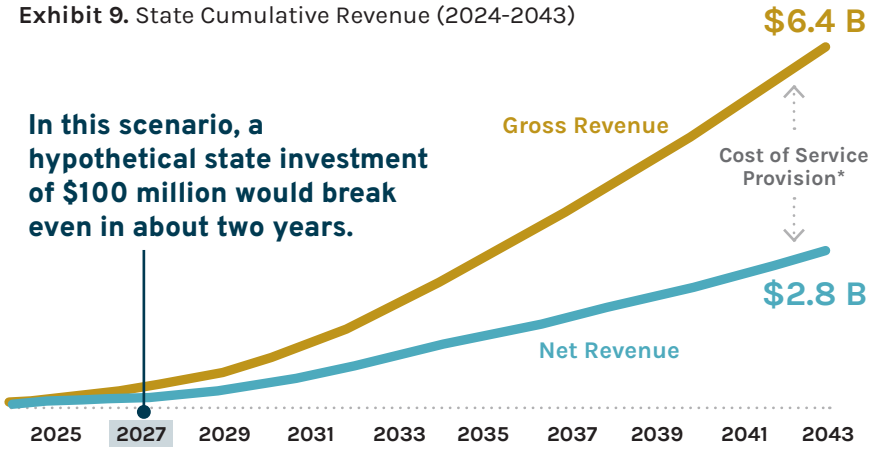
Over 20 years, an average of 26,000 additional jobs are supported annually.

Exhibit 8. Annual Employment Growth Statewide (2024-2043)



Over 20 years, a semiconductor campus expansion could generate $2.8 billion in state net revenue.

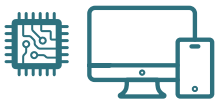
Exhibit 9. State Cumulative Revenue (2024-2043)



In this scenario, a hypothetical state investment of $100 million would break even in about two years.

A semiconductor campus expansion supports supply chain and household expenditures that benefit all industries.

Exhibit 10. Average Annual Statewide Economic Output by Sector Over 20 Years



Computers & Electronics
$5 Billion

Information, Professional, Management
$1.45 Billion

Real Estate
$1.2 Billion

Construction
$1.1 Billion

Retail & Transportation
$840 Million

Manufacturing
$700 Million

Education & Medical
$690 Million

Accommodation & Food
$350 Million

ABOUT ECONORTHWEST

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METHODOLOGY

Assumptions for the campus expansion scenario were gathered from publicly available information and discussions with industry stakeholders. They are intended to reflect a generic prototype rather than a specific firm's potential expansion.

Assumptions for the campus scenario expansion were input into the REMI PI+ dynamic impact model to calculate the statewide economic impacts. Economic impact outputs were then linked to individual fiscal revenue streams at the state level using historical ratios. For example, the state personal income tax was calculated using the most recent statewide effective rate, multiplied by the increase in personal income for each year. Calculated gross fiscal revenues include general fund, state lottery, and other non-general fund revenues. Gross fiscal impacts were then reduced to an estimated net fiscal impact by calculating the cost of service provision.

The cost of service provision for the state was calculated by taking the current state annual revenue and dividing it by the total population. The per capita cost of service was then increased by inflation over the 20-year time horizon and applied to the estimated population growth attributed to the semiconductor campus expansion.

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