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MANUFACTURING & TECHNOLOGY STUDY

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EXECUTIVE SUMMARY

Manufacturing is a Linchpin of Washington's Economy

Manufacturing is a major employer and source of job creation in Washington state. In 2019, the manufacturing sector employed **305,300 workers in Washington state**, equal to 9% of Washington's entire nonfarm employment base (Washington State Employment Security Department, 2020). The sector was responsible for more than 11% of gross state product in 2019, although down from 14% in 2000, a development consistent with manufacturing nationwide (U.S. Bureau of Economic Analysis, 2020).

Manufacturing gross business income (gross receipts, a proxy for revenues), reached $192.5 billion in 2019—albeit slightly below 2018 totals—equal to 20% of all gross business income reported in Washington state (Washington State Department of Revenue, 2020). The sector is also a major source of both foreign and domestic exports (to other parts of the U.S.).

Manufacturing workers earned an average wage of $81,200. This was one sixth higher than the statewide average wage in 2019 (U.S. Bureau of Labor Statistics, 2020). The aerospace sector provided even higher wages ($118,800, more than 1.7 times the statewide average wage). Manufacturing provides numerous family wage jobs for workers with less than a college education.

Manufacturing is alive and robust across the state. There were twenty-three (23) counties with at least 1,000 manufacturing workers in 2019. Seven counties were home to at least 10,000 workers, led by King and Snohomish (105,400 and 60,500) but with large concentrations in Kitsap (17,500), Spokane (16,300), Pierce (17,400), Clark (14,100), and Whatcom (10,500).

Manufacturing creates jobs across the economy in every county. Manufacturing supports additional employment elsewhere in the economy. Manufacturing involves an extensive supply chain, supporting jobs and wages among these businesses. Manufacturing workers, along with workers among suppliers, spend a large share of their income on household goods and services in the economy, such as on groceries and restaurants, spurring additional employment in the economy. For example, each job in aerospace supports a total of three jobs across the state economy, both among suppliers and various services businesses whose revenues come from aerospace worker household spending.

Manufacturing is diverse, supporting jobs and prosperity across a range of activities in Washington state. Among subsectors analyzed in this study, activities ranged from aerospace to biotechnology to food and

beverage processing. The aerospace and space sectors combined employed 88,900 workers and paid an average wage of $151,300 (including benefits). Other transportation equipment—including shipyards, truck manufacturing, and transportation parts and equipment—employed 24,400 workers in 2019. Agri-tech activities, including food and beverage processing, directly employed 51,600 workers and supported nearly $4.0 billion in foreign exports.

Information & Communication Technology (ICT) Directly Employs More than a Quarter of a Million Workers

ICT is among Washington's largest sectors, fast growing, pays strong wages, and an increasingly important driver of other industries in Washington state. The ICT sector in 2019 employed more than a quarter of a million workers (276,700) and paid average annual wages, including benefits, of $225,000 per worker. The sector is highly concentrated in King County but there are **twelve counties in Washington state with at least 1,000 ICT workers**, including Clark (8,940), Snohomish (8,370), and Spokane (5,310). Washington is also home to centers of ICT government work, such as the Department of Energy's Pacific Northwest National Laboratory in Richland.

The economic impact of the ICT sector, including upstream business-to-business transactions (indirect) and household consumption (induced), summed to more than 1.0 million jobs in 2019. The sectoral jobs multiplier of 3.7 is among the highest of any industry in Washington state.

Increasing Overlap Between ICT and Manufacturing

ICT workers and activities play an important and increasing role in manufacturing. For example, an estimated 15% of employees in the space sector work in ICT occupations, such as software engineering. Within biotech, nearly 9% of the workforce are ICT workers, and 6% in energy systems.

The distinction between tech and manufacturing as separate sectors is becoming less defined. Various manufacturing firms develop their own software solutions, whilst the ICT sector also designs and builds hardware products.

Manufacturing Recruitment is Highly Competitive

Washington state has a set of programs and policies used to support and attract manufacturing. These include discretionary investment funds for infrastructure and training, preferential tax rates and tax exemptions, and local tax increment financing with state support. States across the U.S. compete for manufacturing investments through a range of tax incentives and discretionary grants and loans. Manufacturing continues to be a key source of innovation and high paying, high skill jobs and an engine of economic growth.

However, equal or more important are the fundamentals of access to (and cost of) key business inputs, such as qualified workers, land, and energy, and the predictability of permitting processes. Research has shown that, nationwide, small manufacturing firms (those with fewer than 50 employees) bear regulatory costs 77% higher than an average manufacturing firm. Washington's own State Auditor's Office has pointed to the state's lack of a long-term strategy for improving and streamlining regulations.

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INTRODUCTION

Background and Purpose

Manufacturing has long been a leading driver of job creation in Washington state. Manufacturing supports high wage jobs, exports, and broad-based economic growth through upstream and downstream associated spending by businesses and households.

In 2019, the sector employed 305,300 workers in Washington state, equal to 9% of Washington's entire nonfarm employment base, with an average wage of $81,200 (Washington State Employment Security Department, 2020). The sector was the source of more than 11% of gross state product in 2019, although down from 14% in 2000, a development consistent with the national manufacturing trend (U.S. Bureau of Economic Analysis, 2020). Manufacturing gross business income (gross receipts, a proxy for revenues), reached $192.5 billion in 2019—albeit slightly below 2018 totals—equal to 20% of all gross business income reported in Washington state (Washington State Department of Revenue, 2020). The sector is also a major source of both foreign and domestic exports (to other parts of the U.S.).

In recent decades, the information & communication technology (ICT) sector has emerged as a new major source of growth in Washington, anchored by locally founded global companies such as Microsoft and Amazon, a robust and vibrant start-up eco-system, and investments in Washington state by outside firms, including Facebook and Google. There are large and growing synergies and overlaps between ICT and manufacturing in Washington state. The manufacturing sector increasingly relies on and engages with ICT, both in the application and in-house development of ICT solutions.

The Association of Washington Business (AWB), and its affiliate, the AWB Institute, desires an analysis of the economic benefits of manufacturing and the tech sectors to Washington state's economy, the intersection of technology and manufacturing, and an assessment of manufacturing incentives and policies in other states for consideration in Washington state.

This study examines seven sectors and manufacturing subsectors identified by the AWB for deeper analysis:

- **Aerospace and Space**. Including the Boeing Company, Blue Origin, and an extensive supply chain ecosystem across the state. The space sector overlaps with aerospace but also includes activities not captured in the aerospace sector, such as satellite technology and wireless communications systems.
- **Other Transportation**. Shipyards, truck manufacturing, and various parts and supporting firms.
- **Other Durable Goods Manufacturing**. The remaining durable manufacturing jobs and activities, after removing durable goods production activities already listed above (excluding nondurable production found in agri-tech and non-manufacturing activities in ICT).
- **Agri-Tech**. Food and beverage processing, including fruit packaging, wineries, and various frozen vegetable processors.
- **Energy systems**. The overall energy system, and the role and importance of product and technology solutions developed within the sector.
- **Biotech**. Including medical devices and pharmaceuticals.
- **Information & Communication Technology**. Software, cloud computing, e-commerce, computer-related business services, and computer-related manufacturing.

Methods

This study leverages federal, state, and private vendor data sources, along with qualitative research obtained through correspondence with industry representatives, reports, and articles. Economic and fiscal impacts are computed through use of the Washington State Input-Output Model, with adjustments and augmentations to allow for fiscal impact estimates. To the greatest extent possible, existing definitions of select subsectors were used, based on veritable research, to allow for consistency in measures.

Definitions

The following terms are used frequently in this report:

- **Direct impacts**. Revenues, jobs, and income directly tied to either manufacturing or ICT activities. Also referred to as final demand.
- **Indirect impacts**. Additional revenues, jobs, and income supported through upstream supply chain transactions.
- **Induced impacts**. Additional revenues, jobs, and income supported through the spending of income earned among direct and indirect workers on goods and services as part of household consumption.
- **Total economic impacts**. The sum of direct, indirect, and induced impacts.

Organization of Report

The remainder of this report is organized as follows:

- **Economic and fiscal impacts of manufacturing and technology sectors**. Measuring the manufacturing and technology sectors in Washington state. Direct, indirect, and induced economic and fiscal impacts for each subsector, and distribution of jobs across the state.
- **Occupational analysis and tech jobs**. Leading occupations and tech jobs in each subsector.
- **Manufacturing recruitment policies in other states**. Examples of tax incentives designed to support manufacturing activities in other states.
- **Summary and conclusion**. Review of key findings.

MANUFACTURING AND TECHNOLOGY SECTORS IN WASHINGTON STATE

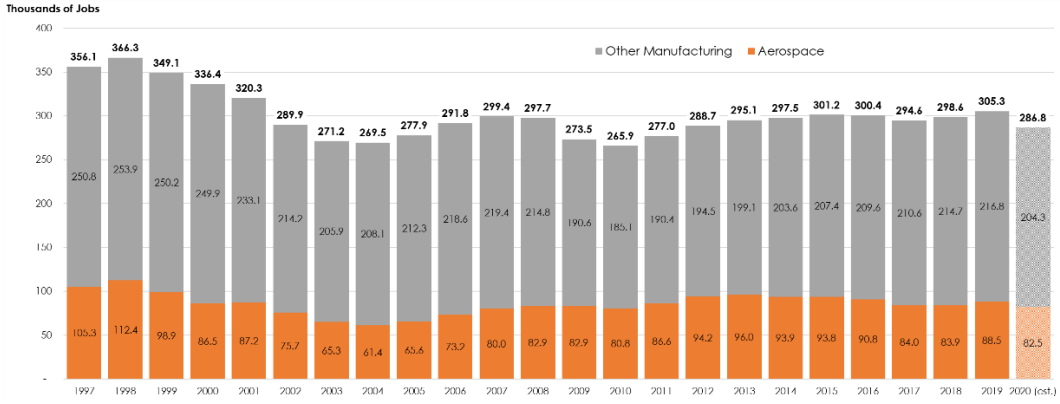
Manufacturing and ICT are anchors of Washington's economy. Both sectors are sources of job creation, innovation, and broad-based economic impact. This section presents key indicators for both, along with select manufacturing subsectors.

Manufacturing Sector Overview

In 2019, the manufacturing sector in Washington state employed 305,300 workers across the state. Through the first eleven months of 2020, sectoral employment declined to 286,800 due primarily to the coronavirus pandemic and the continued grounding of the 737 MAX. Over the past three decades, manufacturing employment statewide peaked in 1998, with 366,300 workers (**Exhibit 1**). Over the same period, Washington state manufacturing has declined as a share of total statewide nonfarm employment, from 15.1% in 1991 to 8.4% through September 2020 (**Exhibit 2**). This generally follows a nationwide trend in manufacturing's share of nonfarm employment, though Washington state has shown more cyclicality (punctuated by peaks and valleys) over the same period before leveling off in 2017. In 1991, aerospace represented 35% of all manufacturing jobs in Washington state, while in 2019 this share declined to 30% (U.S. Bureau of Labor Statistics, 2020).

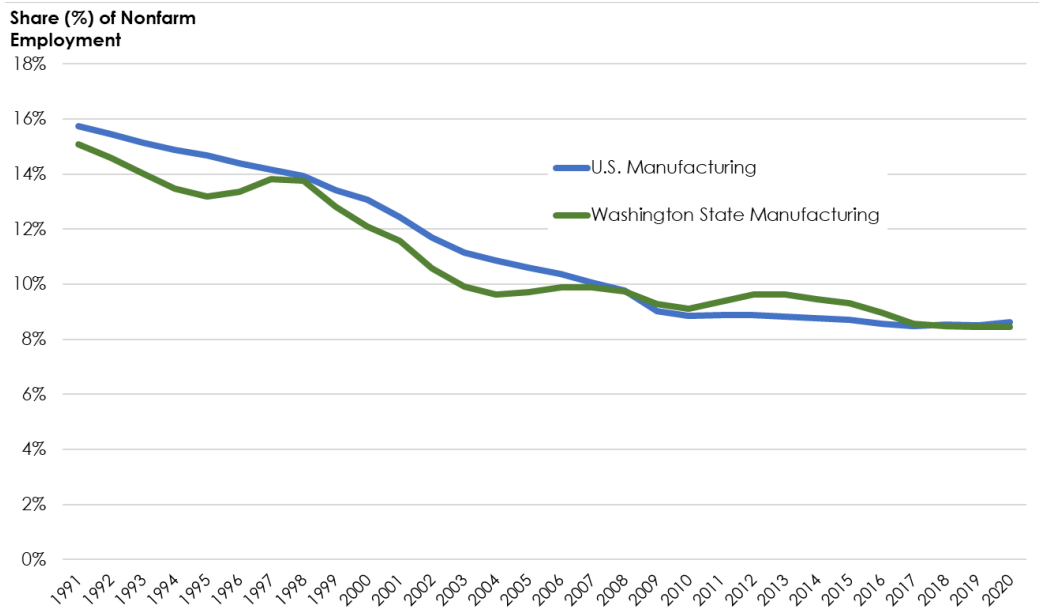
Some segments of the manufacturing sector, such as aerospace, operate under cycles partially decoupled from the broader U.S. economy. For example, in 2009, U.S GDP contracted 2.5%; aerospace employment, by contrast, fell just 0.1% in the same year. Manufacturing is considered a basic industry, meaning it is export-oriented—to both domestic and foreign markets—making it more resilient to swings in the U.S. economy.

Exhibit 1. Manufacturing Jobs, Statewide, 1997-2020 (est.)



Data source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (2020).

Exhibit 2. Manufacturing as a Share of Nonfarm Employment, Washington State and U.S., 1991-2020 (est.)



Data source: U.S. Bureau of Labor Statistics, 2020.

The average wage, before supplemental benefits, for manufacturing workers in 2019 was $81,200. This was approximately one sixth (17%) higher than the statewide average wage in 2019 (U.S. Bureau of Labor Statistics, 2020). However, there is wide variation in average wages across manufacturing subsectors. For example, the average wage in aircraft manufacturing was $118,800, as compared with $50,800 in food manufacturing (a subsector that employed more than 39,000 workers in 2019).

Manufacturing provides numerous family wage jobs for workers with less than a college education. For example, first-line supervisors, which represent an estimated 4% of all manufacturing workers in Washington state, earned an average of $75,600 (before benefits) in 2019. An estimated 85% of these workers had less than a four-year college degree (Washington State Employment Security Department, 2020; U.S. Bureau of Labor Statistics, 2020).

Twenty-three of thirty-nine counties in Washington state have at least 1,000 manufacturing workers. Across the state, the highest concentration of manufacturing jobs was in King County, with 105,400 workers (more than one third of all manufacturing workers statewide), followed by Snohomish County (20% of all workers), Kitsap, and Spokane (**Exhibit 3**). King County was also the largest center for non-aerospace jobs, with 64,000 workers in 2019.

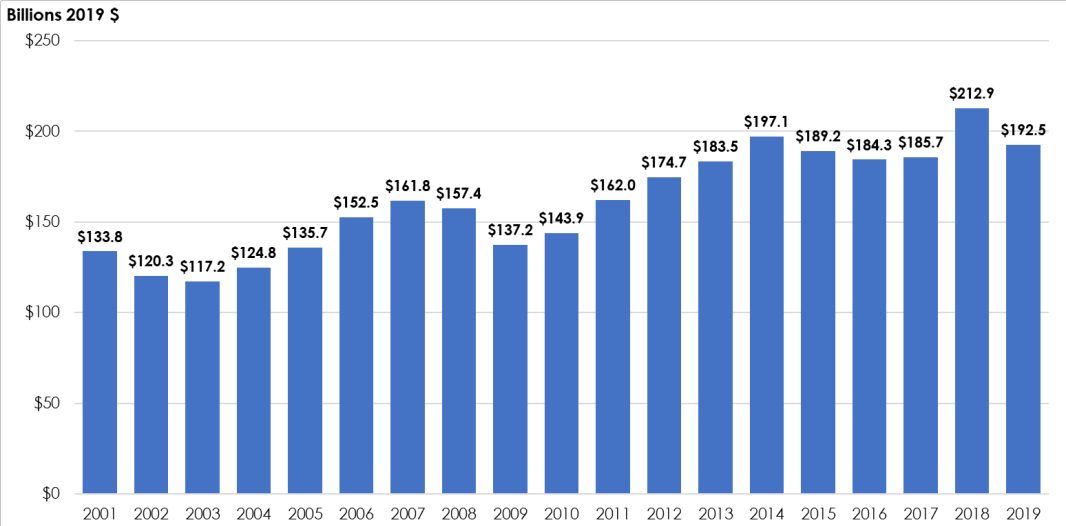
Exhibit 3. Manufacturing Employment by County 2019 (those with at least 1,000 manufacturing workers)

County	Manufacturing Jobs	Non-aerospace Jobs	Nonfarm Jobs	Manufacturing Share of Nonfarm Employment	Non-aerospace Manufacturing Share of Nonfarm Employment
King	105,400	64,000	1,432,400	7.4%	4.5%
Snohomish	60,500	19,500	290,700	20.8%	6.7%
Kitsap	17,500	17,400	91,800	19.1%	19.0%
Spokane	16,300	15,600	227,000	7.2%	6.9%
Pierce	17,400	14,600	316,300	5.5%	4.6%
Clark	14,100	14,100	164,100	8.6%	8.6%
Whatcom	10,500	10,500	89,800	11.7%	11.7%
Yakima	8,600	8,600	97,200	8.8%	8.8%
Cowlitz	6,600	6,600	39,100	16.9%	16.9%
Skagit	5,900	5,900	50,700	11.6%	11.6%
Grant	4,600	4,600	32,400	14.2%	14.2%
Benton	4,600	4,600	87,100	5.3%	5.3%
Walla Walla	4,000	4,000	24,600	16.3%	16.3%
Franklin	3,800	3,800	31,600	12.0%	12.0%
Lewis	3,400	3,400	26,400	12.9%	12.9%
Thurston	3,000	3,000	117,300	2.6%	2.6%
Whitman	2,900	2,900	18,500	15.7%	15.7%
Grays Harbor	2,600	2,600	22,900	11.4%	11.4%
Chelan	1,900	1,900	38,900	4.9%	4.9%
Klickitat	1,700	1,700	6,600	25.8%	25.8%
Stevens	1,100	1,100	10,600	10.4%	10.4%
Adams	1,100	1,100	8,000	13.8%	13.8%
Clallam	1,100	1,100	23,200	4.7%	4.7%
All other counties	*6,700*	*4,200*	*127,800*	*5.2%*	*3.3%*
Statewide	**305,300**	**216,800**	**3,375,000**	**9.0%**	**6.4%**

*A full breakdown of manufacturing jobs by county can be found in the **Appendix**. Data source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (2020).*

Manufacturing revenues have outpaced overall employment growth, increasing in real (inflation-adjusted) terms by 40% in 2019 compared with 2009, or 55% between 2009 and 2018 (reaching a peak of $212.9 billion), before the grounding of the 737 MAX (**Exhibit 4**). This growth compares with 10% overall growth in manufacturing jobs between 2009 and 2019.

Exhibit 4. Revenues, Manufacturing Sector, Statewide, 2001-2020 (billions 2019 $)



Data source: Washington State Department of Revenue, 2020.

Production Sectors

This study evaluates several specific subsectors of manufacturing. These include aerospace, space, other transportation equipment (e.g., shipyards), other durable goods, and agri-tech (food and beverage processing).

Aerospace and Space

The aerospace and space sectors combined employed 89,500 workers in 2019. Roughly two thirds of space sector jobs in Washington are within aerospace companies. This section reviews each of these sectors separately. Estimates below report the direct impacts of each sector separately, though the combined impacts will be less than the sum of these two activities due to some overlap (in aerospace).

Aerospace Sector. The aerospace sector includes a diverse range of manufacturing activities, ranging from aircraft final assembly, composites and advanced materials, aerostructures, avionics, aircraft interiors, rocketry, tooling, and maintenance, repair, and overhaul (MRO) operations.

The sector has long been anchored by The Boeing Company—the largest exporter in the U.S.—and an extensive supply chain. The Boeing Company in 2018 employed nearly 70,000 workers in Washington and did $5 billion in business with nearly 1,500 suppliers and vendor locations across the state (The Boeing Company, 2019). In recent years aerospace companies in Washington have expanded business activities with Airbus and other aircraft original equipment manufacturers (OEM).

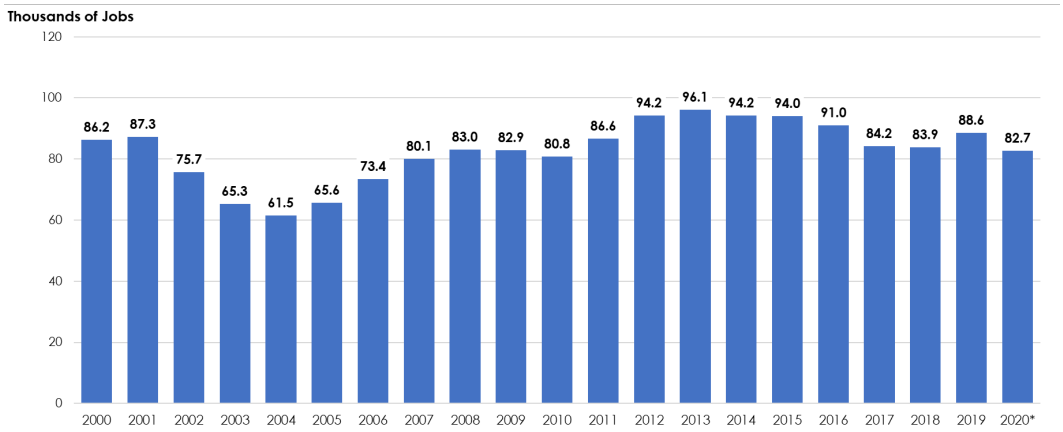
The sector also supports defense programs, such as the Navy's P8 aircraft and Air Force's KC-46 Refueling Tanker (both developed by The Boeing Company with final assembly in Washington state) and the new B-21 stealth bomber currently under development.[1] Many companies also apply their technology and manufacturing capabilities to other sectors, such as in medical devices and advanced manufacturing.

Examples of aerospace companies and suppliers include:

- **Crane Aerospace & Electronics**. Lynnwood-based manufacturer of sensing components and gauges, fluid handling equipment, power system products, and controls. A supplier to the new 777X.
- **Esterline**. Bellevue-based global corporation with multiple locations in Washington state. Provider of technology solutions for commercial and military aircraft, ranging from avionics and control systems, sensors, and advanced materials.
- **Aviation Technical Services**. The largest MRO in North America, with operations in Everett and Moses Lake. Services include airframe maintenance, component repair, engineering support, fuselage painting, and business jet services. One of the largest suppliers of 737 airframe maintenance in the world.
- **Pacific Tool Inc**. A supplier to The Boeing Company since 1966. Provider of specialized tooling for all Boeing aircraft models.

The aerospace sector in 2019 employed 88,600 workers, an increase following four consecutive years of declining workforce due to industry business cycles and voluntary layoffs (**Exhibit 5**). The average wage in aerospace, before benefits, was $118,800 in 2019, more than 1.7 times the statewide average wage of $69,600 (**Exhibit 6**).

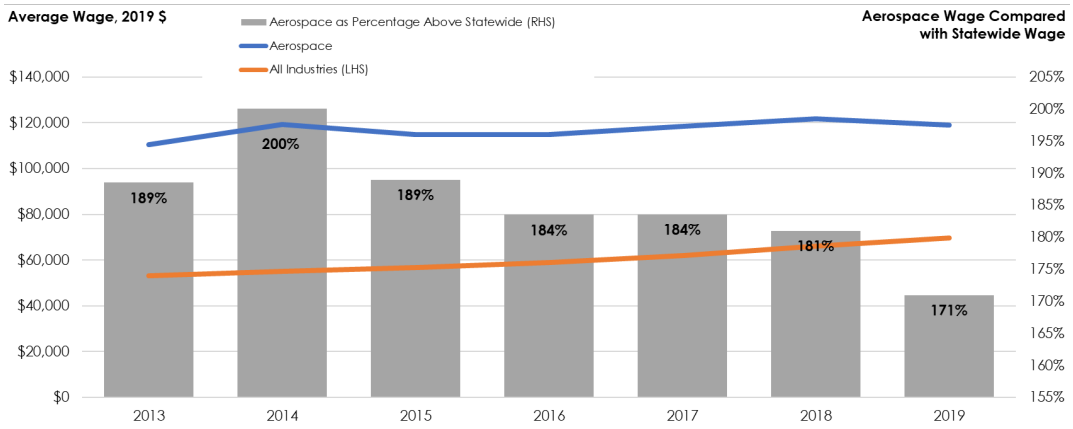
Exhibit 5. Aerospace Employment, Washington State, 2000-2020 (est.)



[1] Among the tier I suppliers to Lockheed Martin is composites tooling company Janicki Industries, based on Sedro-Wooley, WA (Aerospace Manufacturing, 2020).

Data source: Washington State Employment Security Department, Current Employment Statistics Seasonally Adjusted Series, (2020).

Exhibit 6. Aerospace Wage Compared with Statewide Average Wage, Washington State, 2013-2019 (Billions 2019 $)

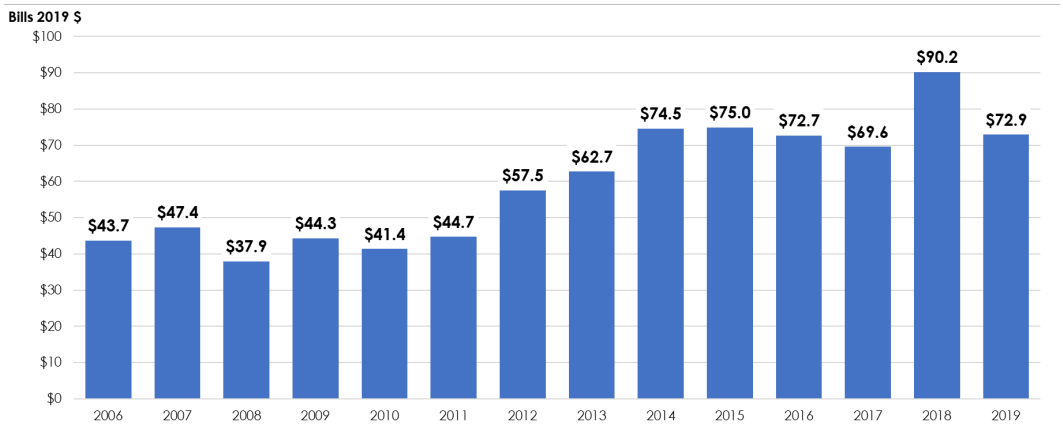


Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

In 2020, the industry has undergone multiple layoff announcements due to the negative impacts of the coronavirus pandemic on air travel and grounding of the 737 MAX.

Aerospace revenues, measuring in gross business income, summed to $72.9 billion in 2019, down from a historic high of $90.2 billion (in adjusted 2019 dollars) in 2018 (**Exhibit 7**). This decline in sales was due in part to the grounding of the 737 MAX and trade war with China, as well as cyclicality within the industry.

Exhibit 7. Aerospace Gross Business Income, Washington State, 2006-2019 (Billions 2019 $)



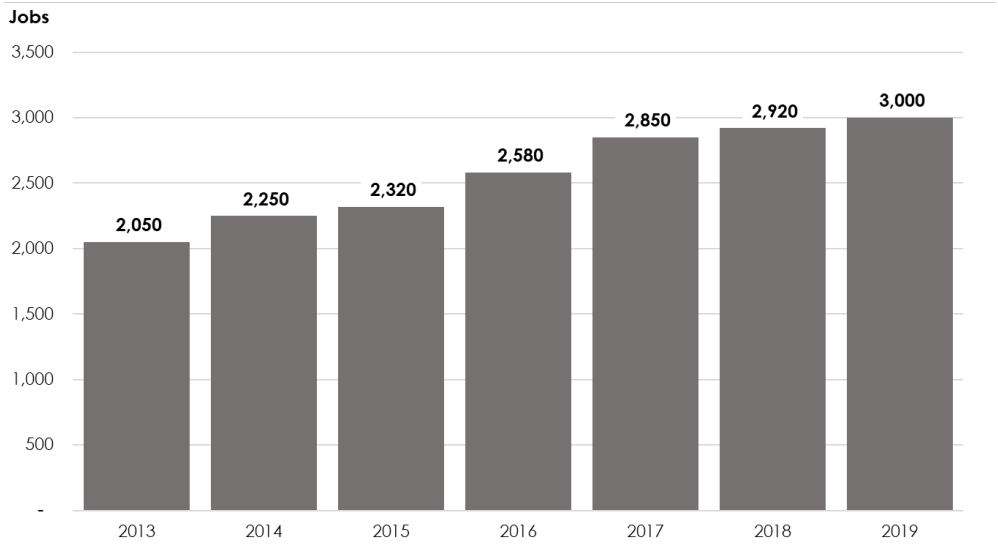
Data source: Washington State Department of Revenue (2020).

Space Sector. The space sector includes aerospace and activities tied to satellite development, rocketry, and non-scheduled chartered flight services. Roughly two-thirds of space workers are employed in aerospace companies and thus also captured in estimates reported above. Estimates in this report were developed based on a 2019 study of the space sector published by the Puget Sound Regional Council for the year 2018 (Puget Sound Regional Council, 2018). In 2019, the industry directly employed an estimated 3,000 workers, up from 2,050 in 2013 (**Exhibit 8**). The average wage (before benefits) in the space sector in 2019 was $120,100, more than 1.7 times the statewide average wage across all sectors.

Core segments of the space industry in Washington state include upper-tier suppliers and original equipment manufacturers (OEMs), space launch service providers, space-related goods and services, and supporting businesses. Illustrative businesses and organizations within each group are reported by the Puget Sound Regional Council (2018, pp. 3-8), summarized below:

- **OEMs and Upper-Tier Suppliers**. Blue Origin, Boeing Defense, Space & Security, SpaceX, and Aerojet Rocketdyne.
- **Space Launch Service Providers**. Launch facility support, mission management, ground support, ongoing satellite operations support. Examples include Spaceflight Industries and Stratolaunch Systems Corporation.
- **Space-Related Goods and Services**. Including telecommunications, research, earth observation and mapping, and defense-related space work. Examples include First Mode, RBC Signals, and BackSky.
- **Business Supported by the Space Industry**. Ranging from weather forecasting to navigational systems. Examples include Zonar Systems Inc. and Meteorcomm LLC.

Exhibit 8. Space Industry Employment, Washington State, 2013-2019



Data sources: U.S. Bureau of Labor Statistics (2020)*; Washington State Employment Security Department* (2020)*; Puget Sound Regional Council* (2018).

Economic and Fiscal Impacts, Aerospace and Space (Combined)

In 2019, the aerospace and space sectors, combined, supported a total of 239,300 jobs, including through upstream business-to-business transactions (indirect) and household expenditures from earned income among direct and indirect workers (induced). These activities were further associated with $22.5 billion in labor income and $99.2 billion in total business revenues throughout the state (**Exhibit 9**). Each direct job in aerospace and space was associated with an additional 1.7 jobs elsewhere in the state economy, or a multiplier of 2.7 (**Exhibit 10**).

Exhibit 9. Statewide Economic Impacts, Aerospace and Space, 2019

	Direct	Indirect	Induced	Total
Employment	88,600	26,000	124,700	239,300
Labor Income (mils $)	$13,400.4	$2,074.6	$6,997.1	$22,472.1
Output (mils $)	$72,910.9	$5,899.9	$20,371.1	$99,181.9

Data sources: Washington State Office of Financial Management (2019); High Peak Strategy LLC (2021).

Exhibit 10. Economic Impact Multipliers, Aerospace and Space, 2019

Total jobs per direct job	2.7
Total revenues per dollar of direct revenues	$1.36
Total jobs per $ mil direct sales	3.3
Total labor income per dollar direct sales	$0.31

Data sources: Washington State Office of Financial Management (2019); High Peak Strategy LLC (2021).

The above statewide economic impacts in turn support state taxes, incurred both through direct activities and additional taxable revenues from indirect and induced activities. In 2019, the aerospace and space sectors combined supported a total state fiscal impact of $631.3 million (**Exhibit 11**).

Exhibit 11. Statewide Fiscal Impacts, Aerospace and Space, 2019

State Tax Category	Direct Taxes	Secondary Taxes	Total
Sales & Use Taxes	$44.4	$247.5	$291.9
B&O	$168.3	$99.1	$267.3
Other Taxes*	$0.0	$72.1	$72.1
Total	**$212.7**	**$418.6**	**$631.3**

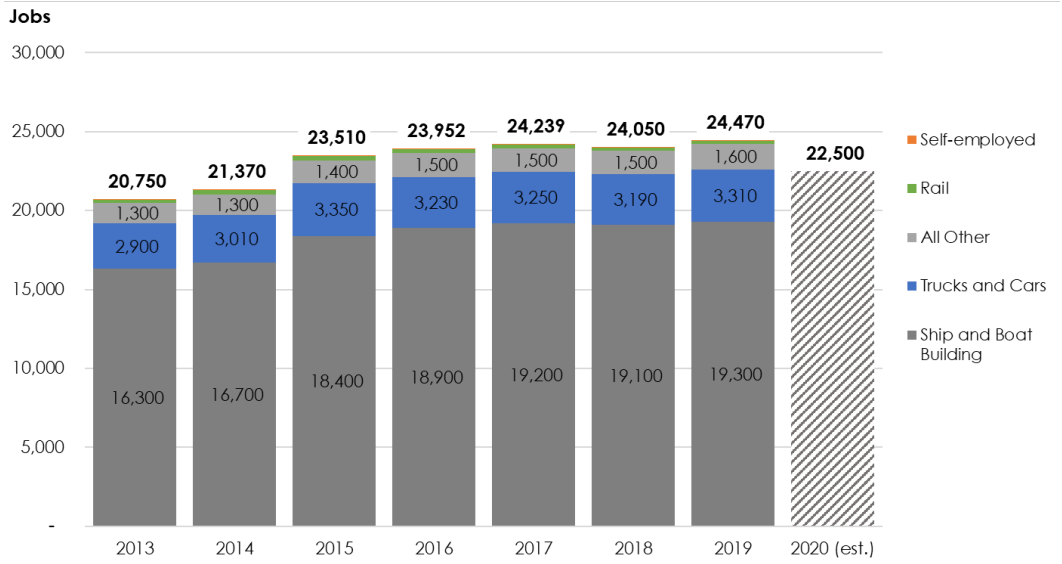
**Includes quantity taxes, utility taxes, and other less common state taxes.*
Data sources: Washington State Office of Financial Management (2019); Washington State Department of Revenue (2020); High Peak Strategy LLC (2021).

Other Transportation Equipment

The largest component of "other transportation equipment" is ship and boat building, representing both private sector and public sector shipyard activities. The Puget Sound Naval Shipyard, based in Bremerton in Kitsap County, in 2019 employed more than 14,000 Department of Defense civilian workers. Other major shipyards operate throughout the Puget Sound region, including in King, Snohomish, Skagit, and Whatcom counties.

Total employment in "other transportation equipment" summed to nearly 25,000 workers in 2019. In addition to shipyards, there were an estimated 3,310 workers employed in the automobile sector, primarily with Paccar (**Exhibit 12**).

Exhibit 12. Other Transportation Equipment Industry Employment, Washington State, 2013-2020 (est.)



Data sources: U.S. Bureau of Labor Statistics (2020)*; Washington State Employment Security Department* (2020).

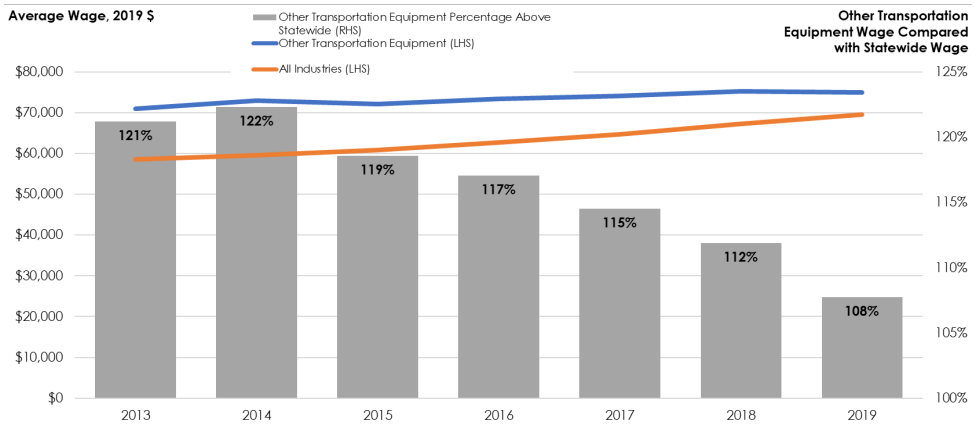
The average wage, before benefits, in "other transportation equipment" in 2019 was $75,100, 8% higher than the statewide wage across all sectors (**Exhibit 13** and **Exhibit 14**).

Exhibit 13. Other Transportation Equipment Average by Subsector Component, 2019

Subsector	Average Wage
Ship and Boat Building	$79,100
Trucks and Cars	$49,300
Rail	$45,700
All Other	$83,400
Total, industry-wide	**$75,100**

Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Exhibit 14. Other Transportation Equipment Average wage, 2019 and Compared Against Statewide Wage, 2013-2019



Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Economic and Fiscal Impacts, Other Transportation Equipment

In 2019, the "other transportation" subsector supported a total of 69,900 jobs, including through supply chain transactions (indirect) and household expenditures (induced). These activities were further associated with $5.2 billion in labor income and $18.9 billion in total business revenues throughout the state (**Exhibit 15**). Each direct job in "other transportation equipment" was associated with an additional 1.9 jobs elsewhere in the state economy, or a multiplier of 2.9 (**Exhibit 16**).

Exhibit 15. Statewide Economic Impacts, Other Transportation Equipment, 2019

	Direct	Indirect	Induced	Total
Employment	24,400	15,600	29,900	69,900
Labor Income (mils $)	$2,449.8	$1,108.0	$1,670.6	$5,228.4
Output (mils $)	$10,765.6	$3,269.6	$4,870.0	$18,905.2

Data sources: Washington State Office of Financial Management (2019).

Exhibit 16. Economic Impact Multipliers, Other Transportation Equipment, 2019

Total jobs per direct job	2.9
Total revenues per dollar of direct revenues	$1.76
Total jobs per $ mil direct sales	6.5
Total labor income per dollar direct sales	$0.49

Data sources: Washington State Office of Financial Management (2019).

The above statewide economic impacts in turn support state taxes, incurred both through direct activities and additional taxable revenues from indirect and induced activities. In 2019, the "other transportation" subsector supported a total state fiscal impact of $169.6 million (**Exhibit 17**).

Exhibit 17. Statewide Fiscal Impacts, Other Transportation Equipment, 2019

State Tax Category	Direct Taxes	Secondary Taxes	Total
Sales & Use Taxes	$14.0	$85.6	$99.6
B&O	$12.8	$35.6	$48.3
Other Taxes*	$0.1	$21.6	$21.6
Total	**$26.8**	**$142.8**	**$169.6**

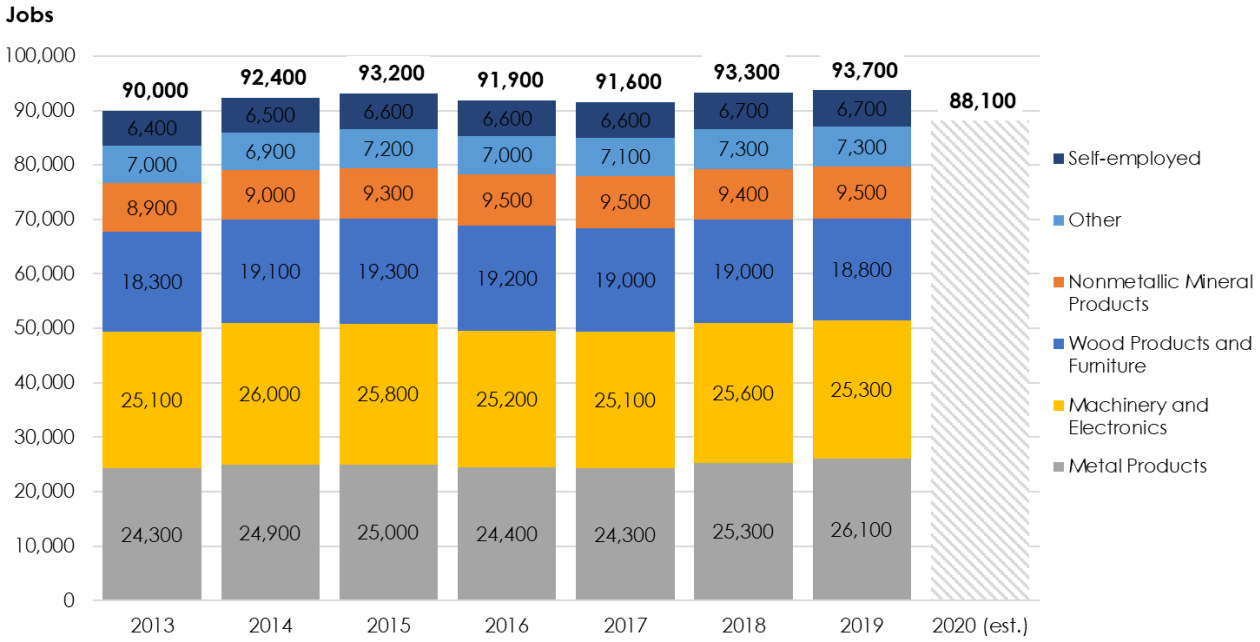
**Includes quantity taxes, utility taxes, and other less common state taxes.*
Data sources: Washington State Office of Financial Management (2019); Washington State Department of Revenue (2020); High Peak Strategy LLC (2021).

Other Durable Goods

Other durable goods manufacturing includes all other manufacturing not covered in the other subsectors above, minus non-durables such as textiles, foods, and petroleum products. Leading categories include nonmetallic mineral products (e.g., gypsum, concrete products, and glass products), wood products and furniture, machinery and electronics, and metal products.

In 2019, "other durable goods manufacturing" businesses employed 93,700 workers. The largest segment of the subsector was metal products, with 26,100 workers, followed by machinery and electronics activities (**Exhibit 18**).

Exhibit 18. Other Durable Goods Employment, Washington State, 2013-2020 (est.)



Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020).

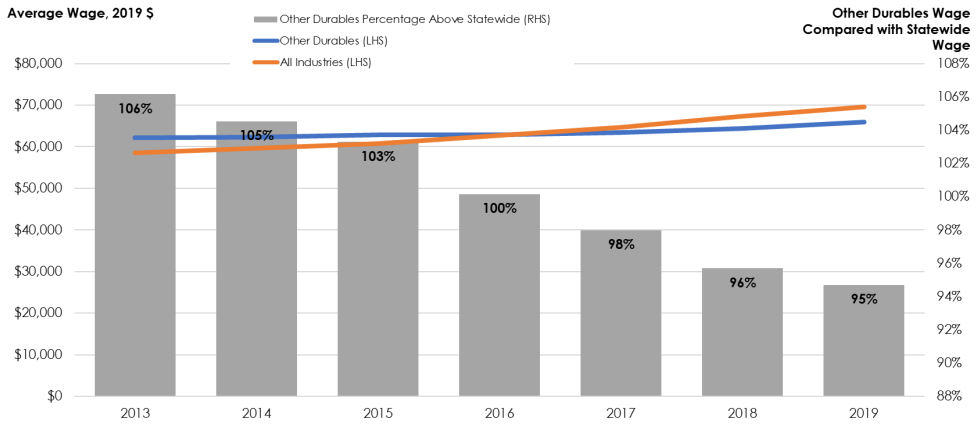
The average wage, before benefits, in "other durable goods" in 2019 was $65,900, 5% lower than the statewide wage across all sectors (**Exhibit 19** and **Exhibit 20**).

Exhibit 19. Other Durable Goods Average by Subsector Component, 2019

Subsector	Average Wage
Machinery and Electronics	$78,200
Nonmetallic Mineral Products	$63,800
Metal Products	$60,900
Wood Products and Furniture	$52,900
Other	*$77,700*
Total, industry-wide	**$65,900**

Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Exhibit 20. Other Durable Goods Average wage, 2019 and Compared Against Statewide Wage, 2013-2019



Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Economic and Fiscal Impacts, Other Durable Goods

In 2019, the "other durable goods" subsector supported a total of 308,500 jobs, including through indirect and induced impacts. These activities were further associated with $21.1 billion in labor income and $92.1 billion in total business revenues throughout the state (**Exhibit 21**). Each direct job in "other durable goods" was associated with an additional 2.3 jobs elsewhere in the state economy, or a multiplier of 3.3 (**Exhibit 22**). The "other durables" category shows an even stronger multiplier than aerospace and space. This is due to the higher share of inputs purchased in-state, compared with the aerospace and space sector; the $49.9 billion in "other durables" sales is associated with 90,700 jobs among various suppliers in Washington state.

Exhibit 21. Statewide Economic Impacts, Other Durables, 2019

	Direct	Indirect	Induced	Total
Employment	93,800	90,700	124,000	308,500
Labor Income (mils $)	$7,510.3	$6,706.1	$6,899.3	$21,115.7
Output (mils $)	$49,903.4	$22,040.7	$20,134.6	$92,078.8

Data source: Washington State Office of Financial Management (2019).

Exhibit 22. Economic Impact Multipliers, Other Durables, 2019

Total jobs per direct job	3.3
Total revenues per dollar of direct revenues	$1.85
Total jobs per $ mil direct sales	6.2
Total labor income per dollar direct sales	$0.42

Data source: Washington State Office of Financial Management (2019).

The above statewide economic impacts in turn support state taxes, incurred both through direct activities and additional taxable revenues from indirect and induced activities. In 2019, the "other durable goods" subsector supported a total state fiscal impact of $877.2 million (**Exhibit 23**).

Exhibit 23. Statewide Fiscal Impacts, Other Durables, 2019

State Tax Category	Direct Taxes	Secondary Taxes	Total
Sales & Use Taxes	$126.4	$359.7	$486.1
B&O	$117.3	$169.3	$286.6
Other Taxes*	$0.1	$104.4	$104.5
Total	**$243.9**	**$633.4**	**$877.2**

**Includes quantity taxes, utility taxes, and other less common state taxes.*
Data sources: Washington State Office of Financial Management (2019); Washington State Department of Revenue (2020); High Peak Strategy LLC (2021).

Agri-Tech

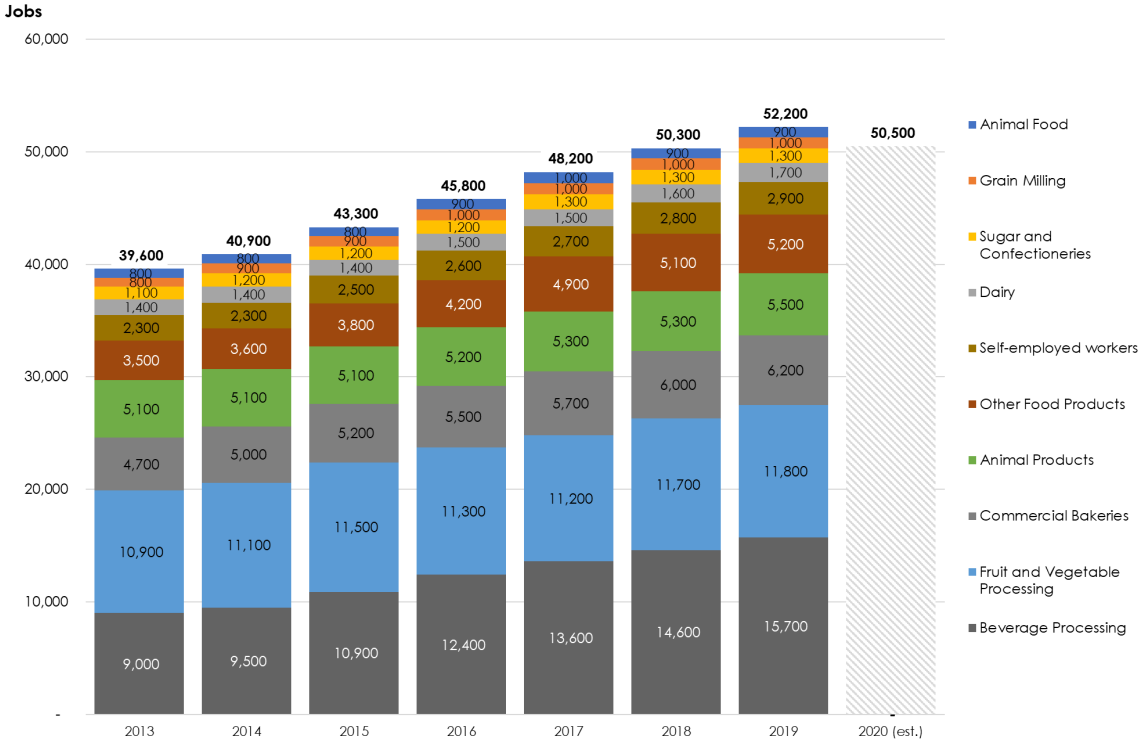
Agri-Tech encompasses a diverse range of activities engaged in the manufacture of food and beverage products, from frozen potato products, packaged fruits and vegetables, and ingredients to soft drinks, alcoholic beverages, and other commodities.[2] Wineries and breweries combined employed an estimated 12,800 workers in 2019 (Washington State Wine Commission, 2015; Washington Beer Commission, 2019; U.S. Bureau of Labor Statistics, 2020).[3]

The agri-tech industry in Washington state has traditionally involved the packaging and processing of fruits and vegetables. Over the years, the industry has evolved both in terms of technologies and types of products, such as the more recent emergence of premium wine as a leading commodity. Technology in the agri-tech sector spans product research & development, packing, supply chain management, and various support services and technologies. Illustrative examples of employers in the food and beverage processing industry include Simplot (a large potato processor), Lamb Weston, Con Agra Foods, McCain Foods, and Ste. Michelle Wine Estates.

In 2019, agri-tech businesses employed 52,200 workers. The largest component of the subsector was beverage processing, with nearly 16,000 workers, followed by fruit and vegetable processing (including frozen potato processing; 11,800 workers), and commercial bakeries (**Exhibit 24**).

[2] Seafood processing, with 5,500 covered workers, was excluded from this total, since a large share of these employees are actually employed in commercial fishing and/or processing at-sea and not in food and beverage processing in Washington state (though there is some processing and packaging in the Seattle region).
[3] Estimates based on winery and brewery employment estimates for years 2013 (wineries) and 2017 (breweries) and scaled to 2019 based on covered employment in each associated North American Industry Classification System (NAICS) code.

Exhibit 24. Agri-Tech Industry Employment, Washington State, 2013-2020 (est.)



Data sources: U.S. Bureau of Labor Statistics (2020)*; Washington State Employment Security Department* (2020).

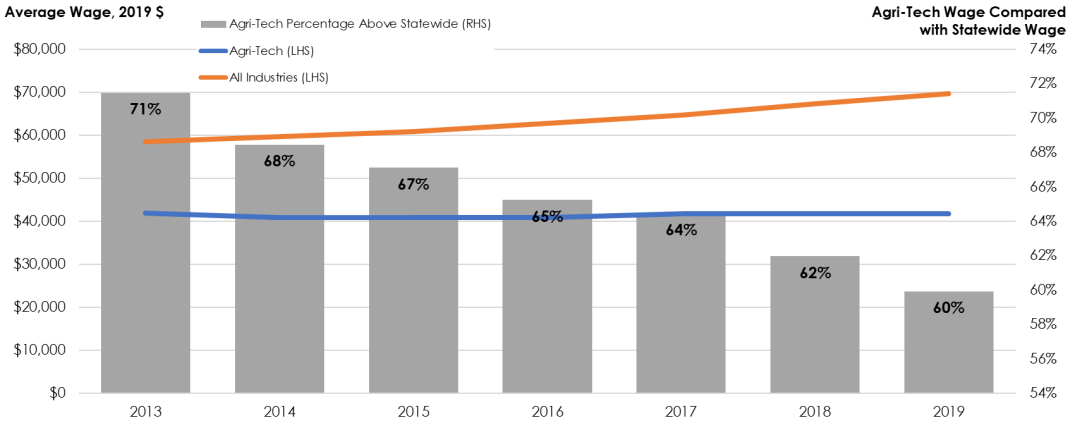
The average wage, before benefits, in agri-tech in 2019 was $41,700, 40% lower than the statewide wage across all sectors (**Exhibit 25** and **Exhibit 26**).

Exhibit 25. Agri-Tech Average by Subsector Component, 2019

Subsector	Average Wage
Grain Milling	$57,000
Dairy	$56,200
Animal Food	$51,900
Fruit and Vegetable Processing	$48,800
Other Food Products	$48,800
Animal Products	$48,400
Beverage Processing	$42,400
Commercial Bakeries	$38,000
Sugar and Confectioneries	$34,800
Total, industry-wide	**$41,700**

Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Exhibit 26. Agri-Tech Average wage, 2019 and Compared Against Statewide Wage, 2013-2019

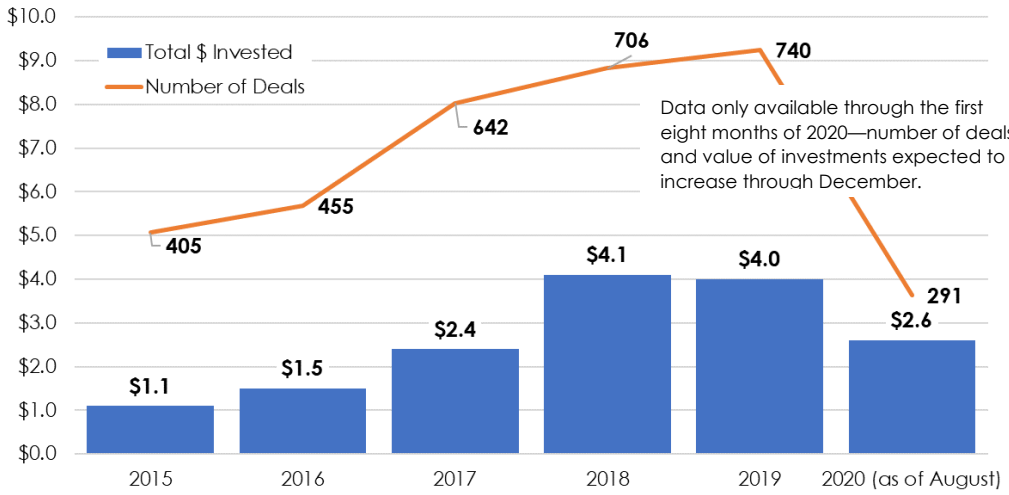


Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Technological solutions have become an increasingly important aspect to food and beverage production in Washington state. For example, the fruit orchards use trellis support systems in each row for fruit laden trees. Most orchards nowadays use automated irrigation systems, while machines are used to combat frost or freezing temperatures. Plastic covers are used over orchards to limit damage from sunburn, insects, birds, and other damaging factors (O'Rourke, 2020).

In recent years, the sector has become a growing source of innovation and attracted venture capital. Through August 2020, global venture investments in the agri-tech sector reached $2.6 billion, potentially on pace to exceed the $4.0 billion in investments in 2019 (**Exhibit 27**).

Exhibit 27. Global Venture Investments in the Agri-Tech Sector (billions $)



Data source: Crunchbase data, cited in Hall (2020).

Economic and Fiscal Impacts, Agri-Tech

In 2019, agri-tech supported a total of 145,900 jobs, including through indirect and induced impacts. These activities were further associated with $8.6 billion in labor income and $42.1 billion in total business revenues throughout the state (**Exhibit 28**). Each direct job in agri-tech was associated with an additional 1.8 jobs elsewhere in the state economy, or a multiplier of 2.8 (**Exhibit 29**).

Exhibit 28. Statewide Economic Impacts, Agri-Tech, 2019

	Direct	Indirect	Induced	Total
Employment	51,600	44,300	50,000	145,900
Labor Income (mils $)	$2,921.0	$2,885.2	$2,786.5	$8,592.7
Output (mils $)	$23,497.3	$10,502.5	$8,129.1	$42,128.9

Data sources: Washington State Office of Financial Management (2019).

Exhibit 29. Economic Impact Multipliers, Agri-Tech, 2019

Total jobs per direct job	2.8
Total revenues per dollar of direct revenues	$1.79
Total jobs per $ mil direct sales	6.2
Total labor income per dollar direct sales	$0.37

Data sources: Washington State Office of Financial Management (2019); High Peak Strategy LLC (2021).

The above statewide economic impacts in turn support state taxes, incurred both through direct activities and additional taxable revenues from indirect and induced activities. In 2019, agri-tech supported a total state fiscal impact of $280.7 million (**Exhibit 30**).

Exhibit 30. Statewide Fiscal Impacts, Agri-Tech, 2019

State Tax Category	Direct Taxes	Secondary Taxes	Total
Sales & Use Taxes	$23.4	$129.6	$153.0
B&O	$25.7	$52.4	$78.1
Other Taxes*	$3.6	$46.0	$49.6
Total	**$52.7**	**$228.0**	**$280.7**

**Includes quantity taxes, utility taxes, and other less common state taxes.*
Data sources: Washington State Office of Financial Management (2019); Washington State Department of Revenue (2020); High Peak Strategy LLC (2021).

Related Production Activities

Related production activities refer to subsectors that are either partially or entirely outside traditional definitions of manufacturing, yet are deeply engaged in the production of technology and even manufactured products. Two activities examined in this section are: 1) biotechnology, which includes both manufacturing (of medical devices and apparatus) and research and development; and 2) energy systems, including innovations in software solutions for the energy grid.

Energy Systems

In addition to providing core infrastructure for Washington's economy, the energy system in Washington is a producer of manufactured technology and ICT services. These include metering devices and software platforms for managing the energy grid and optimizing energy usage.

Washington's Energy System and Sources of Energy

Hydroelectric is the largest single source of electricity, providing approximately 70% of the state's energy each year (70.2% in 2018). Hydroelectric dams in Washington state routinely contribute more than 25% of the nation's total hydroelectric generation; the Grand Coulee Dam, along the Columbia River, is the sixth-largest hydroelectric power plant, and the seventh-largest power plant of all types, in the world (U.S. Energy Information Administration, 2019). Nuclear is the second largest energy source in Washington state by consumption (9.7%), followed by natural gas (ibid.). Washington state's electricity industry powers nearly 2 million households and more than 200,000 businesses (TechAlliance, 2017).

Exhibit 31. Sources of Washington Energy, 2018

Source	Share of Total Consumption
Hydro	70.3%
Nuclear Power	9.7%
Natural Gas	8.0%
Wind	6.9%
Coal	5.7%
Biomass (Wood and Waste)	0.7%
Petroleum Sources	0.0%
Geothermal	0.0%
Electricity net imports	-1.3%
Solar	N/A
Total	**100%**

Data source: U.S. Energy Information Administration (2020).

In 2018, wind represented the fourth largest source of electricity generation by consumption in Washington. There are more than 1,700 wind turbines generating about 3,100 megawatts of capacity. Biomass is supported with two wood pellet manufacturing plants.

Washington businesses are efficient users of energy, as well. On a consumption basis, Washington state consumed approximately 4,000 British Thermal Units (BTUs) per dollar of real GDP in 2018, ranking the state the tenth lowest (or tenth most efficient) among all fifty states and District of Columbia (U.S. Energy Information Administration, 2020).

Washington's Energy System Sector

Low cost, abundant, uninterrupted energy is a critical input for manufacturing. Washington's energy system is not only low cost, but also clean due to the high share of energy production from hydroelectric sources and growing investment in wind and other renewable energy sources.

Washington's energy system comprises: 1) production; 2) distribution, transmission, and storage; 3) management and conservation; and 4) related technologies, including hardware and software solutions. There is also a robust research and development segment to the industry, anchored by the University of Washington, Washington State University, Pacific Northwest National Laboratory, and the private sector.

In 2019, the energy system in Washington state directly employed an estimated 32,300 workers. The largest segment by employment was in "power generation and supply," with 13,000 workers, followed by "utility system construction."

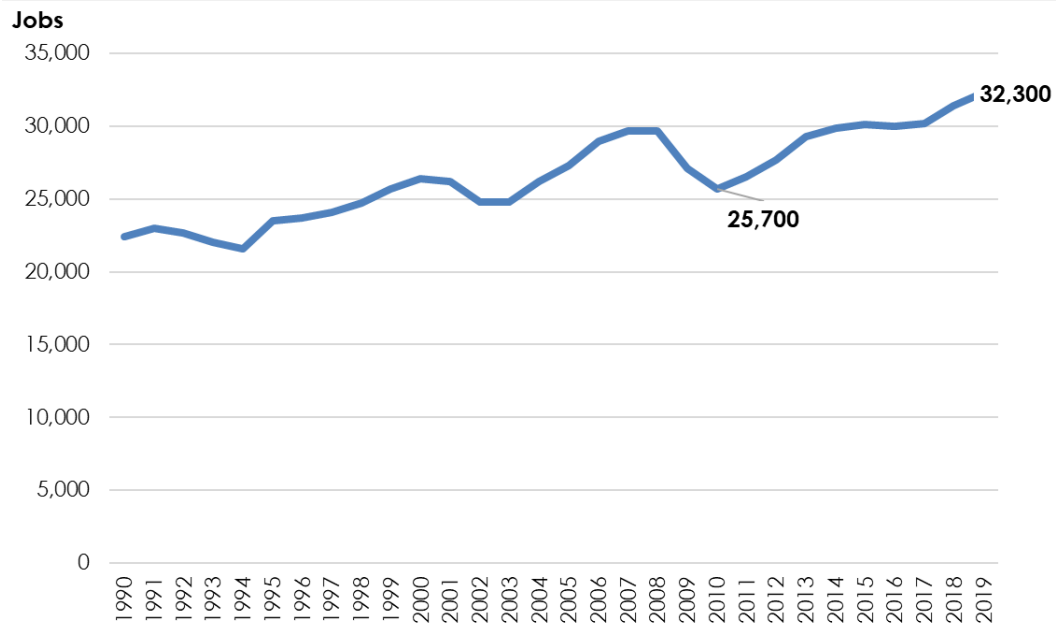
Overall, the energy systems sector experienced a 6,600-worker net increase. Electrical equipment manufacturing, a category that includes firms such as Schweitzer Engineering, experienced a 1,300-worker increase between 2010 and 2019 (U.S. Bureau of Labor Statistics, 2020).

Exhibit 32. Energy Systems Employment, Washington State, Total and by Subsector, 2010 and 2019

Subsector	2010	2019	Net Change
Power generation and supply	12,000	13,000	1,000
Utility system construction	6,800	9,900	3,100
Other general purpose machinery manufacturing	3,600	5,100	1,500
Electrical equipment manufacturing	2,000	3,300	1,300
Natural gas distribution	1,000	700	-300
Turbine and power transmission equipment mfg.	300	300	0
Total	**25,700**	**32,300**	**6,600**

Data source: U.S. Bureau of Labor Statistics (2020).

Exhibit 33. Energy Industry Employment, Washington State, 1990-2019



Data sources: U.S. Bureau of Labor Statistics (2020)*; TechAlliance* (2017).

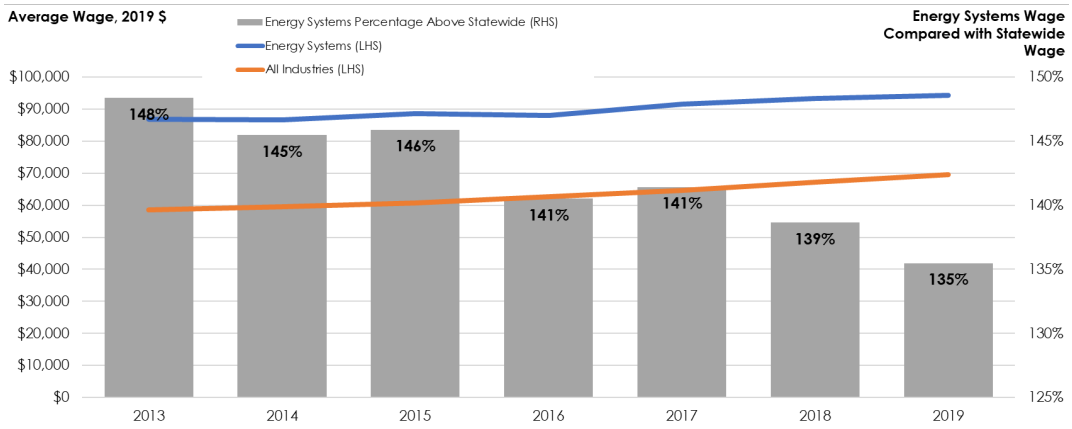
The average wage, before benefits, in energy systems in 2019 was $94,300, 35% higher than the statewide wage across all sectors (**Exhibit 34** and **Exhibit 35**).

Exhibit 34. Energy Systems Average by Subsector Component, 2019

Subsector	Average Wage
Power generation and supply	$117,400
Natural gas distribution	$107,300
Utility system construction	$81,800
Electrical equipment manufacturing	$76,500
Other general purpose machinery manufacturing	$70,900
Turbine and power transmission equipment mfg.	$63,200
Total, industry-wide	**$94,300**

Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Exhibit 35. Energy Systems Average wage, 2019 and Compared Against Statewide Wage, 2013-2019



Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

There is a wide set of businesses and activities within the energy system sector engaged in the development and deployment of technology. Examples include:

- **Schweitzer Engineering Laboratories (SEL)**. Founded in 1984 and based in Pullman, WA, SEL is a leader in the development of digital products and systems that protect, control, and automate power systems. Their technology solution prevents blackouts and improves power system reliability and safety at a reduced cost (Schweitzer Engineering Laboratories, 2020).
- **Avista**. An energy supplier for 300,000 customers across four Pacific Northwest states. Avista develops energy software solutions in-house, in addition to working with contractors.
- **Puget Sound Energy**. Energy utility providing electricity and natural gas to 1.1 million customers throughout the Puget Sound region, serving a population of 4 million.
- **PacifiCorp**. Energy utility whose subsidiary, Pacific Power, serves customers in southeastern Washington, as well as in Oregon and northern California.
- **Energy Northwest**. Richland-based consortium of 27 public utility districts and municipalities across Washington that share services to help member utilities run their operations more efficiently and at lower cost. The consortium collectively serves more than 1.5 million customers. Energy projects include nuclear, wind, hydro, and solar.
- **Itron**, a Liberty Lake, WA-based global leader in the production of metering devices for electricity, gas, water, and thermal energy.
- **Pacific Northwest National Laboratory**. Leading national laboratory for research on atmospheric sciences, grid operations and controls, and renewable energy, including close collaborations with the Washington State University and University of Washington.

Technology Workers in the Energy Systems Sector

In 2019, employees in the energy systems sector engaged in either "computer and mathematical" or "architecture and engineering" occupations represented nearly 10% of the energy systems workforce. This compares with less than 8% across all sectors statewide (Washington State Employment Security Department, 2020; U.S. Bureau of Labor Statistics, 2020). Leading occupations across both categories of employment in 2019 included mechanical engineers (600), industrial engineers (500), and electrical engineers (400).

Exhibit 36. Leading Computer, Mathematical, and Engineering Occupations in the Energy Systems Sector, Washington State, 2019

Occupation	Job Count, 2019
Mechanical Engineers	600
Industrial Engineers	500
Electrical Engineers	400
Mechanical Engineering Technicians	300
Computer Systems Analysts	200
Mechanical Drafters	200
Industrial Engineering Technicians	200
Subtotal	*2,400*
All other occupations	29,900
Total	**32,300**

Data sources: U.S. Bureau of Labor Statistics (2020)*; Washington State Employment Security Department* (2020)*; TechAlliance* (2017).

Economic and Fiscal Impacts, Energy Systems

In 2019, Washington's energy system supported a total of 109,200 jobs, including through upstream business-to-business transactions (indirect) and household expenditures from earned income among direct and indirect workers (induced). These activities were further associated with nearly $9.0 billion in labor income and $34.7 billion in total business revenues throughout the state (**Exhibit 37**). Each direct job in energy systems was associated with an additional 2.4 jobs elsewhere in the state economy, or a multiplier of 3.4 (**Exhibit 38**).

Exhibit 37. Statewide Economic Impacts, Energy Systems, 2019

	Direct	Indirect	Induced	Total
Employment	32,300	25,300	51,600	109,200
Labor Income (mils $)	$4,001.0	$2,087.1	$2,878.1	$8,966.2
Output (mils $)	$19,193.1	$7,157.7	$8,391.9	$34,742.7

Data source: Washington State Office of Financial Management (2019).

Exhibit 38. Economic Impact Multipliers, Energy Systems, 2019

Total jobs per direct job	3.4
Total revenues per dollar of direct revenues	$1.81
Total jobs per $ mil direct sales	5.7
Total labor income per dollar direct sales	$0.47

Data source: Washington State Office of Financial Management (2019).

The above statewide economic impacts in turn support state taxes, incurred both through direct activities and additional taxable revenues from indirect and induced activities. In 2019, the energy systems sector supported a total state fiscal impact of $891.3 million (**Exhibit 39**).

Exhibit 39. Statewide Fiscal Impacts, Energy Systems, 2019

State Tax Category	Direct Taxes	Secondary Taxes	Total
Sales & Use Taxes	$94.2	$124.3	$218.6
B&O	$24.1	$55.8	$80.0
Other Taxes*	$362.5	$230.3	$592.8
Total	**$480.8**	**$410.5**	**$891.3**

**Includes quantity taxes, utility taxes, and other less common state taxes.*
Data sources: Washington State Department of Revenue (2020); High Peak Strategy LLC (2021).

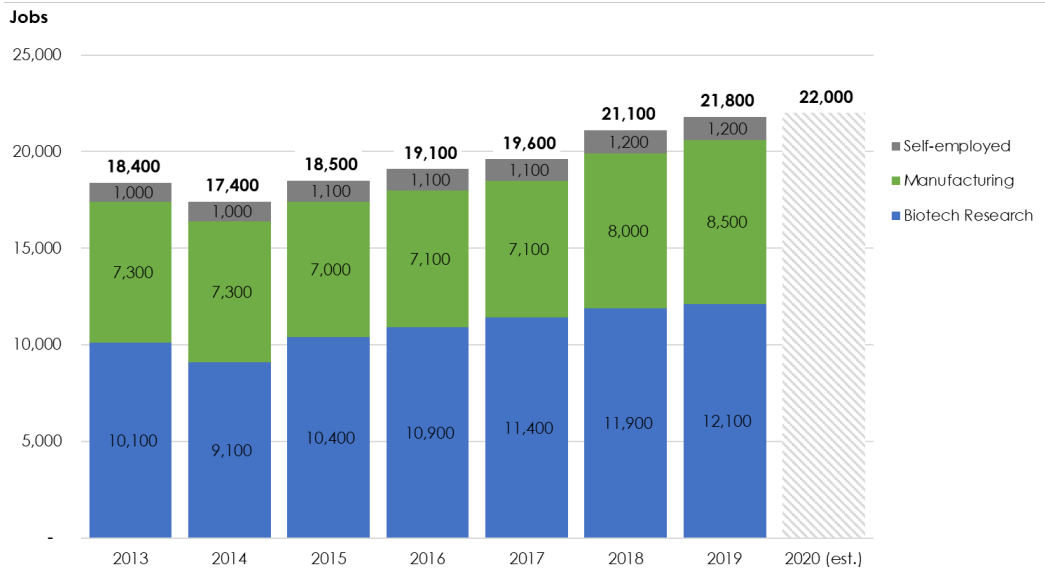
Biotech

The biotech sector includes research, laboratories, medical device manufacturing, global health, drugs & pharmaceuticals, and agbiosciences. Washington state has long been a global hub for medical device production and research, most notably in ultrasound equipment, with most activities concentrated in King and Snohomish counties (Bothell and Redmond), and smaller hubs in Bremerton and Bellingham (Washington Life Science & Global Health Advisory Council, 2017, p. 7). According to a report released by Life Science Washington, in 2017 the life sciences sector—a broader definition that includes hospital and university research, among other activities—directly employed 35,914 workers statewide with an average wage of $93,146 (Life Science Washington, 2019).

In 2019, non-hospital and university research and manufacturing in the biotechnology sector directly supported 21,800 jobs, and 22,000 workers through the first nine months of 2020 (**Exhibit 40**). Employment in the sector grew at a compound annual rate of 4% between 2014 and 2020, compared with 1.9% across all industries in Washington state over the same period. The average wage, before benefits, in biotechnology among activities included in this analysis was $104,400, 50% above the statewide wage across all sectors in Washington state.

Illustrative employers in the biotech sector in Washington state include the Fred Hutchinson Cancer Research Center, Philips, Fujifilm SonoSite Inc., Seattle Genetics, and Juno Therapeutics, among many other operations statewide. In addition to firms whose primary activities in biotech, there are numerous other firms across the state involved in the production of medical technology. These include precision injection mold technology used to produce parts for medical devices, such as casings for defibrillators, and most recently personal protection equipment (PPE), such as for N95 masks.

Exhibit 40. Biotech Industry Employment, Washington State, 2013-2020 (est.)



Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Washington Research Council (2009); Life Science WA, 2019; Washington State Office of Financial Management (2019); U.S. Census Bureau Non-employer Series (2020).

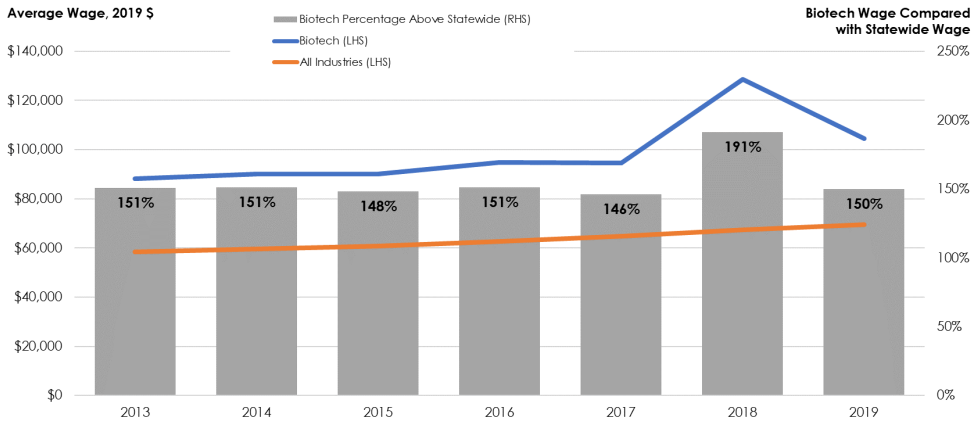
The average wage, before benefits, in biotech in 2019 was $104,400, 50% higher than the statewide wage across all sectors (**Exhibit 41** and **Exhibit 42**).

Exhibit 41. Biotech Average by Subsector Component, 2019

Subsector	Average Wage
Biotech Research	$136,200
Manufacturing	$85,700
Self-employed	*$67,600*
Total, industry-wide	**$104,400**

Data sources: U.S. Bureau of Labor Statistics (2020).

Exhibit 42. Biotech Average wage, 2019 and Compared Against Statewide Wage, 2013-2019



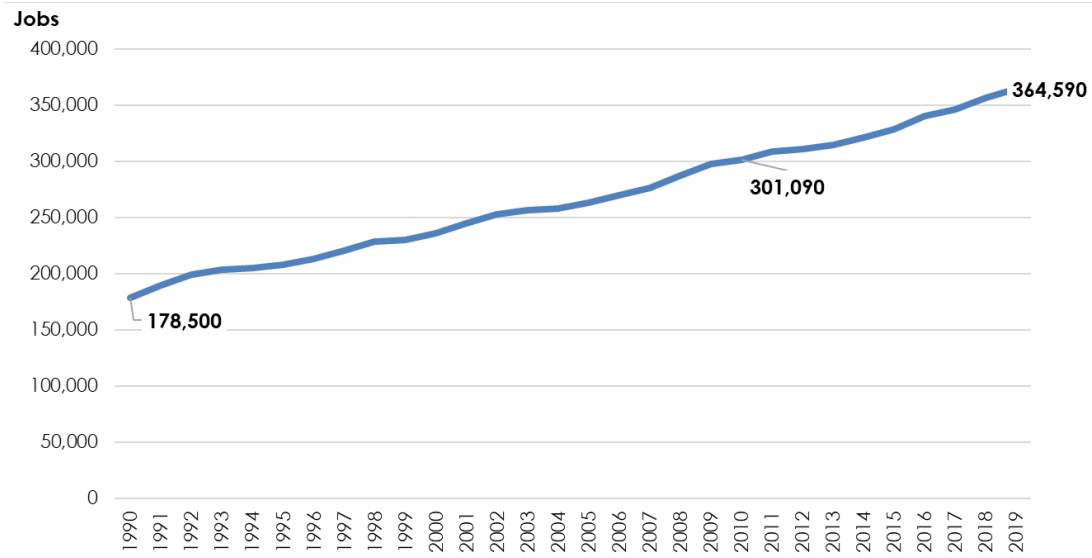
Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Federal Reserve Bank of St. Louis (2020).

Biotech and Healthcare

Biotech belongs to the much larger ecosystem of laboratory research, diagnostic testing, and healthcare provision, including hospitals and clinics. In addition to workers employed among biotech businesses, hospitals, universities, and research organizations are common sources for biotech research and development of medical technology solutions. The production of biotech products, from medical devices to pharmaceuticals, serves patients both in Washington state and across the globe, making the sector among Washington's leading exporters to domestic and foreign markets. During the coronavirus, Washington state organizations have been leading efforts to combat the virus, including nationally recognized work by the University of Washington's Institute for Health Metrics and Evaluation to measure and forecast cases and deaths by state.

Between 1990 and 2019, workers directly employed in the healthcare system increased by more than double, from 178,500 workers to 364,590 workers (U.S. Bureau of Labor Statistics, 2020) (**Exhibit 43**). Between 2010 and 2019, sector employment grew by 23%, nearly double the rate of overall population growth over the same period (12.2%) (Washington State Office of Financial Management, 2020). The largest sources of employment growth between 2010 and 2019 were in "General Medical and Surgical Hospitals" (net increase of 20,690 jobs) and "Outpatient Care Centers" (net increase of 9,350 jobs).

Exhibit 43. Statewide Covered Employment in the Healthcare System, 1990-2019



Data sources: U.S. Bureau of Labor Statistics (2020); TechAlliance (2017).

Healthcare and ICT

Information & communication technology increasingly permeates near all facets of healthcare, including the delivery of healthcare and production of healthcare technologies and solutions. In 2019, across the entire healthcare system, there were an estimated more than 6,500 workers employed in occupations classified as either "computer and mathematical" or "architecture and engineering." ICT workers, including software developers and database managers, summed to 5,500 in 2019. Leading ICT workers within the healthcare sector in 2019 included "computer systems analysts" (1,200) and "software developers" (1,100) (**Exhibit 44**).

Exhibit 44. Leading ICT Workers in the Healthcare Sector, 2019

ICT Occupation	Jobs, 2019
Computer Systems Analysts	1,200
Software Developers	1,100
Computer User Support Specialists	800
Computer Occupations, All Other	600
Computer and Information Systems Managers	500
All other ICT workers	*1,300*
Total	**5,500**

Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020).

Economic and Fiscal Impacts, Biotech

In 2019, the biotech sector supported a total of 61,900 jobs, including through indirect and induced impacts. These activities were further associated with more than $5.0 billion in labor income and $15.5 billion in total business revenues throughout the state (**Exhibit 45**). Each direct job in biotech was associated with an additional 1.8 jobs elsewhere in the state economy, or a multiplier of 2.8 (**Exhibit 46**).

Exhibit 45. Statewide Economic Impacts, Biotech, 2019

	Direct	Indirect	Induced	Total
Employment	21,800	11,700	28,400	61,900
Labor Income (mils $)	$2,545.1	$883.2	$1,590.9	$5,019.2
Output (mils $)	$8,304.6	$2,599.6	$4,635.7	$15,539.9

Data source: Washington State Office of Financial Management (2019).

Exhibit 46. Economic Impact Multipliers, Biotech, 2019

Total jobs per direct job	2.8
Total revenues per dollar of direct revenues	$1.87
Total jobs per $ mil direct sales	7.5
Total labor income per dollar direct sales	$0.60

Data source: Washington State Office of Financial Management (2019).

The above statewide economic impacts in turn support state taxes, incurred both through direct activities and additional taxable revenues from indirect and induced activities. In 2019, the biotech sector supported a total state fiscal impact of $156.9 million (**Exhibit 47**).

Exhibit 47. Statewide Fiscal Impacts, Biotech, 2019

State Tax Category	Direct Taxes	Secondary Taxes	Total
Sales & Use Taxes	$13.2	$72.4	$85.6
B&O	$14.5	$36.5	$51.1
Other Taxes*	$0.0	$20.3	$20.3
Total	**$27.8**	**$129.2**	**$156.9**

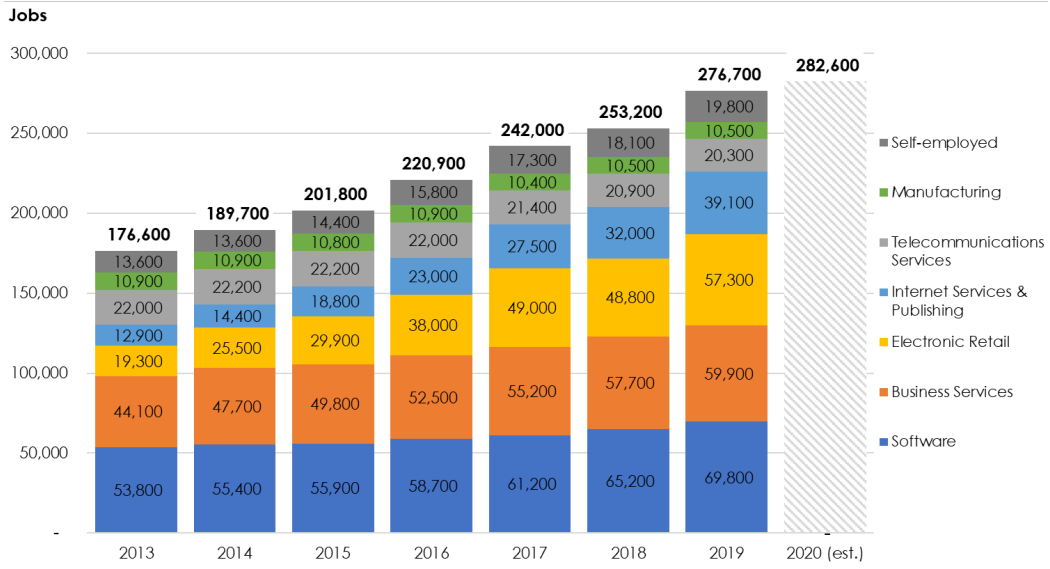
**Includes quantity taxes, utility taxes, and other less common state taxes.*
Data sources: Washington State Department of Revenue (2020); High Peak Strategy LLC (2021).

Information & Communication Technology Sector

The information & communication technology (ICT) sector encompasses a broad range of products and services, including computer hardware, telecommunications, e-commerce, cloud computing, internet services, and software publishing. In 2019, the sector employed an estimated 276,700 workers statewide, and has continued to grow during the coronavirus pandemic, reaching an estimated 282,600 workers through the first nine months of 2020 **(Exhibit 48**). Some of the largest employers in the sector include Amazon, Microsoft, Adobe, and Tableau Software.

ICT employment increased nearly 8% per year between 2013 and 2019, far outpacing statewide employment growth of 1.9% per year over the same period. Some of the fastest growing subsectors include "business services," a grouping that includes cloud computing services such as Amazon Web Services. ICT raw wages (before benefits) averaged $188,700 per worker in 2019, nearly three times the statewide average wage **(Exhibit 49** and **Exhibit 50**). This gap is also growing—while the statewide average wage has grown in real (inflation-adjusted) terms 2.9% per year since 2013, the ICT average wage has increased 5.5%.

Exhibit 48. ICT Jobs Statewide, 2013-2020 (est.)



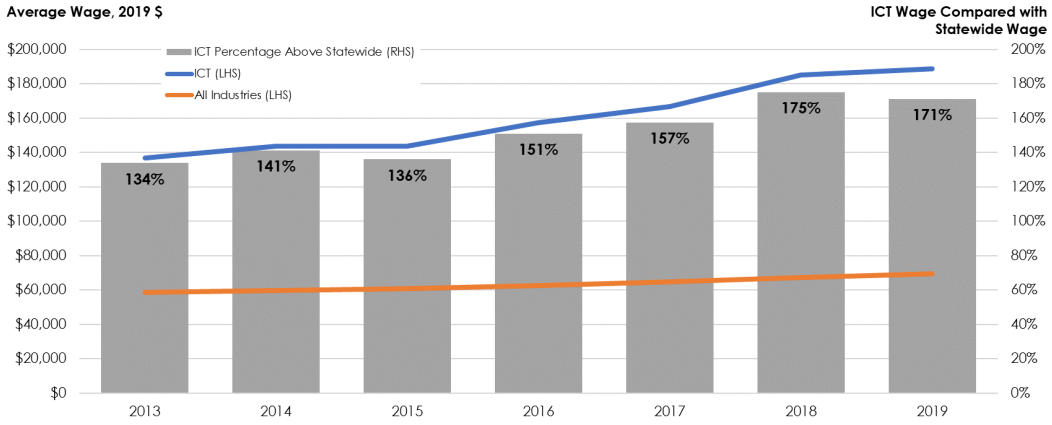
Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Washington Technology Industry Association (2015).

Exhibit 49. ICT Average by Subsector Component, 2019

Subsector	Average Wage
Software	$258,700
Internet Services & Publishing	$214,800
Electronic Retail	$209,200
Business Services	$126,000
Telecommunications Services	$125,500
Manufacturing	$86,200
Self-employed	*$144,000*
Total, industry-wide	**$188,700**

Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Washington Technology Industry Association (2015).
Note: data is for the raw wage, before monetary value of supplemental benefits, e.g., heath insurance.

Exhibit 50. ICT Average wage, 2019 and Compared Against Statewide Wage, 2013-2019



Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Washington Technology Industry Association (2015); Federal Reserve Bank of St. Louis (2020).

ICT Jobs Across Washington

ICT jobs are primarily concentrated in King County, with nearly 220,000 estimated jobs in 2019, or approximately 80% of statewide ICT employment (**Exhibit 51**). Southwestern Washington is also home to a strong cluster of ICT activities, owing to a history of semiconductor work in the region; in 2019 Clark and Cowlitz combined were home to more than 10,000 ICT jobs.

In King County, ICT workers constituted more than 15% of all nonfarm employment in 2019. Statewide, ICT representing more than 8% of all nonfarm employment in 2019.

Exhibit 51. ICT Jobs Across Washington State, 2019

County	Total Jobs, 2019	Share of Stateiwde ICT Jobs	Share of County Nonfarm Jobs
King County	219,610	79.4%	15.3%
Clark County	8,940	3.2%	5.4%
Snohomish County	8,370	3.0%	2.9%
Spokane County	5,310	1.9%	2.3%
Pierce County	4,910	1.8%	1.6%
Thurston County	2,960	1.1%	2.5%
Whatcom County	2,340	0.8%	2.6%
Kitsap County	1,950	0.7%	2.1%
Benton County	1,430	0.5%	1.6%
Skagit County	1,200	0.4%	2.4%
Island County	1,150	0.4%	6.8%
Cowlitz County	1,090	0.4%	2.8%
Other Counties	*17,440*	*6.3%*	*3.9%*
Total	**276,700**	**100.0%**	**8.2%**

Data sources: U.S. Bureau of Labor Statistics (2020).

Economic and Fiscal Impacts, ICT

In 2019, Washington's ICT sector supported a total of more than 1 million jobs, including through upstream business-to-business transactions (indirect) and household expenditures from earned income among direct and indirect workers (induced). These activities were further associated with $104.8 billion in labor income and $240.4 billion in total business revenues throughout the state (

Exhibit 52). Each direct job in ICT was associated with an additional 2.7 jobs elsewhere in the state economy, or a multiplier of 3.7 (**Exhibit 53**).

Exhibit 52. Statewide Economic Impacts, ICT, 2019

	Direct	Indirect	Induced	Total
Employment	276,700	150,900	588,600	1,016,200
Labor Income (mils $)	$62,257.5	$9,528.6	$32,972.2	$104,758.4
Output (mils $)	$117,822.9	$26,535.2	$96,046.5	$240,404.6

Data source: Washington State Office of Financial Management (2019).

Exhibit 53. Economic Impact Multipliers, ICT, 2019

Total jobs per direct job	3.7
Total revenues per dollar of direct revenues	$2.04
Total jobs per $ mil direct sales	8.6
Total labor income per dollar direct sales	$0.89

Data source: Washington State Office of Financial Management (2019).

The above statewide economic impacts in turn support state taxes, incurred both through direct activities and additional taxable revenues from indirect and induced activities. In 2019, the ICT sector supported a total state fiscal impact of more than $3.1 billion (**Exhibit 54**).

Exhibit 54. Statewide Fiscal Impacts, ICT, 2019

State Tax Category	Direct Taxes	Secondary Taxes	Total
Sales & Use Taxes	$501.4	$1,446.7	$1,948.1
B&O	$281.2	$573.9	$855.1
Other Taxes*	$0.0	$338.8	$338.8
Total	**$782.7**	**$2,359.3**	**$3,142.0**

**Includes quantity taxes, utility taxes, and other less common state taxes.*
Data sources: Washington State Department of Revenue (2020); High Peak Strategy LLC (2021).

SUMMARY OF ECONOMIC AND FISCAL IMPACTS

Exhibit 55 below summarizes direct impacts associated with the ICT sector and each manufacturing subsector in this analysis. Foreign exports in the ICT sector summed to $13.6 billion, the vast majority in the form of estimated royalties from licensing of Washington-produced software. Importantly, foreign exports represent only one component of exports. **Domestic exports**—such as sales of food products or software licensing to consumers and businesses elsewhere in the U.S.—are often a more voluminous source of revenues into the state economy.

Exhibit 55. Summary of Direct Impacts for ICT and Manufacturing Subsectors, 2019

Subsector	Employment	Labor Income mils $	Average Wage with benefits	Foreign Exports mils $
ICT	276,700	$62,257.5	$225,000	$13,629.3
Other Durables	93,800	$7,510.3	$80,100	$10,660.8
Aerospace and Space	89,500	$13,563.7	$151,500	$25,577.1
Agri-Tech	51,600	$2,921.0	$56,600	$3,791.4
Energy Systems	32,300	$4,001.0	$123,900	$1,827.1
Other Transp Equipment	24,400	$2,449.8	$100,400	$1,082.9
Biotech	21,800	$2,545.1	$116,700	$1,278.3

Data sources: U.S. Bureau of Labor Statistics (2020); Washington State Employment Security Department (2020); Washington State Department of Revenue (2020); Washington State Office of Financial Management (2019); Federal Reserve Bank of St. Louis (2020); Puget Sound Regional Council (2018); Business Roundtable (2019); U.S. Census Bureau (2020).

Economic impacts refer to additional jobs, income, and business output (revenues) supported through upstream business-to-business transactions (indirect) and household consumption expenditures (induced). In this analysis, the Washington State Input-Output Model was used to compute these two types of impacts, which are collectively referred to as "secondary impacts."

In 2019, the ICT sector supported a total economic impact of more than 1 million jobs throughout the state economy, a jobs multiplier of 3.7. This is due to both the size of the sector and the robust wages paid to ICT workers, who then spend a large share of disposable income on goods and services as household consumption (**Exhibit 56**).

Direct and secondary economic impacts in turn support state fiscal revenues. In 2019, the ICT sector supported direct and secondary tax payments of $3.1 billion to the state budget. The largest component (approximately two thirds) of this ICT state fiscal impact was in the form of sales & use tax, due

to the large induced impact of the ICT sector through high labor income and household consumption throughout the economy (**Exhibit 57**).

Exhibit 56. Economic Impact, Manufacturing Subsectors and ICT, Statewide, 2019

Subsector	Direct Jobs	Total Jobs	Jobs Multiplier	Total output per $ final demand	Total jobs per $ mil final demand
ICT	276,700	1,016,200	3.7	$2.04	8.6
Other Durables	93,800	308,500	3.3	$1.85	6.2
Aerospace and Space	89,500	243,400	2.7	$1.37	3.3
Agri-Tech	51,600	145,900	2.8	$1.79	6.2
Energy Systems	32,300	109,200	3.4	$1.81	5.7
Other Transp Equipment	24,400	69,900	2.9	$1.76	6.5
Biotech	21,800	61,900	2.8	$1.87	7.5

Data sources: U.S. Bureau of Labor Statistics (2020);Washington State Office of Financial Management (2019); Washington State Department of Revenue (2020); Federal Reserve Bank of St. Louis (2020); Puget Sound Regional Council (2018); Business Roundtable (2019).

Exhibit 57. Total State Fiscal Impacts, Manufacturing Subsectors and ICT, 2019 (mils $)

Subsector	Sales & Use Taxes	Total
ICT	$1,948.1	$3,142.0
Other Durables	$486.1	$877.2
Aerospace and Space	$298.4	$642.9
Agri-Tech	$153.0	$280.7
Energy Systems	$218.6	$891.3
Other Transp Equipment	$99.6	$169.6
Biotech	$85.6	$156.9

Data sources: Washington State Office of Financial Management (2019); Washington State Department of Revenue (2020); author's calculations.

OCCUPATIONS AND ICT WORKERS IN THE MANUFACTURING SECTOR

Over time, technology-oriented occupations have played an increasingly important role in the development and manufacture of physical goods, such as medical devices, aircraft, and even food products and other non-durables. In 2019, workers employed in either "computer and mathematical" or "architecture and engineering" macro-occupational categories represented more than 12% of the total manufacturing sector workforce statewide.

Leading occupations in manufacturing will vary widely by subsector and skills requirements. In 2019, for example, "packaging and filling machine operators and tenders" was the most common occupation within the agri-tech subsector, with an estimated 4,500 workers, reflecting the large share of the subsector engaged in fruit and vegetable packing. Within the biotech subsector, more than 6% of workers were employed as "miscellaneous assemblers and fabricators," owing to the large share of biotech activities in precision medical device manufacturing (**Exhibit 58**).

Exhibit 58. Leading Occupations (Representing At Least 4% of Total Workforce) for Each Subsector and ICT, 2019

Subsector	Occupation	Jobs	Share of Total
Space	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	290	9.7%
	Software Developers	260	8.7%
	Miscellaneous Assemblers and Fabricators	190	6.3%
Aerospace	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	12,450	14.1%
	Aerospace Engineers	5,050	5.7%
	Inspectors, Testers, Sorters, Samplers, and Weighers	4,850	5.5%
	Aircraft Mechanics and Service Technicians	4,410	5.0%
	Industrial Engineers	4,120	4.7%
	Logisticians	3,780	4.3%
Other Transportation Equipment	Welders, Cutters, Solderers, and Brazers	3,440	14.1%
	Miscellaneous Assemblers and Fabricators	2,060	8.4%
	Fiberglass Laminators and Fabricators	1,790	7.3%
	First-Line Supervisors of Production and Operating Workers	1,220	5.0%
	Carpenters	990	4.1%
Other Durables	Miscellaneous Assemblers and Fabricators	8,790	9.4%
	Machinists	5,380	5.7%
	First-Line Supervisors of Production and Operating Workers	4,730	5.0%
	Welders, Cutters, Solderers, and Brazers	4,420	4.7%
Agri-Tech	Packaging and Filling Machine Operators and Tenders	4,500	8.7%
	Food Batchmakers	4,330	8.4%
	Demonstrators and Product Promoters	2,560	5.0%
Energy Systems	Customer Service Representatives	2,340	7.2%
	Construction Laborers	2,120	6.6%
	Electrical Power-Line Installers and Repairers	1,950	6.0%
Biotech	Miscellaneous Assemblers and Fabricators	1,380	6.3%
	Medical Scientists, Except Epidemiologists	1,220	5.6%
	Dental Laboratory Technicians	1,030	4.7%

Data source: Washington State Employment Security Department (2020).
Note: occupations are based on categories defined by the U.S. Bureau of Labor Statistics in the Occupational Employment Statistics (OES) data series, and in some cases do not correspond to more commonly used employment positions. For example, members of the Machinists Union, IAM 751, include not only workers classified as "machinists" in the OES data series but also workers reported as "aircraft structure, surfaces, rigging, and systems assemblers," which in fact is the most common occupational category in both the aerospace and space subsectors.

ICT occupations are positions that involve the production or maintenance of software products and services, hardware used in the dissemination of digital information and communications, and databases and data systems. Examples include software developers, web developers, computer hardware engineers, and database administrations (**Exhibit 59**). Statewide, these positions constituted approximately 4% of all workers in the manufacturing sector (U.S. Bureau of Labor Statistics, 2020).

Exhibit 59. ICT Occupations

SOC Code	Title
11-3021	Computer and Information Systems Managers
15-1211	Computer Systems Analysts
15-1212	Information Security Analysts
15-1221	Computer and Information Research Scientists
15-1231	Computer Network Support Specialists
15-1232	Computer User Support Specialists
15-1241	Computer Network Architects
15-1242	Database Administrators
15-1244	Network and Computer Systems Administrators
15-1252	Software Developers
15-1254	Web Developers
15-1299	Computer Occupations, All Other
15-2031	Operations Research Analysts
17-2061	Computer Hardware Engineers
17-2071	Electrical Engineers

Data sources: Washington State Employment Security Department (2020); Washington Technology Industry Association (2015).

By subsector, the highest concentration of ICT workers as a share of total workforce was in space, with an estimated 15% of workers employed in ICT positions. An estimated 8.6% of biotech workers were employed in ICT occupations (**Exhibit 60**).

Exhibit 60. ICT Occupations as a Share of Each Subsector Workforce, 2019

Subsector	ICT Workers	Share of Workforce
Aerospace	6,550	7.4%
Other Durables	1,940	2.1%
Energy Systems	1,900	5.9%
Biotech	1,880	8.6%
Space	450	15.0%
Other Transportation Equipment	420	1.7%
Agri-Tech	210	0.4%

Data sources: Washington State Employment Security Department (2020); Washington Technology Industry Association (2015).

MANUFACTURING RECRUITMENT POLICIES IN OTHER STATES

The cost of doing business is a key consideration in manufacturer's decision on where to locate new investment, either as an expansion of existing operations or new location in another state. The cost of doing business in Washington is a function of:

- **Business tax and regulatory compliance costs**. For example, tax structure, tax rates and exemptions, and permitting fees.
- **Operating costs and inputs**. Including the cost and availability/supply of labor, energy, and land.
- **Regulatory Costs and Certainty**. The duration and predictability of a regulatory compliance and permitting process. For example, the certainty (or uncertainty) of acquiring necessary permits for construction of a new facility.

These factors are especially important for manufacturers, since these investments are often highly capital intensive and subject to various risks beyond the cost of doing business, e.g., changing global trade environment and demand for physical goods and technology and global competition.

Many states across the U.S. have policies and tax preferences designed to incentivize business recruitment, retention, or expansion in manufacturing. This report identifies select policies in other states for further examination and consideration in Washington state. Further research would be needed to determine how best to modify and apply these policies in Washington state.

Comparing Policies in Other States in Support of Manufacturing and ICT

States for comparison on economic development policies were selected based on the following criteria: 1) ranking by size of manufacturing workforce in 2019; 2) ranking by net change in manufacturing workforce, 2010-2019; and 3) ranking by percentage change in manufacturing workforce, 2010-2019. A composite ranking was developed based on the above criteria to arrive at a final list of leading states to consider. For example, Michigan was the fourth largest state in 2019 for size of manufacturing workforce but ranked first in net change and second in percentage change between 2010 and 2019. California is the largest state by manufacturing workforce but ranked 32nd in percentage change in manufacturing workforce between 2010 and 2019 (**Exhibit 61**).

The same methodology is applied for ICT workers by state. Washington state ranks second, behind only California, including the top rank for percentage growth between 2010 and 2019 (**Exhibit 62**).

Exhibit 61. Leading States for Manufacturing Employment and Growth, 2019 and 2010-2019 (ranks in parentheses)

Composite Rank	State	Manufacturing Emp, 2019	Net Change, 10-19	Percentage Change, 10-19
1	Michigan	625,700 (#4)	150,300 (#1)	31.6% (#2)
2	Indiana	541,100 (#7)	93,600 (#3)	20.9% (#10)
3	Florida	384,000 (#12)	76,500 (#6)	24.9% (#5)
4	Texas	906,000 (#2)	95,800 (#2)	11.8% (#25)
5	Ohio	700,800 (#3)	80,500 (#5)	13.0% (#22)
6	Georgia	404,100 (#11)	61,000 (#7)	17.8% (#15)
7	South Carolina	258,300 (#18)	50,400 (#10)	24.3% (#6)
8	Tennessee	355,000 (#13)	56,600 (#8)	19.0% (#14)
9	California	1,322,500 (#1)	87,800 (#4)	7.1% (#32)
10	Wisconsin	483,200 (#8)	53,900 (#9)	12.6% (#24)
..	…	…	…	…
14	Washington	290,300 (#15)	35,500 (#13)	13.9% (#20)

Data source: U.S. Bureau of Labor Statistics (2020).

Exhibit 62. Leading States for Covered ICT Employment and Growth, 2019 and 2010-2019 (ranks in parentheses)

Composite Rank	State	ICT Emp, 2019	Net Change, 10-19	Percentage Change, 10-19
1	California	935,100 (#1)	316,800 (#1)	51.2% (#4)
2	Washington	258,800 (#5)	118,500 (#3)	84.5% (#1)
3	Texas	471,300 (#2)	129,500 (#2)	37.9% (#7)
4	New York	301,300 (#3)	80,100 (#4)	36.2% (#8)
5	North Carolina	154,900 (#11)	58,200 (#5)	60.2% (#3)
6	Florida	259,800 (#4)	56,900 (#6)	28.1% (#13)
7	Massachusetts	194,400 (#7)	42,500 (#7)	28.0% (#14)
8	Arizona	114,400 (#15)	32,100 (#11)	39.0% (#6)
9	Colorado	142,600 (#14)	35,800 (#8)	33.5% (#10)
10	Georgia	170,800 (#9)	35,000 (#9)	25.7% (#18)

Data source: U.S. Bureau of Labor Statistics (2020).
Note: numbers presented above are only for covered workers, so as to allow for state-by-state comparisons and for ranking purposes. The estimate presented for Washington state is thus lower (258,800) than reported in the ICT section earlier in this report (276,700).

Among the states identified above, more than 40 unique state policies supporting manufacturing were reviewed. Sources included information published by each state's agency responsible for tax and incentive policy and economic development, as well as secondary literature such as reports by industry think-tanks. The discussion is a summary of the most common policies found among other states.

Investment Funds

Some states, such as Texas and Ohio, operate discretionary funds that can be used for incentives to attract and/or support investments into the state. These include funds that can provide direct "deal-closing" financial support to businesses (Texas, Ohio), indirect support for business workforce training through public educational institutions (Texas), and matching funds for technology commercialization (Michigan). **Exhibit 63** provide a summary of illustrative examples of state funds used to attract manufacturing investments.

The Texas Enterprise Fund provides "deal-closing" financial resources "for which a single Texas site is competing with another viable out-of-state site" (State of Texas Office of the Governor, 2020). However, Article 8 sections 5 and 7 of the Washington State Constitution prohibit state and local governments from bestowing a gift or lending money, property, or the entity's credit to a private party (State of Washington, 2011).

Exhibit 63. Examples of State Investment Funds

State	Program	Type of Investments	Recipient	Description
Michigan	Emerging Technology Fund	Matching funds.	Company.	Matching dollars to support commercialization of Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) projects. Investments are purposed with expanding funding opportunities for Michigan technology companies. Primarily focused on: life sciences; homeland security and defense; advance automotive, manufacturing, and materials; and alternative energy
Ohio	JobsOhio Economic Development Grant	Discretionary grants.	Company.	Support for manufacturing, R&D, high technology, corporate headquarters, and distribution projects that involve substantial capital investment and job creation. Can be used for machinery and equipment purchase costs, new building construction and acquisition costs, infrastructure improvements and other fixed asset investments.
Ohio	JobsOhio Research & Development (R&D) Center Grant	Discretionary grants.	Company.	Available to companies creating new R&D Centers in Ohio. R&D Centers must support the development and commercialization of emerging technologies and/or products that align with one or more of JobsOhio's targeted industries. Activities are expected to create at least 5 new jobs, foster new technology-enabled products or services, attract new technology-enabled companies to Ohio, and make a capital investment of $3 million.
Ohio	JobsOhio Revitalization Program	Discretionary grants and loans.	Company.	Available to companies seeking to redevelop underutilized sites within the state. To qualify, a company must create minimum of 20 jobs paying at least the county average wage. Grant amounts are typically up to $1 million.
Texas	Texas Enterprise Fund (TEF)	Discretionary grants.	Company.	Used as a final incentive tool for projects that offer significant projected job creation and capital investment and where a single Texas site is competing with another viable out-of-state option.
Texas	The Skills Development Fund	Discretionary grants.	Community and technical colleges.	Discretionary grants may be provided to public community and technical colleges that develop customized job training programs for businesses that want to train new workers or upgrade the skills of existing employees

In addition to incentives to businesses, there are also state-managed funds that are directed to educational institutions for customized training. For example, Texas manages the Skills Development Fund, which provides discretionary grants to public and technical colleges for customized worker training. Grants are designed to support businesses that need to train new workers or upgrade skills of existing workers (State of Texas Office of the Governor, 2020).

The State of Michigan manages the Emerging Technology Fund, which provides matching dollars to support commercialization of Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) projects. Investments are purposed with expanding funding opportunities for Michigan technology companies. The fund is primarily focused on four technology areas: life sciences; homeland security and defense; advance automotive, manufacturing, and materials; and alternative energy (Michigan Economic Development Corporation, 2019).

Tax Policies

Tax policies are a frequent tool for enhancing state competitiveness. Among the ten states reviewed in this analysis, most offer some form of tax abatement, tax credit, or tax exemption. For example, the State of California manages the "California Competes Tax Credit ("Cal Competes"), a corporate

income tax credit available to businesses that want to locate in California or stay and grow in California. The $180 million in tax credits each year is available to businesses of any industry, size, or location. Applicants will be analyzed based on twelve different factors of evaluation, including number of full-time jobs being created, amount of investment, and strategic importance to the state or region.

Sales and use tax exemptions are common among near all states reviewed, including in Washington state. These include exemptions for the purchase of computers, software, and other purchases for research and development activities (e.g., Indiana, South Carolina), manufacturing equipment, such as for tooling (Georgia), and sales & use tax exclusions for advanced transportation and manufacturing activities (California).

A full list of policies and taxes reviewed can be found in the **appendix**.

Washington State Policies in Support of Manufacturing

Washington state has established a number of policies designed to support manufacturers and other businesses. While Washington is constitutionally prohibited from enacting the kinds of investment funds found in Texas, the state can support firms indirectly through investments in educational training and other programs.

For example, Washington has some discretionary funds available for attracting or retaining manufacturing businesses, albeit not direct transfers of financial resources to businesses as found in other states, such as Texas and Ohio. These include:

- **The Governor's Strategic Reserve Fund**. A discretionary job creation/retention incentive. Uses include for workforce development, technical or planning assistance, environmental analysis, or relocation assistance.
- **Community Economic Revitalization Board (CERB) Funds**. Funding for local governments and federally recognized tribes for public infrastructure projects which supports private business growth and expansion. Eligible projects include domestic and industrial water, storm water, wastewater, public buildings, telecommunications, and port facilities (Washington State Department of Commerce, 2020).
- **Clean Energy Fund**. Provides funds for the development, demonstration, and deployment of clean energy technology (Washington State Department of Commerce, 2020).

Washington state is also able to make targeted investments in training in support of business. For example, Washington state has its own customized job training program through community and technical college system, similar to Texas's Skills Development Fund. Washington state also runs the

Jobs Skills Program—a 50:50 cost-sharing program between the state and employer—administered through the state community and technical college system. The Work Start program provides customized training using the Governor's Strategic Reserve Funds.

Washington state tax incentives take the form of reduced B&O tax rates for select activities and B&O tax credits (e.g., for preproduction development expenditures, hiring of new employees and research & development in rural counties), and B&O tax exemptions (Washington State Department of Revenue, 2020). There are also tax credits and exemptions available to businesses that invest in and/or create new jobs in community empowerment zones and rural counties.

Local Programs with State Contributions

Washington also has several policy tools available to local jurisdictions to invest in infrastructure and other local development assets to attract private business. These fall under the category of **tax increment financing**. Recipients include jurisdictions in King, Whatcom, Spokane, Snohomish, Clark, Pierce, and Yakima counties.

The Local Infrastructure Financing Tool (LIFT) was enacted in 2006 and provides state funds to local governments to invest in infrastructure projects. The program is premised on the idea that local infrastructure investments will spur new economic activity that in turn will create new tax revenues in excess of the original state investment. According to the Joint Legislative Audit and Review Committee (2020), between calendar years 2007 and 2018, the program was associated with $166 million in local government investments in "Revenue Development Areas," with an additional $41.4 million in state contributions (over fiscal years 2011 to 2019). Transportation projects have constituted 75% of all spending.

The Local Revitalization Financing (LRF) program was first enacted in 2009 is similar to LIFT. The LRF program authorizes cities, towns, counties, and port districts to create a "revitalization area" and allows certain increases in local sales and use tax revenues and local property tax revenues generated from within the revitalization area, additional funds from other local public sources, and a state contribution to be used for payment of bonds issued for financing local public improvements within the revitalization area (Washington State Department of Revenue, 2016; Smith, 2020).

Local Infrastructure Project Area (LIPA) financing was created in 2011 to enable local governments to finance infrastructure investments and incentivize development rights in the Central Puget Sound. The program is similar to a tax increment financing program. Cities are authorized to create a LIPA and allows certain increases in local property tax revenues generated from within the LIPA to be used for payment of bonds issued for financing

local public improvements within the LIPA (Washington State Department of Revenue, 2017).

Regulatory Costs and Certainty

Regulations are often built on ensuring the public good, such as clean water, building standards, and labor protections. Businesses oftentimes do not necessarily dispute the purpose or intent of the regulation, but desire a more efficient, streamlined, and predictable regulatory system. For example, in 2015 the Washington State Auditor's Office found that Washington lacks a long-term strategy or lead agency for identifying and prioritizing "opportunities for targeted, multi-agency coordination of regulatory processes, and to facilitate that coordination on an ongoing basis" (Washington State Auditor's Office, 2015, p. 3). Regulatory costs are also typically more burdensome on smaller businesses. According to Crain & Crain (2014), manufacturing firms with fewer than 50 employees have regulatory costs that are 77 percent higher than for average manufacturing firms.

The challenge of streamlining regulations is not unique to Washington state. However, drawing state-by-state comparisons can be elusive. For example, the California-based Pacific Research Institute (PRI) in 2015 ranked Washington state 42nd for small businesses regulatory burden, with #1 representing the least burdensome (Winegarden, 2015). According to the PRI study, in 2015 Washington ranked at or near the bottom in unemployment insurance (#48), minimum wage regulations (#50), family leave regulations (#47), and land use regulations (#44).

The Mercatus Center at George Mason University developed a state-by-state comparison of regulations based on the presence of key words in administrative codes, such as "shall," "must," and "prohibit." Based on their analysis, researchers identified more than 196,000 restrictions on companies in the Washington Administrative Code, in addition to 1.09 million restrictions in the federal code (Broughel & McLaughlin, 2020). However, these comparisons are meant only as a proxy for regulatory burden, and would thus require much more in-depth analysis to evaluate the degree of overlap or compliance challenges and costs.

These studies provide a useful prism into understanding the relative amount of rules and regulations businesses, including manufacturers, are subject to. However, oftentimes businesses are more concerned with the predictability of regulations and cost of compliance, such as the risk of duplicative or overlapping regulations and uncertainty over how long a permitting process will take. More research will be needed to evaluate these issues in Washington and best practices specific to manufacturing in other states.

SUMMARY AND CONCLUSION

Manufacturing has long been a leading driver of job creation in Washington state and nationally. Manufacturing supports high wage jobs, exports, and broad-based economic growth through upstream and downstream associated spending by businesses and households. In recent decades, the information & communication technology (ICT) sector has emerged as a new major source of growth in Washington, anchored by locally founded global companies such as Microsoft and Amazon, a robust and vibrant start-up eco-system, and investments in Washington state by outside firms, including Facebook and Google.

This study evaluated the economic impacts and significant contributions of the manufacturing and ICT sector, as well as the large and growing synergies and overlaps between these two sectors in Washington state. The manufacturing sector increasingly relies on and engages with ICT, both in the application and in-house development of ICT solutions.

Manufacturing is alive and robust in every county in Washington. Key findings are summarized below:

Manufacturing drives economic growth and prosperity in Washington state. In 2019, the manufacturing sector employed 305,300 workers in Washington state, equal to 9% of Washington's entire nonfarm employment base (Washington State Employment Security Department, 2020). The sector was the source of more than 11% of gross state product in 2019, although down from 14% in 2000, a development consistent with the national manufacturing (U.S. Bureau of Economic Analysis, 2020). Manufacturing gross business income (gross receipts, a proxy for revenues), reached $192.5 billion in 2019—albeit slightly below 2018 totals—equal to 20% of all gross business income reported in Washington state (Washington State Department of Revenue, 2020). The sector is also a major source of both foreign and domestic exports.

Manufacturing is diverse, supporting jobs and prosperity across a range of activities in Washington state. Among subsectors analyzed in this study, activities ranged from aerospace to biotechnology to food and beverage processing. The aerospace and space sectors combined employed 88,900 workers and paid an average wage of $151,300 (including benefits). Other transportation equipment included shipyards, truck manufacturing, and other transportation parts and equipment, employing 24,400 workers in 2019. Agri-tech activities, including food and beverage processing, directly employed 51,600 workers and supported nearly $4.0 billion in foreign exports.

Manufacturing extends across the state. There were twenty-three counties with at least 1,000 manufacturing workers in 2019. Seven counties

were home to at least 10,000 workers, led by King and Snohomish (105,400 and 60,500) but with large concentrations in Kitsap (17,500), Spokane (16,300), Pierce (17,400), Clark (14,100), and Whatcom (10,500).

ICT is among Washington's largest sectors, fast growing, pays strong wages, and an increasingly important driver of other industries in Washington state. The ICT sector in 2019 employed more than a quarter of a million workers (276,700) and paid average wages, including benefits, of $225,000 per worker. The sector is highly concentrated in King County but there are **twelve counties in Washington state with at least 1,000 ICT workers**, including Clark (8,940), Snohomish (8,370), and Spokane (5,310).

The economic impact of the ICT sector, including upstream business-to-business transactions (indirect) and household consumption (induced) summed to more than 1.0 million jobs in 2019. The sectoral jobs multiplier of 3.7 is among the highest of any industry in Washington state.

ICT workers and activities play an important and increasing role in manufacturing. For example, an estimated 15% of employees in the space sector work in ICT occupations, such as software engineering. Within biotech, nearly 9% of the sectoral workforce are ICT workers, and 6% in energy systems.

The distinction between tech and manufacturing as separate sectors is becoming less defined. Various manufacturing firms develop their own software solutions, whilst the ICT sector also designs and builds hardware products.

Because manufacturing is a key driver of economic growth, states across the U.S. compete for these activities through incentives and recruitment policies. States across the U.S. compete for manufacturing investments through a range of tax incentives and discretionary grants and loans. Manufacturing continues to be a key source of innovation and high paying, high skill jobs and an engine of economic growth. However, equal or more important are the fundamentals of access to (and cost of) key business inputs, such as qualified workers, land, and energy, and the predictability of permitting processes.

APPENDIX

Industry Definitions and NAICS Codes

Information & Communication Technology

- Business Services Subgroup
  - NAICS 541511 Custom computer programming services
  - NAICS 541512 Computer systems design services
  - NAICS 541513 Computer facilities management services
  - NAICS 541519 Other computer related services
  - NAICS 611420 Computer training
  - NAICS 811211 Consumer electronics repair and maintenance
  - NAICS 811212 Computer and office machine repair
  - NAICS 811213 Communication equipment repair
  - NAICS 561499 All other business support services
- Electronic Retail
  - NAICS 45411 Electronic shopping and mail-order houses
- Internet Services & Publishing
  - NAICS 518210 Data processing, hosting and related services
  - NAICS 519130 Internet publishing and web search portals
- Software
  - NAICS 511210 Software publishers
- Telecommunications Services
  - NAICS 517 Telecommunications
- Manufacturing
  - NAICS 334210 Telephone apparatus manufacturing
  - NAICS 334220 Broadcast and wireless communications equip.
  - NAICS 334290 Other communications equipment manufacturing
  - NAICS 334111 Electronic computer manufacturing
  - NAICS 334112 Computer storage device manufacturing
  - NAICS 334118 Other computer peripheral equipment manufacturing
  - NAICS 334310 Audio and video equipment manufacturing
  - NAICS 334412 Bare printed circuit board manufacturing
  - NAICS 334416 Capacitor, resistor, and inductor mfg.
  - NAICS 334417 Electronic connector manufacturing
  - NAICS 334418 Printed circuit assembly manufacturing
  - NAICS 334419 Other electronic component manufacturing
  - NAICS 334512 Automatic environmental control manufacturing
  - NAICS 334513 Industrial process variable instruments
  - NAICS 333316 Photographic and photocopying equipment mfg.

- NAICS 334413 Semiconductors and related device mfg.
- NAICS 325992 Photographic film and chemical manufacturing

Aerospace

- NAICS 3364 Aerospace Product and Parts Manufacturing

Space

NAICS list based on Puget Sound Regional Council's 2018 report, *Washington State Space Economy* (Puget Sound Regional Council, 2018).

- NAICS 334220 Broadcast and wireless communications equip.
- NAICS 336414 Guided missile and space vehicle mfg.
- NAICS 481212 Nonscheduled air freight chartering
- NAICS 517410 Satellite telecommunications

Other Transportation Equipment

- NAICS 3361 Motor vehicle manufacturing
- NAICS 3362 Motor vehicle body and trailer manufacturing
- NAICS 3363 Motor vehicle parts manufacturing
- NAICS 3365 Railroad rolling stock manufacturing
- NAICS 3366 Ship and boat building

Biotech

- NAICS 325411 Medicinal and botanical manufacturing
- NAICS 325412 Pharmaceutical preparation manufacturing
- NAICS 325413 In-vitro diagnostic substance manufacturing
- NAICS 325414 Other biological product manufacturing
- NAICS 334510 Electromedical apparatus manufacturing
- NAICS 334516 Analytical laboratory instrument mfg.
- NAICS 339112 Surgical and medical instrument manufacturing
- NAICS 339113 Surgical appliance and supplies manufacturing
- NAICS 339115 Ophthalmic goods manufacturing
- NAICS 339116 Dental laboratories
- NAICS12 541711 Research and development in biotechnology
- NAICS12 541712 Other physical and biological research
- NAICS 541714 Research and development in biotechnology (except nanobiotechnology)

NAICS 541714 is a more specific industry group for biotech research but was not reported until 2017. For prior years, NAICS codes 541711 and 541712 were used to compute total growth among these two codes, and then applied to more recent data for 541714 to backwards impute past years.

Other Durable Goods

Defined as all other durable manufacturing NAICS codes not already included in other durable goods manufacturing subsectors, except for those classified as "non-durable," listed below:

- NAICS 311 Food manufacturing
- NAICS 312 Beverage and tobacco product manufacturing
- NAICS 313 Textile mills
- NAICS 314 Textile product mills
- NAICS 315 Apparel manufacturing
- NAICS 322 Paper manufacturing
- NAICS 323 Printing and related support activities
- NAICS 324 Petroleum and coal products manufacturing
- NAICS 325 Chemical manufacturing
- NAICS 326 Plastics and rubber products manufacturing

Agri-Tech

Subsector includes all food and beverage processing except seafood processing. Beverage processing was further adjusted using the latest economic impact studies released by the Washington Wine State Commission and Washington Beer Commission, which both include estimated workers engaged in wine and beer production outside the "beverage processing" NAICS codes (e.g., workers at vineyards engaged in wine production).

- NAICS 3111 Animal food manufacturing
- NAICS 3112 Grain and oilseed milling
- NAICS 3113 Sugar and confectionery product manufacturing
- NAICS 3114 Fruit and vegetable preserving and specialty
- NAICS 3115 Dairy product manufacturing
- NAICS 3116 Animal slaughtering and processing
- NAICS 3118 Bakeries and tortilla manufacturing
- NAICS 3119 Other food manufacturing
- NAICS 3121 Beverage manufacturing
- NAICS 3122 Tobacco manufacturing

Energy Systems

- NAICS 2211 Power generation and supply
- NAICS 2212 Natural gas distribution
- NAICS 3336 Turbine and power transmission equipment mfg.
- NAICS 3339 Other general purpose machinery manufacturing
- NAICS 3353 Electrical equipment manufacturing
- NAICS 2371 Utility system construction

Data Sources

Analysis in this report used data published by various state and federal sources, listed below.

- **Quarterly Census of Employment and Wages (QCEW)**. Data on covered workers and wages by state, county, and North American Industry Classification System (NAICS) code. Published by both the U.S. Bureau of Labor Statistics and Washington State Employment Security Department (only for Washington state). The QCEW data is collected as part of the unemployment insurance system and reported for both private and public sector employment. It is released quarterly, with typically a sixth month lag.
- **Current Employment Statistics (Seasonally Adjusted)**. Nonfarm employment data statewide and by metropolitan statistical area (MSA) and metropolitan division (MD) in total and for select industries and industry groupings. Data is based on a survey of employers in the QCEW database and benchmarked against the QCEW series. Data is seasonally adjusted.
- **Occupational Employment Statistics**. Annual series on workers by standard occupational category (SOC) code statewide and by Workforce Development Area. Released by both the U.S. Bureau of Labor Statistics and Washington State Employment Security Department.
- **Industry-Occupational Matrices**. Crosswalk of employment by SOC code and 4-digit NAICS code, statewide and Workforce Development Area. Detailed breakout by 6-digit SOC codes released by the Washington State Employment Security Department for latest available year (2019). Historic annual estimates back to 2012 at the 2-digit SOC code available from the U.S. Bureau of Labor Statistics.
- **Gross Business Income**. Gross receipts by 2-, 3-, 4-, 5-, and 6-digit NAICS code back to 1994 in Washington state, statewide. Published by the Washington State Department of Revenue.
- **Detailed Tax Data**. Annual state tax collections by state tax category and 6-digit NAICS code. Published by the Washington State Department of Revenue.
- **State-of-Origin Export Data**. U.S. Customs data on physical goods (merchandise and commodities) exports by value and volume metrics for products where final stage in value-added process was in Washington state. Published by the U.S. Census Bureau's USA Trade® Online platform by 2-to-6-digit harmonized system code level and 2-to-4-digit NAICS code. Released monthly with typically two-month lag.

- **Non-employer Data Series**. U.S. Census Bureau data on annual non-employer establishments in Washington state by NAICS code and company structure classification.
- **Regional Gross Domestic Product and Personal Income**. Regional accounts data, inflation adjusted, for Washington state.
- **Implicit Price Deflators**. Indexed price deflators for years 1947 to 2020, by quarter. Published by the Federal Reserve Bank of St. Louis.
- **Energy Consumption and Production Data**. State-level data through 2018 published by the U.S. Energy Information Administration.
- **Washington State Input-Output Model**. Latest version of model released for 2007, but with industry-specific and labor income deflators for 2019. Model used to develop industry-specific output-to-worker ratios (along with gross business income and employment estimates), supplemental income benefits adjustments, and statewide economic impacts (indirect and induced).

Economic Impact Estimates

The Washington State Input-Output Model was used to compute indirect and induced impact estimates for each subsector in this report. The Washington State Input-Output Model is a modeled representation of the Washington state economy broken out by 52 industries and industry groupings, including production functions by industry, sales by industry, and sources of final demand by industry (personal consumption expenditures, investment, gross exports, government purchases).

Fiscal Impact Estimates

State fiscal impacts are direct and total state tax revenues generated and supported by each modeled subsector in this study. Tax revenues include direct payments by each subsector as well as additional state taxes through revenues among activities supported through indirect and induced economic impacts. To compute tax payments, effective tax rates are constructed for each industry or industry grouping in the input-output model, based on total tax payments as a share of gross business income. These rates are applied to estimated GBI per industry grouping, which will differ from estimated output in the model.

Manufacturing Jobs by County, 2019

County	Manufacturing Jobs	Non-aerospace Jobs	Nonfarm Jobs	Manufacturing Share of Nonfarm Employment	Non-aerospace Manufacturing Share of Nonfarm Employment
King	105400	64000	1432400	0.073582798	0.044680257
Snohomish	60,500	19,500	290,700	20.8%	6.7%
Kitsap	17,500	17,400	91,800	19.1%	19.0%
Spokane	16,300	15,600	227,000	7.2%	6.9%
Pierce	17,400	14,600	316,300	5.5%	4.6%
Clark	14,100	14,100	164,100	8.6%	8.6%
Whatcom	10,500	10,500	89,800	11.7%	11.7%
Yakima	8,600	8,600	97,200	8.8%	8.8%
Cowlitz	6,600	6,600	39,100	16.9%	16.9%
Skagit	5,900	5,900	50,700	11.6%	11.6%
Grant	4,600	4,600	32,400	14.2%	14.2%
Benton	4,600	4,600	87,100	5.3%	5.3%
Walla Walla	4,000	4,000	24,600	16.3%	16.3%
Franklin	3,800	3,800	31,600	12.0%	12.0%
Lewis	3,400	3,400	26,400	12.9%	12.9%
Thurston	3,000	3,000	117,300	2.6%	2.6%
Whitman	2,900	2,900	18,500	15.7%	15.7%
Grays Harbor	2,600	2,600	22,900	11.4%	11.4%
Chelan	1,900	1,900	38,900	4.9%	4.9%
Klickitat	1,700	1,700	6,600	25.8%	25.8%
Stevens	1,100	1,100	10,600	10.4%	10.4%
Adams	1,100	1,100	8,000	13.8%	13.8%
Clallam	1,100	1,100	23,200	4.7%	4.7%
Mason	800	800	14,300	5.6%	5.6%
Island	800	800	16,800	4.8%	4.8%
Jefferson	700	700	9,100	7.7%	7.7%
Pacific	700	700	6,300	11.1%	11.1%
Douglas	600	600	10,100	5.9%	5.9%
Kittitas	600	600	14,500	4.1%	4.1%
Asotin	400	400	6,400	6.3%	6.3%
Skamania	300	300	2,100	14.3%	14.3%
Okanogan	300	300	13,900	2.2%	2.2%
Pend Oreille	200	200	3,100	6.5%	6.5%
San Juan	200	200	6,000	3.3%	3.3%
Columbia	100	100	1,400	7.1%	7.1%
Wahkiakum	100	100	700	14.3%	14.3%
Lincoln	-	-	2,500	0.0%	0.0%
Ferry	-	-	1,700	0.0%	0.0%
Garfield	-	-	700	0.0%	0.0%
Statewide	**305,300**	**216,800**	**3,375,000**	**9.0%**	**6.4%**

Sources: U.S. Bureau of Labor Statistics (2020); High Peak Strategy LLC (2021).

Incentives and Policies Offered in Other Leading Manufacturing States

Type	State	Name	Description	Eligibility and Terms	Source
Tax incentive	Michigan	Industry Property Tax Abatement (P.A. 198)	A tax incentive to manufacturers to enable renovation and expansion of aging facilities, assist in the building of new facilities, and to promote the establishment of high tech facilities.	An Industrial Development District (IDD) or a Plant Rehabilitation District (PRD) must be created prior to initiating a project Local units of government have the ability to reduce property taxes on new investment by 50% for manufacturers and high-technology businesses. abatements can last up to twelve years and can provide relief on both real and personal property taxes as determined by the local govt.	https://www.michigan.gov/taxes/0,4676,7-238-43535_53197_69512-213175--,00.html https://blsstrategies.com/michigan https://blsstrategies.com/michigan
Bond	Michigan	Private Activity Bond Program	Provides profitable firms with capital cost savings stemming from the difference between taxable and tax-exempt interest rates.	**Manufacturing projects**, not-for-profit corporation projects and solid or hazardous waste disposal facilities. **For manufacturing projects, 95 percent of the bond proceeds must be used to acquire land, building and equipment directly related to the manufacturing process**. Warehouse space and other "non-core" items are ineligible unless they are directly related to the manufacturing process, and then are limited to 25 percent of the project. **At least 70 percent of bond proceeds must be spent on "core manufacturing" costs. If you acquire existing facilities, a minimum of 15 percent of the bond proceeds must be used to renovate the facility. Bond size is between $1 million and $10 million. no limit on the size of bonds issued to finance solid or hazardous waste disposal facilities or not-for-profit corporation projects.**	https://www.michiganbusiness.org/4903ab/globalassets/documents/reports/fact-sheets/privateactivitybondprogramformeridrb.pdf
Fund	Michigan	Emerging Technology Fund	Expands funding opportunities for Michigan technology companies in federal research and development by providing matching dollars to support commercialization of Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) projects.	Applies to four sectors: Life sciences • Homeland security and defense • **Advance automotive, manufacturing and materials** • Alternative energy	https://www.michiganbusiness.org/48d942/globalassets/documents/reports/fact-sheets/emergingtechnologiesfundmedc.pdf
Tax incentive	Michigan	New Personal Property Exemption (in distressed Communities)	100% property tax exemption for specific businesses located within eligible distressed communities.	Types of eligible businesses: **manufacturing**, mining, research and development, wholesale trade or office operations. This exemption is for all new personal property placed in a district that has been established by the local unit of government. The local unit of government determines the number of years granted and may grant any number of years for the exemption.	https://www.michigan.gov/documents/taxes/New_Personal_Property_FAQs_04.26.16_522890_7.pdf https://www.michigan.gov/taxes/0,4676,7-238-43535_53197-213182--,00.html
Tax incentive	Michigan	Sales Tax Exemption	Manufacturing machinery and equipment, pollution control equipment and electricity and natural gas used in production are all exempt from sales tax.		https://blsstrategies.com/michigan
Tax incentive	Michigan	RENEWABLE ENERGY RENAISSANCE ZONES	Tax exemptions for qualified facilities include: state education tax, personal and real property taxes, and local income tax where applicable. Taxes still due are those mandated by the federal government, local bond obligations, school sinking fund or special assessments	A facility that creates energy, fuels, or chemicals directly from the wind, the sun, trees, grasses, biosolids, algae, agricultural commodities, processed products from agricultural commodities, or residues from agricultural processes, wood or forest processes, food production and processing, or the paper products industry; A facility that creates energy, fuels, or chemicals from solid biomass, animal wastes, or landfill gases. A facility that focuses on research, development, or manufacturing of systems or components of systems used to create energy, fuel, or chemicals from the items described in this subdivision. A facility that focuses on research, development, or manufacturing of systems or components of systems that involve the conversion of chemical energy for advanced battery technology.	https://www.michiganbusiness.org/49c59d/globalassets/documents/reports/fact-sheets/renewableenergyrenzones.pdf
Tax incentive	Indiana	Sales & Use Tax Exemptions	Manufacturing and research & development equipment (including computers, computer software, software-as-a-service, and testing equipment) are exempt from sales and use tax.		https://blsstrategies.com/indiana

Tax incentive	Florida	Sales and Use Tax Exemption	Manufacturing equipment and machinery, commercial space activities, and R&D machinery and equipment are all exempt from Sales and Use Tax.	Exemption for Boiler Fuels Used for manufacturing, processing, compounding, or production of tangible personal property for sale . Exemption for Electricity or Steam Used to Operate Machinery or Equipment Used in Certain Manufacturing Industries, including manufacture, process, compound, or produce items of tangible personal property for sale; or operate pollution control equipment, recycling equipment, maintenance equipment, or monitoring or control equipment in such operations. Exemption for Solar Energy Systems Exemption for Electricity Used for Agricultural Purposes Exemption for Machinery and Equipment and Other Materials Used for Pollution Control Exemption for Machinery and Equipment Used to Produce Electricity or Steam Exemption for Machinery and Equipment Used in Semiconductor, Defense, or Space Technology Production	https://floridarevenue.com/taxes/taxesfees/Pages/sales_tax_incent.aspx
Tax incentive	Texas	STATE SALES & USE TAX EXEMPTIONS		Available to taxpayers who manufacture, fabricate, or process tangible property for sale. manufacturing companies are also exempt from paying state sales/use tax on electricity and natural gas used in manufacturing, processing, or fabricating tangible personal property.	https://gov.texas.gov/uploads/files/business/IncentivesOverview.pdf
Tax incentive	Texas	RENEWABLE ENERGY INCENTIVES	Tax exemptions and deductions for solar, wind, ethanol and biodiesel.	tax exemption to manufacturers, sellers, or installers of solar energy devices. Tax reduction for renewable energy sources, from the company's taxable capital of 10% from the company's income. A 100 percent exemption on the appraised value of solar, wind or biomass energy devices installed or constructed for the production and use of energy on-site.	https://gov.texas.gov/uploads/files/business/IncentivesOverview.pdf
Fund	Texas	Texas Enterprise Fund (TEF)	used as a final incentive tool for projects that offer significant projected job creation and capital investment and where a single Texas site is competing with another viable out-of-state option.		https://blsstrategies.com/texas
Fund	Texas	The Skills Development Fund	Discretionary grants may be provided to public community and technical colleges that develop customized job training programs for businesses that want to train new workers or upgrade the skills of existing employees	the average training costs reimbursed are $1,800 per trainee and up to $500,000 for a business	
Tax incentive	Ohio	Sales Tax Exemption		Machinery and equipment used in the manufacturing process; material handling equipment used in warehouse and distribution facilities; equipment used for research and development purposes; pollution control equipment	https://blsstrategies.com/ohio
Fund	Ohio	Energy Loan Fund	provides low-cost financing to small businesses and manufacturers for energy improvements that reduce energy usage and associated costs, reduce fossil fuel emissions, and/or create or retain jobs.		https://development.ohio.gov/bs/bs_busgrantsloans.htm
Fund	Ohio	Roadwork Development (629) Funds		available for public roadway improvements, including engineering and design costs. available for projects primarily involving manufacturing, research and development, high technology, corporate headquarters, and distribution activity. Projects must typically create or retain jobs. Grants are usually provided to a local jurisdiction and require local participation.	https://development.ohio.gov/cs/cs_r629.htm
Fund	Ohio	JobsOhio Economic Development Grant	Discretionary grants are available to support manufacturing, R&D, high technology, corporate headquarters, and distribution projects that involve substantial capital investment and job creation. Grant funds can be used for machinery and equipment purchase costs, new building construction and acquisition costs, infrastructure improvements and other fixed asset investments.		https://blsstrategies.com/ohio
Tax incentive	Georgia	Sales and Use Taxes Exemption		A wide range of expenditures made by manufactures, including machinery and equipment, repair and replacement parts, molds, dies and waxes, tooling, raw materials, packaging for sale or shipment, and other needed supplies, when it's necessary and integral to the manufacturing process purchase of energy when it's necessary and integral to the manufacturing process	https://www.georgia.org/competitive-advantages/incentives/tax-exemptions

Tax incentive	Georgia	Job Tax Credit	Gives a credit ranging from $1,250 to $4,000 per year for 5 years for every new job created. In certain areas, the credit can also lower payroll withholding obligations.	Manufacturing is one of the qualified sector.	https://www.georgia.org/competitive-advantages/incentives/tax-credits
Tax incentive	Georgia	QUALITY JOBS TAX CREDIT		Available to all industries Companies need to create at least 50 net new jobs within a 24-month period with wages that are at or above 110% of the county average wage. Credits range from $2,500 to $5,000 per job, per year for 5 years.	https://www.georgia.org/competitive-advantages/incentives/tax-credits
Tax incentive	Georgia	Research and Development Tax Credit	Businesses may claim a tax credit equal to 10% of qualified R&D spending in Georgia when compared to a base period. The credit can be used to offset up to 50% of net Georgia corporate income tax liability after all other credits have been applied. Any excess R&D credits can be applied to state payroll withholding. Unused credits can be carried forward for up to 10 years.	The Georgia facility must be engaged in a specified operation, or the headquarters of a company engaged in a specified industry, including **manufacturing**, warehousing, distribution, logistics, software development, contact centers, and others, to qualify for the Research and Development Tax Credit.	https://www.georgia.org/competitive-advantages/incentives/tax-credits https://blsstrategies.com/georgia
Tax incentive	Georgia	Investment Tax Credit	Provides tax credits to companies engaged in manufacturing or telecommunications support that have operated in Georgia for at least 3 years	Businesses may be eligible for a tax credit ranging from 1% to 8% of qualified investment of at least $50,000.	https://blsstrategies.com/georgia
Tax incentive	South Carolina	Sales Tax Exemptions		include Machinery and equipment, and applicable repair parts, used in the production of tangible goods; Materials that will become an integral part of the finished product; Coal, coke or other fuel for manufacturers, transportation companies, electric power companies and processors; Industrial electricity and other fuels used in manufacturing tangible personal property; Research and development machinery and equipment; Air, water and noise pollution control equipment; Material handling equipment for manufacturing or distribution projects investing $35 million or more in the state; Packaging materials;	https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	South Carolina	Corporate Income Tax Credits	Companies creating net new jobs in certain of South Carolina's economically distressed counties can benefit from a corporate income tax moratorium where the Company's entire state corporate income tax liability may be eliminated for a period of either 10 or 15 years.		https://blsstrategies.com/south-carolina
Tax incentive	South Carolina	Jobs Tax Credits	Companies must create and maintain a certain number of net new jobs in a taxable year.	A manufacturing facility may qualify for the Jobs Tax Credit by creating a monthly average of 10 net new jobs. The value of the credit depends on the county's development tier. A manufacturing facility that has fewer than 99 employees worldwide, the company could qualify for the Small Business Jobs Tax Credit by creating a monthly average of two net new jobs, instead of 10.	https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	South Carolina	Investment Tax Credit	Allows manufacturers locating or expanding in South Carolina a one-time credit against a company's corporate income tax of up to 2.5% of a company's investment in new production equipment. Unused credits may be carried forward for up to 10 years.		https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	South Carolina	Research & Development Tax Credit	Tax credit applied to qualified research expenses.	A credit equal to 5% of a company's qualified research expenses in the state may be claimed by eligible businesses. The credit cannot be used to offset more than 50% of a company's remaining tax liability after all other credits have been applied. Unused credits can be carried forward for up to 10 years.	https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	South Carolina	Credit for Alternative Fuels	Provides a company a credit against income taxes equal to 25% of the cost of purchasing, constructing and installing eligible property that is used for distribution, dispensing, or storing alternative fuel at a new or existing commercial fuel distribution or dispensing facility in South Carolina.		https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	South Carolina	Property Tax Exemptions	14.2857% of the property tax value of manufacturing property assessed for property tax purposes will be exempt from property taxation; provided, however, that the total amount of the exemption for all entities in the State for that fiscal year will not exceed $85 million.		https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	South Carolina	Five-Year Property Tax Abatement	Manufacturers investing $50,000 or more are entitled to a five-year property tax abatement from county operating taxes. This abatement usually represents an offset of up to 20% to 35% of the total millage, depending on the county		https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf

Tax incentive	South Carolina	Textile Revitalization Credit		for abandoned sites used directly for textile manufacturing or operations or ancillary uses for, or designed for use by, textile manufacturing. "Abandoned" means that at least 80% of the site has been closed for a period of at least one year.	https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	South Carolina	Port Volume Increase Tax Credit	Provides a possible income tax credit or withholding tax credit to manufacturers or distributors or companies engaged in warehousing, freight forwarding, freight handling, goods processing, cross docking, transloading or wholesale of goods.		https://www.sccommerce.com/sites/default/files/2020-02/ManufacturingIncentivesBooklet_Jan2020_Web.pdf
Tax incentive	Tennessee	Sale and Use Tax Exemption	for manufacturing: for industrial machinery and reduced sales tax rate for utilities at qualified manufacturing facilities.	Exemptions include industrial machinery, repair parts and industrial supplies used in the manufacturing process. Reductions include: 0-1.5% tax on water depending on use and 0-1.5% on gas, electricity and various energy sources depending on use.	https://www.tn.gov/transparenttn/open-ecd/openecd/openecd-tax-incentives.html
Tax incentive	Tennessee	Industrial Machinery Tax Credit	For manufacturing: includes purchases for machinery; apparatus and equipment with parts; appurtenances and accessories; repair parts and labor.	Credit of 1% to 10% for the purchase, third party installation and repair of qualified industrial machinery.	https://tnecd.com/advantages/incentives-grants/
Tax incentive	Tennessee	Job Tax Credit and Enhance Job Credit		For all industries.	https://tnecd.com/advantages/incentives-grants/
Tax incentive	California	Sales and Use Tax Exemption for Manufacturing	Credit for manufacturing R&D.	All manufacturers and businesses primarily engaged in R&D related to the physical sciences, engineering, and life sciences industries are eligible for a partial exemption in state sales and use tax (3.9375%). NAICS codes Codes 311100 to 339999 2018 addition: NAICS codes 22111 to 221118, inclusive, and 221122; These industries generally include those primarily engaged in the generation and production, or storage and distribution of electric power. The partial exemption only applies to the state's portion of the sales tax rate (7.25%) – businesses are still subject to local sales tax.	https://www.cdtfa.ca.gov/industry/manufacturing-exemptions.htm#Qualifications
Tax incentive	California	Advanced Transportation and Manufacturing Sales and Use Tax Exclusion	Provides a full sales and use tax exclusion for advanced manufacturers and manufacturers of alternative source and advanced transportation products, components or systems. The program was expanded to include advanced manufacturing projects and projects using recycled feedstock.		https://www.treasurer.ca.gov/caeatfa/ste/index.asp
Tax incentive	California	California Competes Tax Credit ("Cal Competes")	The California Competes Tax Credit (CCTC) is an income tax credit available to businesses that want to locate in California or stay and grow in California. Businesses of any industry, size, or location compete for over $180 million available in tax credits by applying in one of the three application periods each year. Applicants will be analyzed based on twelve different factors of evaluation, including number of full-time jobs being created, amount of investment, and strategic importance to the state or region.		https://business.ca.gov/california-competes-tax-credit/ https://www.treasurer.ca.gov/caeatfa/ste/faq.asp#apply
Fund	California	Renewable Energy for Agriculture Program (REAP)	Implemented in 2018 by the CA Energy Commission. Funds emissions-eliminating manufacturing and processing projects.	Approximately $10 million is available for renewable energy technologies that are capable of achieving a net greenhouse gas reduction benefit.	https://blsstrategies.com/california
Fund	California	CalRecycle Programs	For companies manufacturing with recycled materials there are numerous programs offered by CalRecycle, including low-interest loans and grants to promote infrastructure development for recycling/manufacturing projects that divert materials from landfills and that reduce greenhouse gas emissions. During FY 2018-19 $11.0 million of grants were awarded.		https://blsstrategies.com/california
Tax incentive	Wisconsin	Sale and Use Tax Exemption		Available for manufacturing machinery, equipment and materials, biotechnology and manufacturing research, production fuel and electricity, as well as alternative energy used in manufacturing. Computer equipment, machinery and equipment used in manufacturing, and manufacturing, merchant and farm inventories are exempt from property tax.	https://www.revenue.wi.gov/Pages/Businesses/incentives-finder.aspx?type=Manufacturing
Tax incentive	Wisconsin	Manufacturing and Agriculture Credit	Tax credits for job creation, capital investments, job training, and/or locate or retain corporate HQ in state.	This non-refundable credit is equal to 7.5% of eligible qualified production activities income and may be used to offset state income or franchise taxes. The annual tax credit reduces the company's effective state corporate income tax rate to 0.4%. Unused credits may be carried forward for up to 15 years.	https://blsstrategies.com/wisconsin
Tax incentive	Wisconsin	Research and Development Incentives	Research credit.	For Activities Related to Internal Combustion Engines	https://www.revenue.wi.gov/DOR%20Publications/pb131-2018.pdf

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