SEIZING OPPORTUNITY

Initial Report and Subcommittee Findings

Oregon Semiconductor Competitiveness Task Force

August 2022

Semiconductor Competitiveness Task Force Members

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Task Force		
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Executive Summary

Semiconductor industry expansion presents Oregon with an extraordinary opportunity to intentionally create the kind of jobs and investment the state needs for us to emerge from the pandemic with a stronger, more deliberately equitable economy.

The global semiconductor industry is investing billions to fill a worldwide chip shortage. And the U.S. Government is taking strong action to secure our nation's semiconductor supply chain. In July 2022 Congress passed the $52 billion CHIPS Act to boost domestic semiconductor manufacturing and design. This creates a huge opportunity to solidify Oregon's position as a world leader in semiconductor innovation, dramatically expanding our base of semiconductor design and manufacturing.

The benefits in equitable economic development will be transformational. Billions in capital investment will create tens of thousands of high-paying construction jobs, many of them held by black, indigenous and people of color. Once the facilities are operational -- thousands of additional semiconductor manufacturing and supply chain jobs will be created, where nearly 50% of positions require no more than high school or community college training. The public revenues generated will be in the billions, providing needed financial resources to support critical community priorities such as homelessness, affordable housing, and education.

The Semiconductor Task Force was convened to develop a strategy to secure this once-in-a-generation opportunity for all Oregonians. The Task Force organized five subcommittees to explore and make recommendations on key factors influencing the industry's growth in Oregon. These are the subcommittees' findings and broad recommendations to date:

- **R&D Strength:** Semiconductor research and development is Oregon's competitive advantage. Our strategy to secure chip investment should focus on solidifying a world-class innovation ecosystem around chip research and production.
- **Talent:** Premier access to talent and a robust, private sector-led innovation ecosystem separates Oregon from others. To preserve this advantage, Oregon needs to invest across the talent continuum, from entry-level positions to PhDs.
- **Land:** To attract and retain semiconductor research and development and manufacturers, we need more buildable industrial land proximate to infrastructure, talented workers, and specialized suppliers. Oregon's land use system and infrastructure investment programs need urgent legislative attention and investment to address this need.
- **Incentives**: Other states offer incentive packages that are both larger and more specifically tailored to the semiconductor industry than Oregon. We need to preserve and strengthen existing tools and consider new ones such as a research tax credit and workforce training incentive programs to spark new investment and generate additional public revenue.
- **Regulation**: When it comes to permits and environmental regulations for new facilities, the semiconductor industry tells us it wants a strong partnership to aggressively pursue greenhouse gas reductions and other planet-friendly measures. They point out that other states offer a more streamlined approach that is more in sync with the speed of the market.

Oregon has a once-in-a-generation opportunity to advance our vision for equitable economic prosperity. We need to act quickly to preserve and grow our global leadership in this important industry that anchors Oregon's economy.

Introduction

In early February 2022, Senator Ron Wyden, Senator Jeff Merkley, Governor Kate Brown, and Representative Suzanne Bonamici, and Portland General Electric CEO Maria Pope announced the formation of the Oregon Semiconductor Competitiveness Taskforce. The task force charge was to analyze the state of the semiconductor industry in Oregon and how this important industry can continue to thrive, grow, and help produce prosperity and opportunity for a broad cross-section of Oregonians.

The task force organized itself into five subcommittees to address issues that it identified as critical to the growth of the semiconductor industry in Oregon. The full task force and individual committees reached out to the industry to learn its perspective about Oregon's strengths and weakness in each of these areas.

What quickly emerged is that Oregon has an extraordinary and immediate opportunity to grow in the semiconductor sector, which would lead to far reaching benefits for our state. However, the task force also identified significant barriers that must be overcome for this opportunity to be realized. This report highlights both the opportunity and our challenges.

The first section of this report provides an overview of key trends in the semiconductor sector and describes Oregon's current position in it. It highlights how Oregon can sustain itself as a world leader in the industry and identifies the steps needed to achieve that position.

The sections that follow are the findings and recommendations of the subcommittees. Each are in different stages of development. In some cases, committees have identified and already acted on opportunities. For example, we have seen great progress over the past few months in strengthening Oregon's resources for research in the semiconductor sector. In other cases, the challenges have been identified, but more work and more dialogue will be required to refine the recommendations. In all cases, the findings provide a roadmap for further work ahead.

Oregon secured its current position as a world leader in semiconductor design and manufacturing through the extraordinary leadership and innovation of the companies located here, combined with decades of support from state and local officials. We stand on the shoulders of those who came before.

It is now time to step up again. This report provides a roadmap for the work ahead.

The Opportunity

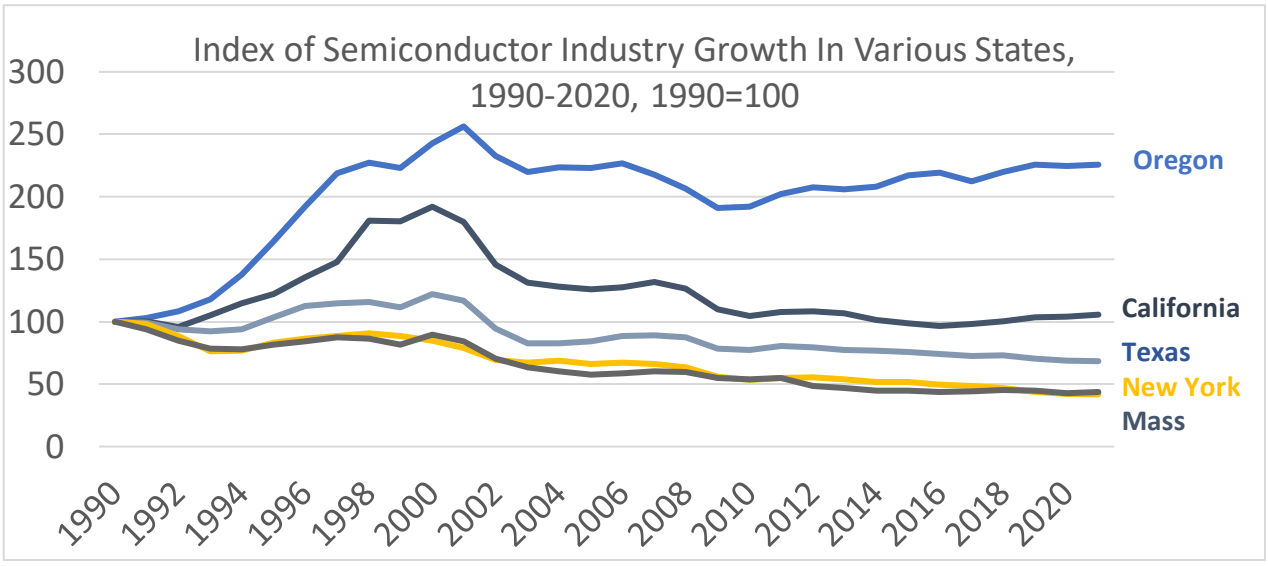
Semiconductors are the foundational technology of the digital era, serving as the "brains of modern electronics."[i] They are required in every digital device from microwaves to cars to computers to phones. In short, semiconductors power the modern the world.

A fact that may surprise many Oregonians is that Oregon is home to one of the world's leading clusters of semiconductor makers, with perhaps the world's top concentration of leading talent and expertise. Intel's Gordon Moore Park at Ronler Acres Research Campus in Hillsboro is one of the global centers of semiconductor research and development, on par with Taiwan (TSMC), and South Korea (Samsung). Spectacularly, Intel's Gordon Moore Research Campus is responsible for the creation of 1,000 patents a year – a level of R&D and innovation that exceeds the patent output of more than 21 U.S. states. So immense is our semiconductor patent activity that Oregon ranks 5th in the nation in patents per capita[ii].

The impact of that technological leadership and impact is evident across the state. Semiconductors represent nearly half of Oregon exports. And we know that export-sector businesses bring-in wealth that circulates through our communities and expands state and local budgets.

Where we are today is a product of a massive surge in the 1990s, helped along greatly by government leadership and support best encapsulated in the passage of the Strategic Investment Program – an extremely valuable incentive program for large capital investments.

We – and the U.S. broadly – are on course for another surge of chip investment and employment, spurred on by global semiconductor shortages and federal interest in securing the nation's long-term domestic chip supply. Indeed, Congress recently passed a $52 billion piece of legislation – the CHIPS Act – to encourage more U.S. chip manufacturing and R&D. Over five years it provides $40 billion in grants for manufacturing and $10 billion for investments in research. It also creates a 25% investment tax credit for equipment and facilities used to produce semiconductors or semiconductor manufacturing tools. Of the $10 billion for research, $2 billion is reserved for the formation of a National Semiconductor Technology Center. Intel has developed a proposal for an Advanced Lithography Center to be located in Oregon and funded under the NSTC. If successful, regional location of an advanced lithography focused NSTC hub would draw billions of federal investments to Oregon and serve to significantly increase the level of industry interest and investment here.



Nationwide the investment surge could total nearly $280 billion over 10 years, a portion of which would be induced by the passage of the federal CHIPS Act.[iii] For Oregon, home to 15%[iv] of the national semiconductor workforce, this opportunity could mean $40 billion of investment in the state over the next ten years, generating tens of thousands of jobs in the chip companies, their suppliers, and in construction contractors building out the facilities.

What would this investment be worth to Oregonians? Per research from ECONorthwest (see Appendix 1), $40 billion of semiconductor investment could generate more than $1.5 billion in state and local tax revenues. And that figure doesn't include the impacts of employment gains on income tax revenues. This represents a significant opportunity for a state in need of more resources to fight homelessness, to increase affordable housing, and to support K12 and higher education access.

$40 billion of semiconductor investment could generate $2-3 billion in state and local tax revenues.

$40 billion in investment would also significantly advance shared prosperity more widely. We tend to think of semiconductor manufacturing as a high-wage field dominated by engineers and scientists with many advanced degrees. Nearly 44% of the semiconductor workforce holds only high school or two-year post-secondary degrees.[v] Intel alone has hired 1,900 workers this year, many of whom needed no more than a high school degree to earn well-above average paychecks. Including the construction jobs created for facility build-outs, this is a real opportunity to create many thousands of middle-class pathways for Oregonians, particularly those experiencing long term systemic economic disparities.

But this assessment of the opportunity doesn't include the boom that a surge in chip investment and innovation could create in industries that would benefit from locating near the best chip R&D ecosystem in the country. Imagine electric and autonomous vehicles, biotech, clean tech and others doing research and advanced manufacturing here, multiplying the above-mentioned benefits. In short, acting now could spark a boom that lasts another 30 years.

If this all sounds fanciful, please think again. According to Business Oregon, at the time of this writing, three major semiconductor companies are considering investments ranging from $6-$8 billion in the state. These investments would create several thousand permanent semiconductor industry jobs, thousands more along the supply chain and thousands more still in construction to build the new facilities. The total new employment impact could be well-above 10,000. And using the ECONorthwest research referenced above, these investments could generate more than $500 million in state and local tax revenues over a five-year period.

But these projects need help to get across the finish line. Analysis done by one of these companies shows that it costs more to build and operate in Oregon than the other locations they are considering. Based on the strength of Oregon's ecosystem – particularly its robust pool of talent – we need only narrow that gap with the strategic use of incentives to close these deals.

And this says nothing of the opportunities we are missing. As this report was being written, Oregon lost a major semiconductor investment opportunity. Unfortunately, Oregon lacked a parcel of the size and proximity to the key workers and suppliers required.

The bottom line is, we have a uniquely strong cluster here, but we have reached a ceiling. According to the findings of the subcommittees, we have run out of buildable/shovel ready industrial land in the

locations the industry requires. Our incentive offerings have fallen behind other states even as the cost to build and operate here has outstripped other states. Our state clean air permitting processes are long and uncertain. We need more investment in the research mission of our research universities.

Simple math demonstrates this fact: the chip industry has invested roughly $90 billion in the U.S. over the last year and a half. Only a small portion of that, including the thousands of middle-class jobs and hundreds of millions in tax revenues, has found its way into Oregon. If we do not act boldly and with urgency, as we did in the 1990s, we will miss the lion's share of this once-in-a-generation opportunity and risk decline in this vital industry sector as the industry concentrates in alternative locations.

So how will we be successful? By building (and solidifying) our position as a world-class semiconductor innovation ecosystem with key nodes extending south from Portland to Corvallis and Eugene and east to Bend.

Our cluster of companies largely focuses on advancing the extremely research-and innovation-intensive effort of fitting ever-more transistors on a single-chip – the very innovation that has allowed us to have powerful computers in our pockets. Having access to the best talent in the world is central to this work. As one company that spoke to the Task Force said, talent is the number one factor it looks at when identifying locations to invest in. The ability of companies to tap into (and depend on) an abundant supply of diverse, world-class talent, connecting to specialized and cutting-edge suppliers, and access the research apparatus of leading research universities is a highly compelling mix for an innovation-focused chip outfit.

Sustaining that advantage in talent and innovation requires additional **investment in our talent and workforce development** systems to build the nation's best pipeline of semiconductor talent from technicians to PhDs. It also requires more collaboration and alignment with our K-12, community college, local government and community-based organizations to recruit, train and retain a diverse, reliable workforce and increase economic mobility for our communities. Doing so also requires investment in post-secondary certifications and degrees and the **research capacity of our universities.**

But to innovate in this industry anchor companies often require large parcels of **industrial land** and proximity to both talent and partnering suppliers or customers who also need adequate size sites. The 1990s chip investment surge that secured Oregon's moniker as the "silicon forest" required large parcels of land totaling 2,000+ acres in aggregate. Today, per the work of the Industrial Lands Subcommittee, we only have two parcels (82 acres combined) with site criteria that match the industry's needs that would be "shovel ready" in only a six-month timespan. In short, we significantly lack enough buildable industrial land in the locations required to catalyze transformational growth.

Chipmaking is also an extremely expensive endeavor. In 2022 Intel expects to invest $27 billion[vi] in capital expenditures. That's more than the sum of Oregon's *biennial* general fund budget. That makes chipmakers extremely sensitive to differences in building and operating costs between locations. And chipmakers that spoke before the Task Force testified to higher building and operating costs in Oregon compared to elsewhere, which includes other state's use of tax and incentives. Thus, the Tax and Incentives Subcommittee found that strategically using **incentives** to narrow this cost gap while encouraging more R&D and manufacturing will be essential to success.

Markets and market opportunities develop quickly. First movers often secure the greatest rewards. The states that can meet industry's imperative of moving quickly will have an advantage in all markets but especially in semiconductor. Oregon companies need faster, more certain clean air **permitting** processes.

Success means capturing tens of billions of semiconductor investment, tens of thousands of equitable jobs across the state, and dramatically strengthening an industry to power our economy for generations. But success requires urgent action along each step mentioned above.

The reports below describe each subcommittee's assessment of the opportunities, challenges and actions needed to develop and solidify our position as a world-class semiconductor innovation ecosystem.

University-Industry Partnerships Subcommittee

The most competitive states in the semiconductor industry are those with the most advanced innovation ecosystems. These require coordination across colleges, universities, government, trade organizations, and workforce partners to provide the services, programming, and talent the industry needs.

Universities help provide two critical ecosystem services: producing research and engineering talent from baccalaureates to PhDs and providing basic and applied research in support of industry research priorities. This committee found several ways in which Oregon universities can improve their support of industry needs, and ways in which universities can be empowered to do so.

Questions Sub-Committee Addressed

A. What are the Oregon semiconductor industry's research priorities, what capacity exists to meet them, and what specific investments and other steps are required to build an ecosystem that helps the sector capture opportunities?
B. What R&D funding opportunities do the CHIPS Act and other related initiatives offer and how can a significant share of this funding be channeled to Oregon?
C. What actions and investments are needed to strengthen Oregon universities' role in helping to meet the industry's workforce development needs, through undergraduate education, graduate education (masters and PhD.), and partnering in the development of innovative alternative credentials, flexible pathways to knowledge and skills, and professional training?

What We've Learned

A. Unlike many other states, Oregon is playing catch-up on forging the kind of deep and sustained industry-university-government (state and local) partnerships and trust that are necessary to move swiftly when opportunities like the CHIPS Act and National Science Foundation initiatives arise. There is a need for a convening body or organization focused on the semiconductor cluster that would build and maintain that capacity over time.
B. There are several significant federal funding opportunities that Oregon should pursue to support the state's innovation ecosystem for semiconductors and related industries. These include the proposed CHIPS Act and its call for the National Semiconductor Technology Center, the National Science Foundation's Regional Innovation Engines initiative, and Business Oregon's Center for Innovation Excellence initiative. These efforts would require leadership from Oregon's research universities and close partnership with industry and government.
C. Oregon's vision for post-secondary education does not explicitly recognize the distinctive missions of the state's different universities: two national R1 research universities (OSU and UO); an urban-serving R2 research university (PSU); a public polytechnic university (OIT); and three comprehensive regional universities (WOU, SOU, EOU). Research and innovation are not a focus and priority in Oregon post-secondary education coordination and investment. This weakens Oregon's research and innovation ecosystem relative to other states with large semiconductor footprints such as California, Ohio, Washington, Texas, New York, and North Carolina.

D. There is a significant need to increase the number of graduates from Oregon universities at all levels from undergraduate through PhD in the fields of engineering, computer science, and other specialties supporting the semiconductor industry. This more specialized workforce must complement efforts to expand the technical workforce that is a priority target of the Future Ready Oregon initiative.
E. There is a need for a thorough assessment of Oregon's university R&D and workforce development ecosystem, especially compared to those in other states. Notably, Oregon needs to increase the number and racial, ethnic, and gender diversity of graduates earning advanced STEM degrees.
F. A close look at the success of the Center for Semiconductor Research in Albany, NY, a key model for how Oregon should seek to develop its chip-related innovation ecosystem, suggested the following lessons:
    a. The center was premised on the principle that, for this sector, leading with R&D would generate manufacturing activity.
    b. The key in New York was a sustained commitment of elected officials (five governors have invested to date), industry leaders, and higher education leaders. It took five years to establish a truly differentiated capacity and ten years to achieve a status of among the best in the world. This capacity has put the state and region in a very strong position to respond to opportunities like the CHIPS Act.
    c. An anchor industry tenant—IBM, which provides a lot of direction and stability—and universities are critical. On the latter, recruiting and retaining top faculty are key, but also important is a high level of agility in addressing the needs of industry, flexible management of IP, and support facilities for R&D activity and education. Any investments to support industry also included investments in research universities.
    d. The state's nimbleness in setting up the deal and willingness to "move at the speed of industry" was also important to New York's success.

Recommendations

A. **Capture Immediate Opportunities**. The state should move collaboratively and aggressively right now to respond to opportunities. These include the National Science Foundation's Regional Innovation Engine initiative call for proposals, Business Oregon's Center for Innovation Excellence call for proposals, and opportunities that arise via the CHIPS Act, specifically Intel's Advanced Lithography Center proposal for a National Semiconductor Technology Center. Informed primarily by industry needs and aspirations for the sector in Oregon, industry, university, and government partners must come to an agreement on how to approach these opportunities to avoid internal confusion and competition.

    As one example of this work, recently Oregon State University submitted a concept paper—*Securing America's Semiconductor Technology Future and Growing Regional Economic Prosperity*—in response to the National Science Foundation's Regional Innovation Engine call. If this initial proposal advances, the engine will take advantage of the unprecedented alignment in research capabilities, lab-to-market translational resources, strategic partnerships with industry, state and local government and workforce development entities to drive the development of a northwest regional technology innovation engine. A strong and committed coalition will be needed to ensure success.

B. **Increase Capacity for Sustained Collaboration.**

- Leverage Business Oregon's Centers of Innovation Excellence (CIE) to create a center dedicated to cooperation around innovation and academic research that will lead to commercialization pathways. This will include our statewide network of universities, colleges and community colleges with industry and government entities working together to develop a pragmatic, academic and industry-led applied research and development program.
- Create a Higher Education Center that: serves as a regular convener of industry, university, community college, and government partners; acts as a catalyst for collaborative activities and actions that position Oregon as a leading state for semiconductor innovation and manufacturing; monitors the growth and needs of the semiconductor cluster; and provides grant writing, marketing, and public relations capacity necessary to respond quickly to opportunities emerging at the federal level. Provide sustained state funding for the center to ensure it can build the kind of deep networks and sector knowledge necessary to be an effective convener as opportunities arise.

C. **Invest in Oregon's Public Research Universities.** Top-flight research universities—and the mission of research and innovation they advance—are essential to the success of the semiconductor industry in every state in which the sector has a significant presence. Oregon has two strong R1 research universities (Oregon State University and the University of Oregon) and an R2 urban research university (Portland State University). All three contribute to Oregon's semiconductor R&D strengths in both unique and complementary ways. All three are also committed to inclusion and diversifying the STEM pipeline. However, none are ranked among the top tier of public research universities in the country and they are not presently funded at a level necessary to bring them to a premier level. Delivering both undergraduate and advanced degrees, taught in state-of-the-art labs tailored to keep pace with industry research and innovation trends, requires a level of state investment that recognizes the research mission of these institutions.

The result is that Oregon is lagging badly behind states like Ohio, Georgia, Texas, California, Washington, and Florida that have actively propelled their institutions to among the top public research universities in the country. Those states are doing so by investing in recruiting exceptional faculty and graduate students, building advanced facilities, leveraging industry and philanthropic support, and innovating in academic program delivery. Such states are also investing in diversifying the STEM pipeline. It is time for Oregon to do the same and aspire for its research universities to be among the best in the country. This priority should not result in less support for other Oregon universities, which also have important missions.

- ***Establish and fund a bold faculty recruitment initiative to attract 25 new leading engineering and computer science faculty*** to the state's research universities, with the universities collaborating in building interinstitutional clusters and affinity groups aimed at supporting research that advances semiconductor industry needs. Create shared branding to support the recruitment that positions Oregon as a national leader in semiconductor research and innovation and highlights the commitment of industry, universities, and government to partner in supporting R&D in this area.

- ***Create a fund to support STEM faculty start-up packages.*** Faculty start-up packages—which include non-recurring support for lab upgrades, equipment, and initial graduate student recruitment—can make a tremendous difference in attracting the best and most diverse research faculty to Oregon, supporting the academic goals of Oregonians of all backgrounds, and recruiting diverse undergraduate and graduate students to the state. Such packages can run from $1 to 2 million per faculty member, but the payoff is the subsequent federally funded research brought to the state.

- ***Support state investments for facilities and comprehensive initiatives that accelerate university research, innovation and technology and align with the industries' needs:*** As an example, OSU's Collaborative Innovation Complex, a 150,000 square foot, $166 million building housing advanced research infrastructure, including a supercomputer and clean room—will significantly improve Oregon's capacity to support the needs of the semiconductor industry. OSU has raised over $100 million in philanthropy for the building and is seeking $75 million in state-paid bonds to support its construction. The OSU project is one of several important initiatives across the state's public universities that will facilitate partnership with the semiconductor sector and advance efforts to expand and increase the mix of STEM faculty and students.

- ***Develop a multi-year strategy to increase the most highly trained workers needed for the sector's success, placing a specific focus on diversifying the pipeline of students with the goal of ensuring that economic investments benefit traditionally underserved communities.*** Partner with industry, university, and government leaders in the creation of a multi-year strategy to increase bachelors, masters, and Ph.D. graduates critical to the industry's success. Highlight and recognize the Oregon Institute of Technology as one of the nation's top producers of bachelor's graduates in applied technical fields and OSU, UO, and PSU's roles in graduating large numbers of undergraduate, graduate and Ph.D. scientists and engineers. Leverage existing programs such as the National GEM Consortium, an organization that partners with universities and industry to increase the participation of underrepresented students at the master's and doctoral levels in engineering and science.

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- Ed Feser, Provost and Executive Vice President, Oregon State University
- Sue Richards, Global Head of Printing, HP

Staff Lead:

- Julie Brandis, College of Engineering, Executive Director of Strategic Partnerships, Oregon State University

Talent and Workforce Subcommittee

The success of Oregon's semiconductor industry depends on building and attracting a world-class workforce in research, engineering, and manufacturing. Indeed, several semiconductor firms that spoke to the Task Force called out talent as the top factor driving decisions of where to invest. Talent is a significant advantage for Oregon. We boast one of the most concentrated bases of diverse semiconductor talent in the world, with workers ranging from skilled technicians to advanced PhDs.

Even so, as is discussed below, we found that talent shortages are a serious constraint for Oregon semiconductor manufacturers, with a particularly urgent need for technicians and operators. Fortunately, this problem is not unique to Oregon as the semiconductor industry faces a significant talent shortage across the country. But this fact creates significant opportunity for Oregon: the state that can create the most robust talent pipeline will have a potent competitive advantage going forward.

We must build new strategic relationships between industry and education and expand access to successful models of technology education that build a skilled, diverse workforce.

To meet the talent and workforce needs of Oregon's semiconductor industry, we must build new strategic relationships between industry, education, community organizations, and local government and expand access to successful models of technology education that build a sustainable, skilled, diverse workforce.

Committee Analysis

The Talent and Workforce Subcommittee was charged with assessing the industry's most pressing talent needs and developing recommendations to address them. Subcommittee staff held interviews and focus groups with semiconductor industry executives to better understand their needs. Those efforts yielded the following insights:

- Oregon is home to 15 percent of the national semiconductor workforce and has a higher concentration of the industry's skilled workers than any other state.
- Oregon employs a diverse mix of engineers and production workers across its design, chip manufacturing, and fab equipment manufacturing functions.
- Shortages in technology talent are a serious production constraint for Oregon semiconductor manufacturers, in particular for equipment operators and for technicians with maintenance, repair, and production process skills.
- For every PhD doing high-level product design and production engineering, the industry needs a substantial multiple of technology workers at the baccalaureate, associate, and certificate level to produce products and to support production equipment and processes.
- Entry-level technicians are a particular need, as well as a growing challenge because of projected new-job growth and retirements in the next 5-10 years. This role is also becoming more important in semiconductor manufacturing with increasing scale and innovation in production processes.
- Oregon's education systems are producing tech-savvy, skilled graduates, and there are some outstanding programs and models, but there are not enough of them, and they lack the capacity and alignment to meet the industry's large and growing demand.

- Engineering and design drives strong need for four-year engineering and technology degree holders, many hired in Oregon. Research and design require graduate degrees, most often recruited from out of state and frequently globally.
- There is a lack of awareness and understanding of semiconductor and manufacturing careers. Providing middle and high school career exploration opportunities and clearer pathways to post-secondary certification is key to building a semiconductor workforce pipeline. Data shows an increase in wages and economic mobility for those who receive a short-term credential or associate's degree.
- Industry, community, and education leaders are effectively collaborating on a local level to address workforce challenges and create pathways that meet and anticipate industry needs on an ongoing basis and this work needs to be elevated to regional and state efforts.
- The industry wants to forge partnerships with historically underserved communities to 1) connect more diverse young people with industry career opportunities, and 2) increase the number of women, people of color, veterans, and other priority populations to livable wage careers in this sector by removing barriers to access, including tuition support, childcare, and transportation.
- Future Ready Oregon provides an ideal opportunity to invest in a semiconductor industry workforce education consortium to tackle the talent challenge.

Recommendations

With the vision of establishing Oregon as a leader for cultivating high-quality semiconductor talent in the U.S. in mind, we recommend the following actions:

1. Create a statewide semiconductor industry consortium to build robust, strategic partnerships among industry, education, workforce, and community-based organizations focused on communicating and meeting industry education and workforce needs.
    - Use Future Ready Oregon investment funds to develop the statewide semiconductor consortium on the successful model developed by the Hillsboro Advanced Manufacturing Workforce Consortium.
    - At the same time, also use Future Ready Oregon investment funds to expand the regional capability and impact of the Hillsboro Advanced Manufacturing Workforce Consortium.
2. Working with the statewide semiconductor industry consortium noted above, develop a comprehensive semiconductor workforce investment package for the 2023 Legislature that includes investments across the PK-20 education continuum.
3. Use Future Ready Oregon investments to address the industry's talent needs by building infrastructure and expanding access to successful models of technology education.
    - Increase opportunities for apprenticeships to strengthen a diverse pipeline of talent.
    - Address the immediate need to expand the supply of operators and technicians.
    - Invest in community college capacity to recruit, retain, upskill and graduate students from the large and diverse population of low-wage working adults.

- Work with industry and universities to identify and address opportunities to improve and expand the supply of semiconductor-related engineering and technology talent.

4. Strengthen interest in and access to semiconductor career pathways.
    - Strengthen student engagement in STEM education across the continuum, in particular among students historically underrepresented in STEM fields.
    - Invest in the development of a campaign to raise awareness of career opportunities in Oregon's semiconductor sector and of education pathways to those opportunities.
    - Partner with community-based organizations to expand culturally and linguistically relevant engagement with historically underrepresented communities in Oregon's semiconductor workforce.

5. Enhance the industry's access to highly skilled global talent, by removing restrictions and increasing the efficiency of the immigration system.
    - Support the bipartisan EAGLE Act (H.R. 3648) to reform per-country caps on green cards, which have created a significant backlog for immigrants with technology credentials.
    - Support passage of the America COMPETES Act immigration provisions (HR 4521, section 80303) to exempt science, technology, engineering, and math PhDs from annual green card limits.

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- Dr. Nagi Naganathan, President, Oregon Institute of Technology

Staff Leads:

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- John Tapogna, Economic and Fiscal Analysis Consultant, Oregon Business Council

Taxes and Incentives Subcommittee

Companies weigh many factors when considering where to locate their chip-making and R&D operations. As companies stated at the Task Force's second meeting, access to the best possible talent is often the most important factor companies consider when choosing where to invest. Our talent strength places Oregon high on the list of worldwide locations to locate due to our exceptionally high concentration of leading semiconductor talent. Many companies are willing to accept higher-cost operating environments in exchange for proximity to this critical advantage.

However, this subcommittee has discovered that it is meaningfully more expensive to build and operate semiconductor fabs in Oregon compared to key competing states. One company that spoke to the Task Force placed the premium at 10% to 15%, which includes taxes and incentives, compared to competing states. Willingness to accept slightly higher construction and operating costs to locate near strong talent has limits. The gap identified here is large enough (for some companies at least) to erode the advantage of locating near Oregon's talent and innovation ecosystem.

Access to the best possible talent is often the most important factor companies consider when choosing where to invest.

Therefore, incentives play a critical role in the Task Force's overall strategy to retain and attract semiconductor investment, serving to *protect and build on* our competitive advantage in talent and workforce by narrowing our cost disadvantages.

The Tax and Incentives Subcommittee set out to examine how we can most efficiently and effectively narrow our cost disadvantage while encouraging the greatest amount of economic activity across all Oregon industries, manufacturing or otherwise.

Work Done

In support of the subcommittee, Business Oregon retained consultant Smart Incentives (see Appendix 2) to present a competitive analysis of other states' offerings and incentives policy, including in-depth proposals on actual projects by other states. The Oregon Business Council also commissioned analysis from ECONorthwest (Appendix 1) of the potential fiscal impacts of semiconductor industry investment. The Subcommittee also heard from companies directly on the strengths and weaknesses of Oregon's incentives. The findings below emerged:

- Semiconductor industry growth could produce a substantial return for state and local tax revenues. Analysis from ECONW found that every $1 billion in semiconductor capital investment generates $44 million in public revenues and 7,000 construction-related jobs, and that every 2,000 permanent chip jobs created generates $57 million in *annual* public revenues and creates another 4,000 jobs. According to Business Oregon, three companies are considering capital investments worth up to $6-$8 billion with 2,000 chip jobs created. ECONW's analysis suggests such an investment could create tens of thousands of jobs spread across the state and be worth more than $500 million to state and local governments over a five-year period.
- Oregon's renowned property tax abatements – the Strategic Investment Program, along with its companion Gain Share, and Enterprise Zones – and the single sales factor for corporate income taxes continue to be essential to industry expansions in the state. Nevertheless, other states' programs and tax structures now more than negate what Oregon provides. Our vaunted

property tax abatements no longer separate Oregon, but rather allow us simply to remain relevant.

- Tax incentives alone are insufficient. Smart Incentives underscored how forgivable loans, grants and other upfront resources are increasingly indispensable, being used to buy down the total cost of development and production related to land, construction, infrastructure, and equipment in the semi-conductor industry. Oregon has grant programs, but they are not in the same league as other locations.
- In addition, competing states deploy a range of incentive strategies to attract semi-conductor investment, such as refundable or cashable tax credits and substantial public investment in land or infrastructure development and workforce. Both financial and institutional support for workforce development can be the linchpin with major projects that would create many quality jobs.
- Given our commitment to innovation across industries, and the state's unique strength in semiconductor research and development, one glaring omission in our toolbox is an R&D tax credit. Conversations with companies also identified other tools, namely, employment- and training-based incentives as missing pieces.

Recommendations

As we seek to make Oregon more cost-competitive for semiconductor and related activity, we must consider what specifically to incentivize. Two answers continue to arise. First, deepening our R&D strength and encouraging more innovation here should be a priority as we seek to position ourselves as a global center of semiconductor research and innovation. Second, we need to encourage semiconductor and related input manufacturing. Semiconductor manufacturing creates thousands of jobs, at well above area average wages, often without requiring more than H.S. or two-year degrees. Encouraging more manufacturing here is thus a critical strategy for equitable job growth in the state.

Therefore, the Subcommittee's recommendations focus on encouraging more R&D and manufacturing by lowering the costs to do both and while addressing known gaps in our incentive offerings. The tools in the package below complement each other, creating a whole greater than the sum of its parts.

- **Bolster and add to existing forgivable loan programs, including Governor's Strategic Reserve Fund and Business Expansion Program**. Program's purpose is to help lower the total cost of construction and operations in Oregon for very large projects. The loan would be funded by a portion of the increased tax revenues resulting from the investment, and loan amounts would be progressively forgiven relative to satisfaction of criteria in performance agreement.
- **Workforce Training Incentive Program for Advanced Manufacturing**. The nature of work is changing as manufacturing adopts to ever-evolving, more advanced technologies (i.e. "Industry 4.0") and companies face immediate needs to increase their employees' technical proficiency. Special funds and dedication of higher education infrastructure would be used for a customized response to certain major project opportunities anywhere in Oregon, to not only help the company in adapting to the rapidly changing workforce needs for doing more in Oregon, but also to reduce the cost of employee training and the higher cost of labor in Oregon.
- **Research Activities Tax Credit**. Unlike a former Oregon credit, this would include non-corporate companies and could have special features for small or disadvantaged innovators. Found in nearly all states, such a credit offsets state taxes based on a percentage of increased annual

spending inside Oregon under federal definitions of R&D. It would emphasize substantial benefits up to a point for businesses performing the R&D with mechanisms (e.g., partial refund) to ensure usability.

- **Family-Wage Tax Credit.** A family-wage tax credit stimulates a key outcome of economic development: the creation of well-paying jobs, by providing an offset or other return to businesses proportional to their payroll expenses arising from an increase in the number of good jobs over several years.
- **Investment Tax Credit for Advanced Manufacturing.** Like the SIP and Enterprise Zones programs, an investment tax credit would also induce more capital expenditure in Oregon – i.e., the investment in plant and equipment. Such a program could plug holes between the property tax abatement programs in certain cases and is a common type of incentive that businesses look for based on a percentage of their investment costs, to be claimed or used over several years.
- **Maintain essential existing tools like SIP and enterprise-zone property tax abatements, and state policy on Single Sales Factor for corporate income taxes**. Without them Oregon would be completely uncompetitive from a cost of construction/operation perspective, for which businesses require reasonable predictability. As such, the 2023 Legislature is urged to address the future of enterprise zone programs well before 2025 sunset date.

Subcommittee Co-Chairs:

- Matt Chapman, Civic Leader
- Monique Clairborne, President and CEO, Greater Portland, Inc.

Staff Leads:

- Andrew Desmond, Policy Analyst, Oregon Business Council
- Colin Sears, Regional Development Officer, Clackamas, Multnomah, and Washington Counties, Business Oregon
- Scott Bruun, Director of Tax, Fiscal, and Manufacturing Policy, Oregon Business and Industry

Industrial Land Subcommittee

A major component of economic competitiveness is the time it takes to assemble the baseline ingredient of development: industrial land and infrastructure. In many states and countries this isn't a challenge, but in Oregon, it has become a serious barrier in achieving our goals surrounding shared economic prosperity.

As established in this report's "Opportunity" section, Oregon is on the cusp of a 1990s-like semiconductor boom when billions were invested and industry employment more than doubled. That boom was facilitated by 2,000+ acres of industrial land.

As discussed below, this subcommittee found that Oregon faces a serious shortage of available, development-ready large industrial sites relative to 1990s-like demand. If left unaddressed, the shortage presents a critical threat to Oregon's semiconductor industry competitiveness.

Furthermore, the passage of the federal CHIPS Act is likely to ignite a rush of near-term investment activity: the bill disburses $52 billion in incentives over five years but is heavily front loaded with nearly half the funds spent in the first two years. As a leading job creator and generator of critical tax revenue to fund state and local government, a growth strategy for the semiconductor sector will require bold new approaches in planning and investment.

Summary of Work Completed and Findings

The Industrial Lands Subcommittee interviewed semiconductor site selection experts, reviewed and updated past industrial land inventories in the Metro region, and reviewed the suitability of sites therein based on industry requirements. Below are insights and ultimate recommendations drawn from these analyses.

The Metro region is the key to continued growth and development of the semiconductor sector.

The semiconductor industry is especially prone to clustering and is predominantly located in urban locations. The U.S. semiconductor industry is primarily concentrated in Silicon Valley; Portland; Austin; Dallas; Phoenix; Orlando; Boise; Albany, NY.

Clustering is driven by multiple factors, including the ability to attract talent and a technical workforce, and the need for close proximity to suppliers.

- Access to talent is the most important factor driving location decisions for many semiconductor firms. Companies need to be where the workers are. Professionals in this field often move from one job to another between companies and suppliers. It is a dynamic employment ecosystem.
- Semiconductor fabs are highly complex manufacturing facilities that involve efficient operation of large pieces of equipment that require skilled maintenance by the equipment makers. Down time for equipment failure can equate to millions of dollars of lost product potential. This places a premium on proximity to certain suppliers who can respond within minutes for equipment issues.
- The R&D process of semiconductor fabrication is a highly collaborative effort between the fabricator and the suppliers of key process equipment. Semiconductor makers and their suppliers often collocate to conduct joint R&D.

- An often-overlooked aspect of clustering is the importance of public and private utilities such as electricity, water and wastewater systems. Cities that are home to concentrations of semiconductor-related companies have invested over decades in highly efficient, reliable and redundant systems.

For all these reasons, the semiconductor industry is highly likely to continue clustering in the Metro region, with smaller but significant nodes of supplier-related activity in the Willamette Valley such as Salem, Corvallis, Eugene, in Central Oregon cities of Bend and Redmond and south into the Rogue Valley.

The semiconductor industry is poised for a 1990s-like growth surge. Though the Metro region has thousands of acres of industrial land, its lacks supply of development-ready large industrial sites (25-plus buildable acres) the semiconductor industry needs to grow.

The surge of semiconductor activity in the 1990s required 2,000+ acres of industrial land. There is reason to believe today's boom could be even larger. If we use the 1990s analog to gain a rough sense of possible demand today, we find that we are in significant shortage of development-ready industrial land.

At an aggregate level, the Metro region shows thousands of acres designated as industrial property over a 20-year planning cycle. However, a closer look at this land shows very few sites of appropriate size that development-ready and suitable for major manufacturing investment, especially semiconductor R&D and manufacturing.

Since 2012, the Metro region has studied land readiness to gain a sense for the number of large sites that are development ready, ranked by tiers, and to understand pathways toward moving sites to Tier 1 (ready) status. A 2022 review of the available inventory of large industrial sites reveals that the inventory has fallen sharply since 2017. In that year the Metro region had 47 industrial sites with more than 25 acres. Today, that inventory has fallen by 40% to only 28 sites.

Most troubling is the paucity of large sites that are "Tier 1" or "development ready", meaning they have infrastructure in place and development can begin within six months or less. The Metro region currently has only two development ready sites totaling 82 acres. There are only six sites in the Tier 2 category, meaning they require significant permitting and infrastructure improvements to be developed within three years. This subcommittee determined that only three of those six sites and 352 acres would meet the industry's site requirements (including those listed above and other factors like site grade).

Notably, there are no development ready sites of the size needed to attract a major semiconductor investment, or to support larger size suppliers**.**

Oregon lacks both adequate funding for infrastructure, and tools for land aggregation to make large lots development ready to respond to strategic opportunities.

The Metro region has developed an industrial lands toolkit[vii] to provide guidance, case studies, and best practices for local governments interested in readying land for industrial development. Most local governments lack the resources necessary to fund the core elements of getting land development-ready, including investing in infrastructure, and both tools and funding to assemble smaller properties into large lots. As the toolkit demonstrates, significant development barriers place the private return on

investment in the negative for industrial land purposes, requiring local or state government action to prepare these sites. This is often not the case for residential development, which can demand prices that allow private developers to achieve a greater ROI.

The Metro regional government has grant funding for cities to conduct concept plans for both proposed urban growth boundary (UGB) expansions and for areas already inside the UGB. But most cities lack up-front funding to acquire sites and provide core infrastructure such as roads and water/sewer pipes to and on site. Cities also face costs to incorporate and annex lands, and to establish proper zoning required before industrial development can occur.

Portland Metro Inventory of Large Industrial Sites

	2011 Inventory	2014 Inventory	2017 Inventory	2022 Inventory
Tier 1	9	14	10	2
Tier 2	16	17	11	6
Tier 3	31	23	26	20
Total	56 sites	54 sites	47 sites	28 sites

Recommendations

Short Term

There is no quick, comprehensive fix to such a multifaceted challenge. It is critical that we deepen our analysis and report back in Fall 2022 with a short term "strategic site" map, including an outline for bringing sites to readiness. The analysis will be done under the subcommittee and coordinated by the staff team. There is urgency to this work, as it is necessary to form a more detailed approach heading into the 2023 legislative session. The consultant work scope will include:

- Engaging local jurisdictions within Portland Metro and Willamette Valley to determine land availability and site readiness for semiconductor expansion in their respective communities.
- Reviewing responses against criteria to create an updated map of sites of significance for semiconductor expansion both inside and outside the Urban Growth Boundary based on planning documents and community interest.
- Creating an updated map to identify sites most suitable for semiconductor expansion during this industry investment cycle, including the following, keeping in mind demand could exceed these needs:
    - Two sites of 500+ acres each to accommodate large-scale semiconductor R&D and/or production fabrication operations.
    - Four sites of 50-100 acres suitable for integrated device manufacturers or major semiconductor equipment manufacturers.
    - At least eight sites of 15-35 acres to enable key suppliers to the semiconductor cluster to locate and expand.
- Summarize development constraints and cost estimates to bring sites to Tier 1.

The above work scope will allow the subcommittee to generate specific legislative recommendations around the following topics:

1. Site availability, site readiness funding and investment
2. Expedited permitting and planning necessary to move sites forward
3. Public developer role including staff and consultant funding

Medium-Long Term

The semiconductor opportunity should be viewed as a catalyst for long-term change. Beyond meeting immediate needs, we face a larger challenge. Our lack of industrial land is a chronic problem that has been vividly exposed by the surge interest in semiconductor expansion. Year in and year out Oregon misses significant opportunities. Oregon needs a 21st century advanced manufacturing strategy that plays to our strengths in innovation and incorporates industrial land availability and site readiness as a key part of inclusive statewide economic development. We need a nimble land use system that can anticipate and quickly respond to economic opportunities.

Subcommittee Chair:

- Travis Stovall, Mayor, City of Gresham

Staff Leads:

- Keith Leavitt, Chief Trade and Equitable Development Officer, Port of Portland

Environmental Regulations Subcommittee

Oregon's Department of Environmental Quality (DEQ) has a long, successful history of partnering with businesses to meet their needs while developing some of the most innovative and stringent air quality regulations in the country. Businesses are reporting that recent rulemaking is eroding predictability and increasing uncertainty in regulatory compliance and permit review times, which is significantly lengthening permit review times.

As semiconductor firms race to invest, the resulting uncertainty challenges the ability of interested companies to invest quickly. The current regulations and regulatory environment in Oregon diminishes Oregon's competitiveness and needs improvement.

The Governor and her office convened businesses from the semiconductor and other industries to identify the root of the challenges and their solutions. What follows is what emerged from those discussions.

Problem	Potential Solution (Best Practices)
Problem #1: Need to better understand overarching permitting timeline in order for businesses to make decisions around timing, funding, breaking ground and investments	Ohio sits down with businesses at the beginning of the process and walks them through the fixed timeline, milestones and requirements. They also adhere to a 45-day review (through rule) of a draft permit once submitted.
Problem #2: Historically, DEQ rules have been understandable and reasonable. However, new programs have made them complex and challenging. DEQ engages in periodic rule updates which upends the process for businesses who feel like they understand and can comply with current rules but rule updates provide uncertainty that they cannot easily adjust to. These also seem to come at random times.	A yearly or biennial calendar that outlines when DEQ will be under rulemaking, why and for which program and a commitment not to do all programs at once. OR a moratorium on rulemaking that is not for a new program needing legislative implementation
Problem #3: Other states have an "off ramp" for de minimis environmental impacts that are identified up front, providing a path to focus on areas of concern instead of spending time and money on impacts that will not have a significant impact.	Implement off ramps. Review Washington's process and see what is transferable to our process and if it can be done through rule or needs a statutory change.
Problem #4: Oregon has a complex air toxics program that would benefit from clear guidance and clear timelines. The complex system may lead to focusing on toxics that do not have significant impacts. DEQ currently operates a toxic-by-toxic review as part of the permitting process.	Ohio has a toxics program that has triggers on a toxic-by-toxic basis and has a model that identifies if emissions are above x, those need to be added into the modeling. If they do not trigger the threshold, they are omitted as a risk.

Problem #5: Timeline is unpredictable and at the discretion of available staff. There is not an upfront touch point with the agency that walks through processes and expectations.	Similar to #1, define predictable timelines, dedicate staff to an applicant or a project so they can work with them through the entire process and ensure the team is fully staffed at all times.
Problem #6: A better understanding of who businesses should be working with on the local level would be helpful.	A posted roadmap of local contacts on the DEQ website.
Problem #7: There is not an initial touch point for new/smaller businesses who are looking to start a DEQ process.	Have a joint point of contact with Business Oregon and DEQ to help direct businesses at the very beginning of the process, similar to the Small Business Navigator role.

The environmental regulations subcommittee identified these challenges and solutions. Most solutions can be addressed through rule-making or administrative policies.

In addition to these specific challenges, the subcommittee recognized that DEQ needs adequate resources to implement its regulatory programs and does not currently have all the resources it needs. Future state budgets and legislative priorities should include adequate staffing for administrative agencies, particularly DEQ, to meet its statutory charge.

Subcommittee Chair:

- Governor Kate Brown

Staff Lead:

- Jason Minor, Natural Resources Policy Director, Office of the Governor, State of Oregon

Acknowledgments

The Task Force wishes to thank the staff team that supported this effort. This remarkable group, drawn from several organizations, came together quickly and with great professionalism. The team includes:

- Julie Brandis, College of Engineering, Executive Director of Strategic Partnerships, Oregon State University, Oregon State University
- Scott Bruun, Director of Tax, Fiscal, and Manufacturing Policy, Oregon Business and Industry
- Chris Cummings, Assistant Director, Economic Development Division, Business Oregon
- Andrew Desmond, Lead Staff for the Semiconductor Task Force, Policy Analyst, Oregon Business Council
- Dan Dias, Economic and Community Development Director, City of Hillsboro
- Bart Eberwein, retired Executive, Hoffman Construction
- Chris Edmonds, Principal, Coastline PR
- Erica Fitzgerald, Senior Economic Development Specialist, City of Gresham
- Leah Horner, Deputy Chief of Staff and Infrastructure Director, Office of the Governor, State of Oregon
- Tim Leahy, Outreach Director, Office of Senator Ron Wyden
- Keith Leavitt, Chief Trade and Equitable Development Officer, Port of Portland
- Jason Minor, Natural Resources Policy Director, Office of the Governor, State of Oregon
- Jim Riley, Senior Economic Development Manager, City of Hillsboro
- Kyle Ritchey-Noll, Director of Education and Workforce Policy, Oregon Business Council
- Colin Sears, Regional Development Officer, Business Oregon
- Doug Smith, International Business Development Manager, Port of Portland
- John Tapogna, Consultant, Oregon Business Council
- Kristi Wilson, Workforce Development Manager, City of Hillsboro

The Task Force and its subcommittees benefited greatly from numerous conversations with Semiconductor executives throughout this process. In particular, we wish to thank the following individuals who provided their insights before the full taskforce:

- Renée J. James, Founder/Chairman & CEO, Ampere Computing
- Ann Kelleher, Executive Vice President, General Manager of Technology Development, Intel
- Dan Malinaric, State Operations Director, Microchip
- Dave Robertson, Vice President of Engineering & Senior Tech Fellow, Analog Devices Inc
- Richard Sheehy, retired Director of Site Selection, CH2M Hill/Jacobsen
- Sesha Varadajan, Senior Vice President, LAM Research

Appendix 1

ECONorthwest
ECONOMICS · FINANCE · PLANNING

DATE: 6 June 2022
TO: Duncan Wyse & Andrew Desmond, Oregon Business Council
FROM: Joel Ainsworth, ECONorthwest
SUBJECT: Calculating the economic and fiscal contribution of new semiconductor investments in Oregon

Overview

The Oregon Business Council (OBC) requested a high-level analysis of how an expansion of the state's semiconductor industry could affect economic and fiscal conditions in Oregon. The state is well-positioned to pursue opportunities for public and private investment opportunities given the state's long history of semiconductor manufacturing and depth of the state's skilled workforce ready to expand the state's capacity for production.

As part of OBC's strategy for pursuing opportunities within the incentive program, they asked ECONorthwest to calculate high-level estimate of adding additional investment in Oregon's semiconductor industry. Because specifics of the growth opportunity are unknown, ECONorthwest evaluated economic and fiscal impacts associated with scalable construction and operational assumptions (i.e., per $1 billion of construction and per 1,000 employees during operations). Additionally, ECONorthwest applied information from its prior research into the semiconductor sector in Oregon to refine the estimates of local and non-local spending used in the input-output model.

Calculating the economic effect of new investments

For this analysis, we consider the economic and fiscal effects of a $1 billion capital investment—assumed to take place in a calendar year. Previous work by ECONorthwest has shown that only a small proportion of that capital purchases stay within the state due to the need for specialized services, equipment, and materials which are not produced within Oregon. While that proportion can certainly vary due to the design specifications and other supply constraints that may affect how the facilities are constructed. For the purposes of this analysis, we assume that 59 percent of construction spending would occur within Oregon.

The assumptions about ongoing operations are simpler. We assume that a new facility would support an additional 2,000 jobs, all of which would work and reside within the Portland Metropolitan area. We assume that labor compensation is like the overall industry average for semiconductor manufacturing in Oregon.

We then apply multipliers from IMPLAN and scale the secondary effects based on the existing economic relationships in the Portland Metro economy during 2019. Although we acknowledge that there is uncertainty about whether these new facilities would have similar supply chain linkages compared to existing plants, we believe that using existing information about local industry linkages is more appropriate than disaggregating from national estimates.

Summary Results

Based on the assumptions describe above, along with the derived multipliers for the Portland Metropolitan area, we calculate that a $1 billion investment in capital investment for the semiconductor industry in Oregon would support almost 7,000 job years and $647.7 million in gross state product over the lifecycle of the project. Additionally, the construction project could support an additional $44.1 million in state and local taxes over the lifecycle of the project.

Figure 1. Economic contribution of $1 billion in additional investment in the semiconductor industry

	Direct	Indirect	Induced	Total
Job Years	4,294	840	1,856	6,990
Labor Income ($M)	$350.7	$65.1	$105.0	$520.9
Gross State Product ($M)	$346.4	$102.9	$188.3	$637.7
Output ($M)	$1,000.0	$190.6	$311.2	$1,501.7

Note: Dollar values are expressed in millions of current US$
Source: ECONorthwest calculations using IMPLAN

After the completion of the facility construction, we assume that 2,000 permanent jobs would be added to the Semiconductor Manufacturing sector, which pays well above the median income for the Portland Metropolitan area. That additional income for workers, along with increased business purchases could increase the overall productive capacity of the Metro area. Based on known relationships about labor and supply chain spending within the sector, we calculate that an additional 2,000 jobs could support over 4,000 jobs in other sectors of the economy and an additional $830 million in Gross State Product. Based on the additional employment and business activity, sector could support another $56.9 million in state and local tax revenues per year.

Figure 2. Economic contribution of operations in the semiconductor industry

	Direct	Indirect	Induced	Total
Job Years	2,000	2,063	2,107	6,170
Labor Income ($M)	$279.4	$184.9	$119.3	$583.7
Gross State Product ($M)	$355.0	$258.2	$214.3	$827.6
Output ($M)	$999.0	$442.4	$354.0	$1,795.4

Note: Dollar values are expressed in millions of current US$
Source: ECONorthwest calculations using IMPLAN

A quick note about "job-years"

Because jobs are often used as an important talking point when discussing the economic development potential of a new investment, it's worth taking a moment to describe how to interpret the way jobs are calculated in IMPLAN. The jobs calculated in IMPLAN are in terms of full-year-equivalents (FYE), which are known as "job-years". One FYE equals work over twelve months in a studied industry (this is the same definition used by the federal Bureau of Labor Statistics).

A FYE job can be full-time or part-time, seasonal, or permanent and two jobs that each last six months would together count as one FYE job. Because the results are calculated for the lifecycle of the project, the results represent the total FYE for the construction period. For example, if someone had a part-time, temporary job for 2 years as part of the fabrication plant construction, they would be counted as 2 job-years by IMPLAN. To estimate the change in job positions, job-years should be divided by the number of construction years to obtain the average annual job-years.

This average annual job-year figure should not be interpreted as the total employment gains and losses but can be used to estimate the changes in long-term positions during the study period.

Appendix 2

Competitive Analysis – State Incentive Offers

ELLEN HARPEL

OREGON SEMICONDUCTOR TASKFORCE,
TAXES AND INCENTIVES SUBCOMMITTEE

JUNE 2022

SMART INCENTIVES
SOUND DECISIONS

Strategic approach to incentives

Business Oregon's *Strategic Assessment of Incentives* examined how a set of legacy incentive programs align with current economic development priorities.

- Adapt the incentives toolkit to a changing competitive and economic environment
- Communicate how Oregon's incentives support the state's strategic priorities

We use incentives to achieve our state's economic development objectives.

Incentives are not about winning a deal or completing a transaction. Smart incentive use is always connected to a larger economic development strategy.

National context for semiconductor incentive conversations

Incentives that lower the total cost of ownership
- Reduce up front capital expenditures on land, construction, infrastructure, and equipment
- "Temper" operating expenses, including labor and utilities

Build on strengths in talent and existing ecosystems

Taxation matters but is not the driver
- "The US can be competitive on taxation in some cases because of an effective tax rate that is significantly lower than the nominal corporate tax rate, as well as substantial reductions in state and local taxes in some locations.
- However, these state and local government incentives fall significantly short of **grants and direct cash** incentives provided by other national governments."

Source: Government Incentives and US Competitiveness in Semiconductor Manufacturing, BCG and SIA, 2020.

Grants and refundable tax credits

Grants
- AZ Competes Fund - TSMC grant not made public; largest prior grant was $5m
- California Competes - Applied Materials: $30m grant
- New York - Wolfspeed: $500m in performance-based, capital grants for a portion of the cost of construction (part of prior commitment to develop the site for previous failed effort)
- JobsOhio
  - Up to $150m for economic and workforce development grants; largest prior workforce grant was $5m
  - $600m onshoring incentive grant
- Texas Enterprise Fund and Local 4(a) grants
  - Samsung: eligible for $27m from Texas Enterprise Fund + local 4(a) grant
  - Texas Instruments Richardson - $5m TEF award; none for new Sherman facility
  - Largest TEF grant in recent years was $25m

Refundable tax credits
- AZ Quality Jobs and Qualified Facilities tax credits
  - Intel AZ: Up to $90m in refundable Qualified Facility tax credits (through 2030)
- NY Excelsior Jobs Tax Credits
  - Wolfspeed NY: $1m. $400m offered to Samsung; program allows benefits up to 10 years
- OH Job Creation Tax Credits
  - Intel: $650m refundable job creation tax credits over 30 years based on withholding once jobs are created
  - Tax credits available to suppliers

Land and infrastructure

Land
- TSMC AZ bought land at a state auction
- Wolfspeed NY is subleasing SUNY-owned land from Mohawk Valley EDGE
  - State is advertising 4 shovel ready sites with infrastructure, workforce, R&D assets too
- Intel OH
  - New Albany Co. (MBJ Holdings) purchased parcels
  - Site annexed and rezoned and designated Community Reinvestment Area
- Applied Materials TX (pending)
  - Hutto "megasite" includes 400 acres owned by the Hutto EDC, with options on 1000 additional acres

Infrastructure
- TSMC AZ: $205m in Phoenix city funds for roads and water improvements
- Intel AZ: special agreement for power purchase for Ocotillo campus
- Intel OH: $691m for investments in water, sewer, roadwork, water reclamation
- Applied Materials TX: $80m city incentives over 10 years for infrastructure reimbursements (proposed)
- TI TX: Sherman had previously spent $30m to expand water treatment facility
- Samsung TX: state committed $67m state for road construction; water deal facilitated by local leaders

Property tax abatements and other cost reductions

Personal property (equipment) is not taxed in OH or NY

Manufacturing machinery and equipment sales and use tax exemptions in AZ, CA, NY, OH and TX

Wolfspeed NY: $280m (est.) in local incentives
- Sales tax exemptions for construction materials and equipment
- Payment in lieu of taxes (PILOT) to local taxing jurisdictions, with $50m going back to the company

Samsung NY: (offer)
- $289.7m local sales tax exemption
- $696m savings via PILOT to abate real property taxes

Intel OH:
- 100% property tax abatements on buildings for 30 years (city)
- Exemptions for certain equipment sales from the commercial activity tax (CAT)
- Sales tax exemption on construction materials, R&D equipment, and other certain manufacturing items

TI TX:
- 90% tax abatement for 10 years (city), estimated value $148m for first fab
- 90% abatement for 30 years (county)
- $182m in tax savings over 10 years (est.)(Ch 313, school district)

Workforce and talent

Technician Training
- Maricopa Community College (AZ) as a model
  - Workforce Pipeline 450 and Quick Start Program
  - Strategic partnership with Intel; state and foundation funding
  - Arizona Advanced Manufacturing Institute; AZ Office of Economic Opportunity, other community colleges, other semiconductor company partners
- CA Employment Training Panel program – training reimbursements
- NY has proposed $350m for workforce development for semiconductor and advanced manufacturing
- Columbus, OH region will model its workforce efforts on Maricopa

Higher Education Partnerships
- Arizona State University Core Facilities
- Albany NanoTech Complex
- Ohio State Semiconductor Education and Research Program

State incentive package examples

New York $1.89b offer to Samsung (not successful)
- $400m Excelsior refundable tax credits
- $25m infrastructure investment
- $360m estimated savings for special NYPA utilities contract
- $115.5m estimated savings for discounted land to be acquired from Genesee County
- $289.7m local sales tax exemption
- $695.8m real property tax abatement (personal property is not taxed)
- No corporate income tax for manufacturers

Ohio $2b offer to Intel
- $600m cash grant ($300m for each fab)
- $691 infrastructure investment
- $650m job creation tax credits
- $150m Economic development and workforce training grants
- 100% local property tax abatement on buildings for 30 years (tangible personal property is not taxed)
  - Site annexed and rezoned and designated Community Reinvestment Area
  - State law changed to allow 30 year abatement
- CAT and sales and use tax exemptions
- Workforce initiatives with Ohio State and community and technical colleges
- Research initiative with Ohio State

National incentives: CHIPS and FABS

Federal incentives in the CHIPS Act

- To incentivize investment in facilities and equipment in US
- Funding still to be determined (est. $39b, FY22-26)
- Companies will apply for the incentives
  - State and local incentives will be part of application
  - Commitments to worker training and community investment
  - Will be clawback terms

Substantial research (est. $10b) and National Semiconductor Technology Consortium (est. $2b) money

FABS Act

- Semiconductor manufacturing investment tax credit
- 25% tax credit for qualified investment in manufacturing equipment and construction of manufacturing facilities

For consideration

Bringing together and scaling up state and local programs to create a compelling, unified incentive package

Leveraging funds and programs in CHIPS and FABS Acts

Pursuing R&D and investment/jobs tax credits

Investing in Oregon as well as the company

Considering incentives built around people/talent

Communicating what Oregon wants to incentivize and why

[i] https://www.semiconductors.org/semiconductors-101/industry-impact/
[ii] https://fredblog.stlouisfed.org/2021/05/the-distribution-of-patents-across-u-s-states/
[iii] https://www.semiconductors.org/wp-content/uploads/2021/10/CHIPS-FABS-Hill-handout-oct-2021.pdf
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