Global Trade and Supply Chain Management Sector Economic Analysis

2020 Update

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Center of Excellence
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Highline College

Prepared by:

cai community attributes inc

Community Attributes Inc. tells data-rich stories about communities that are important to decision makers.

President & CEO
Chris Mefford

Project Manager
Spencer Cohen, PhD

Analysts
Zack Tarhouni
Tyler Coyle

Community Attributes Inc.
500 Union Street, Suite 200
Seattle, Washington 98101

www.communityattributes.com

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INTRODUCTION

Background and Purpose

Washington state is among the most trade dependent states in the U.S. Washington's exports include not just airplanes, but also medical devices, agriculture commodities, machined parts, and processed foods, among many other Washington-made products. Washington's ports, led by the Northwest Seaport Alliance, non-containerized operations at the ports of Seattle, Tacoma, Grays Harbor, and Everett, and air cargo out of Sea-Tac International Airport, are also key purveyors of trade between other parts of the U.S. and the world. These ports facilitated the movement of $75.9 billion in exports and more than $96.4 billion in imports in 2019, including products from or destined to domestic markets as far as the U.S. Midwest, making our region one of the most important centers for containerized, bulk, and breakbulk shipments in the country.

Behind these large trade flows exist an extensive network of service providers and logistics operations. These include companies and organizations specializing in marine terminal operations, air freight shipments, supply chain management, freight forwarders, trade finance, and trucking, as well as the ports, educational institutions, and state and federal government agencies, to name just some of the main segments of Global Trade & Supply Chain Management sector. Added to this, there are many related operations and personnel within trade-reliant industries in Washington, such as global logistics and supply chain managers at The Boeing Company.

This study presents updated estimates on the size, breadth, geographic dispersion, and economic impacts of this sector, including quantifying the number of jobs, income, and business revenues for subsector. The original study, produced in 2018, reported sectoral metrics for year 2017. Analysis in this update includes data through the 2019 calendar year.

This report concludes with a discussion of the impacts of the Covid-19 virus on Global Trade & Supply Chain Management system in Washington state, including the various types of disruptions in global supply chains and cargo flows through Washington.

Methods

This analysis leverages multiple data sources, including employment data series published by the Washington State Employment Security Department (ESD) and U.S. Bureau of Labor Statistics, revenue data from the Washington State Department of Revenue (DOR), personal income and self-employment data from the U.S. Bureau of Economic Analysis, and trade data

from the U.S. Census Bureau. Estimates were then validated and/or adjusted based on industry representative interviews and auxiliary information and data sources. Economic impacts were calculated through use of the Washington State Input-Output (I-O) Model.

Outline of Report

The remainder of this report is organized as follows:

- **Overview of Global Trade and Supply Chain Management**. A review of the sector definition and summary of key activities.
- **Workforce System**. Educational institutions that support the sector.
- **Direct Activities**. Key measures of the sector, including jobs, income, revenues, and leading occupations.
- **Economic Impacts**. Additional jobs, income, and revenues supported through multiplier effects statewide.
- **Tracking the Impact of Covid-19**. Effects of Covid-19 on global trade flows, marine cargo and air freight handing, and other activities in Washington state.
- **Summary and Conclusions**. Review of key findings.

OVERVIEW OF GLOBAL TRADE AND SUPPLY CHAIN MANAGEMENT

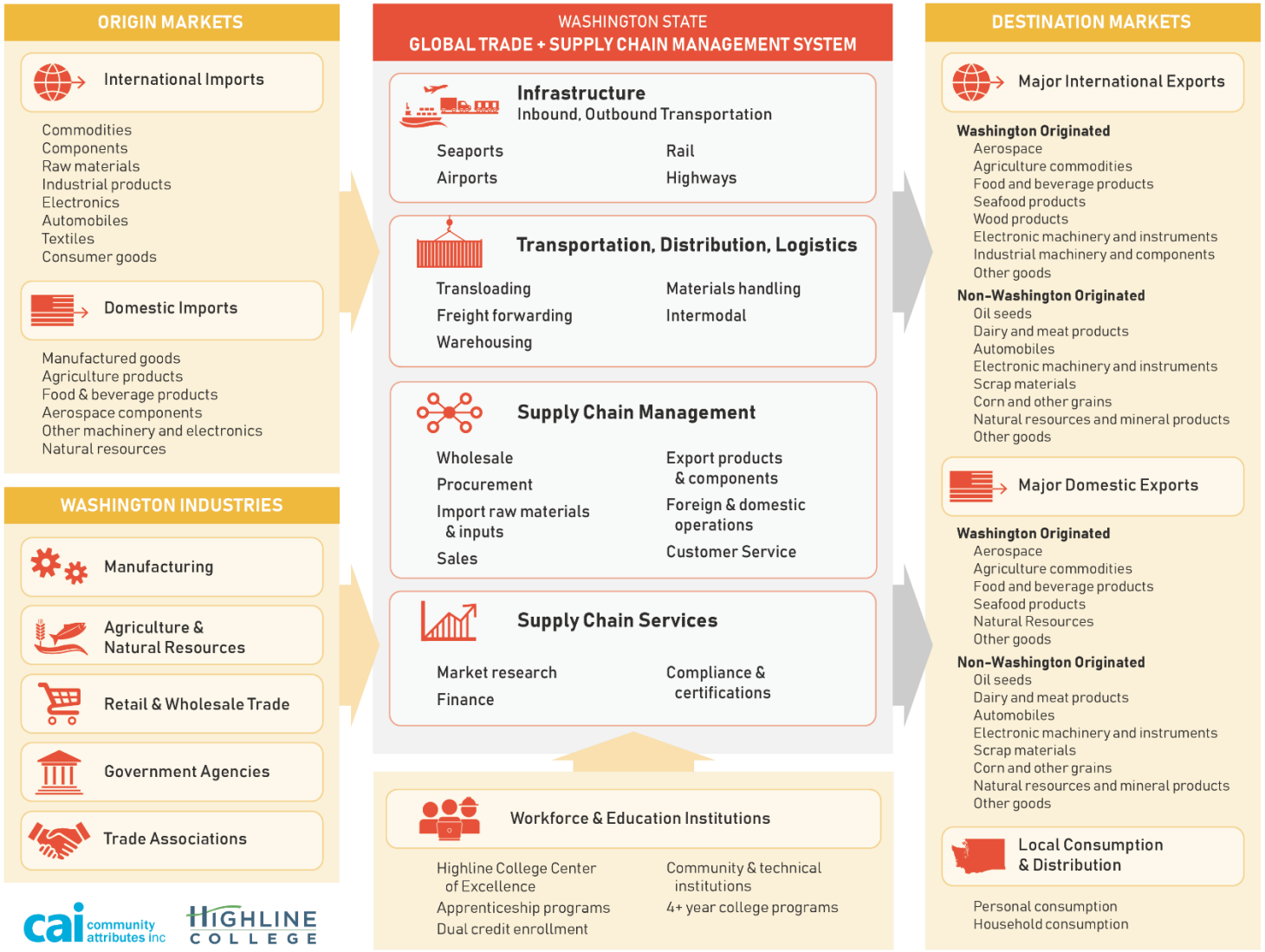
Definition of Global Trade and Supply Chain Management Sector

The Global Trade and Supply Chain Management Sector includes a range of activities involved in facilitating the movement of goods between businesses and final users/consumers**. Exhibit 1** and **Exhibit 2** below present a description and schematic rendering of the sector, taking into consideration businesses and activities central to the movement of goods (Transportation, Distribution, and Logistics), critical infrastructure, supporting services, other businesses in Washington engaged procurement and supply chain management (e.g., procurement and compliance divisions within larger manufacturers), and educational institutions whose mission is to provide needed human capital to support these activities.

Exhibit 1. Description of Segments of Sector

Segment	Subsector/Activity	Description	Illustrative Companies and Organizations
Transportation, Distribution & Logistics	Marine cargo shipping	Domestic and international freight vessels, e.g., Tote, as well as supporting operations such as tugs.	Tote Maritime, Foss Maritime
	Transloading & Intermodal	Movement of cargo from one mode to another and consolidation and repackaging of goods, including between container sizes.	BNSF, UP, SSA Marine, MacMillan-Piper, Oak Harbor Freight Lines.
	Air cargo shipping	Freight airlines (e.g., Air China) and air cargo ground-handling operation.	Air cargo jobs at Alaska Airlines and Delta, Hanjin Global Logistics, Swissport.
	Freight forwarding	Freight arrangement and 3rd Party Logistics	Expeditors International
	Warehousing & storage	Dry and cold storage facilities and packaging.	
	Couriers	Express delivery services	DHL, FedEx, UPS
Supply Chain Management	Procurement, Sales, import and export of finished and/or intermediate goods and materials, customer service.		
Supply Chain Services	Trade finance	Letters of credit and other short-term lending for exporters and importers.	U.S. Bank, Bank of America, Washington Trust
	Compliance	ITAR and other regulatory compliance issues.	Dorsey Whitney LLP
	Consulting/Market research	Research on market opportunities.	

Exhibit 2. Infographic of Global Trade & Supply Chain Management Sector



Transportation, Distribution, and Logistics

Transportation, Distribution, and Logistics, or "TDL," refers to activities directly engaged in the movement of goods, either to/from international or domestic sources and destinations. TDL activities include:

- **Transloading and intermodal**—the movement of cargo from one mode to another, such as from a maritime vessel to a train. Transloading includes marine and air cargo handling, terminal operators, airport ground-handling services, courier services, trucking companies (long-haul and drayage activities), rail operators, and the consolidating and repackaging of cargo, often time between 40-foot and 52-foot containers.
- **Freight forwarding** entails a suite of services on behalf of shippers. These include tracking inland transportation, preparation of shipping and export documents, warehousing, booking cargo space, negotiating freight charges, freight consolidation, cargo insurance, and filing of insurance claims.
- **Warehousing and storage**, including dry storage and refrigeration facilities for perishable goods.
- **Materials handling**—firms specializing in the handling of bulk, breakbulk goods, such as grain and industrial machinery.

Supply Chain Management in Other Industries

Many of the skills necessary within TDL operations can be found in other sectors of the economy, such as among local manufacturers, many of whom have internal staff tasked with managing procurement, logistics, sales, customer service, and trade finance. For example, in 2019 the aerospace industry in Washington state employed an estimated more than 3,800 logisticians, based on Washington State Employment Security Department data.

A large share of trade is either between businesses, such as between The Boeing Company and its network of suppliers, or between producers and wholesalers who then further distribute products to retail operations.

Supporting Services

An extensive eco-system of businesses and government agencies provides critical services to facilitate global and domestic trade. These include trade finance, state and federal export assistance programs, trade associations, market research firms, and compliance services, the latter including law firms specializing in fields such as export controls.

Infrastructure Assets

Washington's Global Trade and Supply Chain Management sector begins with an extensive transportation system and network of infrastructure assets. Washington state is home to 75 public ports, ranging from major containing loading centers such as the Ports of Tacoma and Seattle (Northwest Seaport Alliance), breakbulk operations at the Port of Grays Harbor, to smaller ports along the Columbia and Snake Rivers serving the bulk grain trade.

Rail Network

There are over 3,000 miles of railroad lines in Washington state (**Exhibit 3**). These include two class I railroads—Burlington Northern Santa Fe (BSNF) and Union Pacific—and 23 short-line railroads, many supporting the agriculture industry in Eastern Washington. The Washington State Department of Transportation owns the Palouse River and Coulee City (PCC) rail system, the longest short-line freight rail network in Washington. WSDOT contracts with private railroads to operate each of the branches.

Exhibit 3. Map of Major Rail Lines in Washington State

Seaports and Riverports

Washington has 45 ports situated along Puget Sound, the Pacific Coast and inland rivers. These include 11 deep-draft seaports, capable of handling ocean-going vessels and containerized cargo, and 17 barge intermodal facilities handling bulk or breakbulk cargo on the Columbia and Snake Rivers.[1] In 2019, Washington state seaports handled $172.3 billion in imports and exports, including products destinated for or originating from regions elsewhere in the U.S. These shipments included containerized cargo, breakbulk (e.g., tractors, automobiles, large machinery), and various bulk commodities, such as soybeans and grains.

Washington's seaports serve as important gateways to trade across the Pacific Rim, and they are major loading centers for discretionary cargo either originating or destined for other parts of the United States. On-site facilities include container and breakbulk terminal operations, warehousing, cold storage, grain terminals and on-dock rail and drayage operations. Ports are also vital to Washington's agricultural industry. In 2015, an estimated $519.5 million in fresh apples was exported through the state's public ports.

[1] Washington State Department of Transportation, "Marine Freight," https://www.wsdot.wa.gov/Freight/Marine.htm (accessed June 18, 2018).

Apple exports in turn supported 9,110 jobs, largely impacting counties in Eastern Washington.[2]

The Northwest Seaport Alliance is a marine cargo partnership of the Ports of Seattle and Tacoma. Its facilities are major centers for containerized traffic, bulk, breakbulk, project/heavy-lift cargoes, automobiles and trucks. In addition to providing a domestic gateway to Alaska, its international trading partners include China, Japan, South Korea, Canada and others. The Northwest Seaport Alliance was formed in 2015, and between the Ports of Seattle and Tacoma, it has 10 container terminals with 23 berths and 47 cranes, as well as 7 non-container terminals mainly used for breakbulk cargo.[3] Other container ports in the state include the Ports of Grays Harbor, Bellingham, Olympia, Everett, Longview, Kalama and Vancouver.[4]

Bulk and breakbulk cargo is handled at several ports across the state. These include the Port of Grays Harbor (soybeans, automobiles, compressed natural gas), the Port of Everett (aerospace parts, logs), the Port of Vancouver USA (grain, automobiles, steel) and the Ports of Longview and Kalama along the Columbia River (grain, steel, petroleum coke).[5]

The Port of Grays Harbor has four terminals and was the second port district established in the state after the Port of Seattle. In recent years, the Port of Grays Harbor has transformed its terminal operations from a heavy dependence on forest products to a diverse cargo mix.[6] In 2013, the Port opened new infrastructure to process automobiles through the roll-on/roll-off capabilities of Pasha Automotive Services.[7]

Airports

There are 28 public port-owned airports in Washington. The largest of these is Seattle-Tacoma International Airport, which is the state's hub for passenger travel and air freight, followed by King County International Airport and Spokane International Airport. These three airports dominate

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[2] Washington Public Ports Association, "Washington State Public Ports Economic Impact Analysis," 2017.
[3] The Northwest Seaport Alliance, "Facilities Guide," https://www.nwseaportalliance.com/sites/default/files/nwsa_mapbrochure_5-2016_web.pdf (accessed June 18, 2018).
[4] Washington State Department of Transportation, "Marine Ports and Navigation Plan," 2017, https://www.wsdot.wa.gov/NR/rdonlyres/95926DE6-98B7-4470-BE87-14427F780C86/0/FreightPlanAppendixBMarinePortsNavigationPlan.pdf.
[5] Ibid.
[6] Port of Grays Harbor, "Port of Grays Harbor Info," http://www.portofgraysharbor.com/about/index.php (accessed June 18, 2018).
[7] The Pasha Group, "Automotive Services at the Port of Grays Harbor," https://www.pashagroup.com/brochures/134/automotive-services-port-grays-harbor (accessed June 18, 2018).

the air cargo market in Washington state.[8] In recent years, Paine Field has emerged as an important gateway for regional air cargo volumes; air cargo tonnage has increased from just 0.4% of all air cargo in the Seattle Customs District in 2013 to nearly 5% in 2018 and 2019. Many smaller, regional airports do not offer passenger services but are critical in connecting rural goods to larger cargo networks.

Several of Washington's industries favor the use of air cargo. The cherry industry, for example, relies on air freight because cherries are time-sensitive and require refrigeration for export. In 2016, cherries comprised over 23 percent of exports from Sea-Tac International Airport, the largest share of any category.[9] Other major industries that utilize air freight include aerospace and medical devices. Each of these cargoes find certain advantages in air transportation, such as speed and security.

Air cargo carriers can be divided into three categories:[10]

- **Combination carriers**, like Delta, store cargo in the belly of passenger aircraft to transport goods between airports. In response to the Covid-19 related slump in passenger air travel, some airlines have begun removing seats to carry more cargo.[11]
- **All-cargo carriers**, like Alaska Airlines, operate at least a portion of their fleet as cargo-only aircraft transporting goods between airports.
- **Express freighters**, like FedEx and Amazon (Prime Air), have integrated capabilities across the supply chain. These companies use internal operations in freight forwarding, ground handling and air cargo to deliver goods 'door-to-door.'

Congestion threatens economic competitiveness and the health of the air cargo industry, as addressed by the Washington State Legislature and private stakeholders. This is caused by stress to one or many supply chain components, leading to increases in costs to shippers as cargo volumes approach capacity. To be efficient, therefore, air cargo relies on support

[8] WSP, "Washington State Air Cargo Movement Study," April 9, 2018, http://leg.wa.gov/JTC/Documents/Studies/AirCargo/AirCargo_presentation_040918.pdf (accessed June 18, 2018).
[9] Community Attributes, "Sea-Tac International Airport Economic Impacts," January 2018, https://www.portseattle.org/sites/default/files/2018-02/180131_CAI_sea_tac_airport_economic_impacts.pdf (accessed June 18, 2018).
[10] Washington State Legislature Joint Transportation Committee, "Washington State Air Cargo Movement Study," November 15, 2017, http://leg.wa.gov/JTC/Meetings/Documents/Agendas/2017%20Agendas/Nov%202017/Air%20Cargo%20presentation.pdf (accessed June 18, 2018).
[11] Tom Reed, "As Cargo Capacity Crisis Mounts, More Airlines Take Out Seats To Make Room," Forbes, April 28, 2020. https://www.forbes.com/sites/tedreed/2020/04/28/as-cargo-capacity-crisis-mounts-more-airlines-take-out-seats-to-make-room/#5fae0cda2f9c

services and connections with other industries such as road transportation, warehousing and handling systems.

Roadways and Surface Transportation

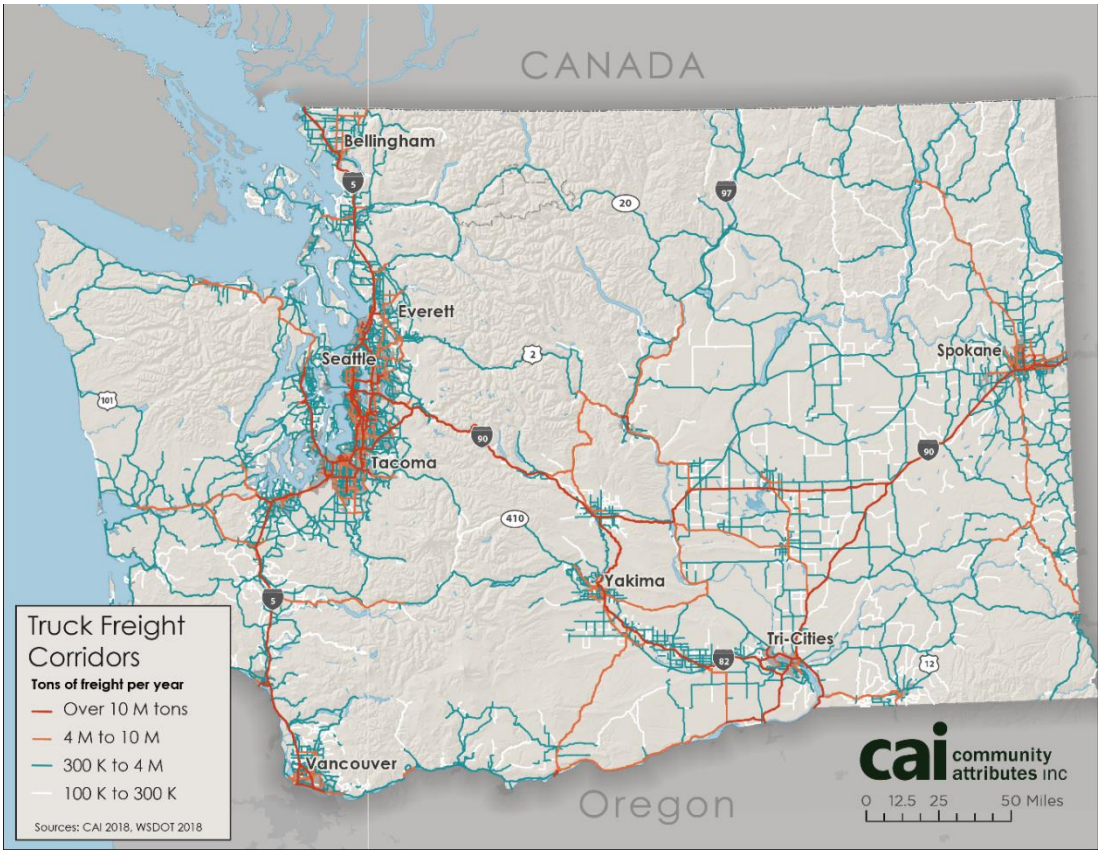
There are over 7,000 miles of highways in Washington state, in addition to thousands of miles of roads. According to the Washington State Department of Transportation, trucks move an estimated $42 million of freight on roadways in the state every hour of every day. The mobility of freight into, out of, within and through the state is integral to its economy and jobs.[12]

Truck freight corridors are densest in the Puget Sound region, followed by Spokane, Vancouver and the region between Yakima and the Tri-Cities. The state's interstate highways constitute the main veins of ground transportation. The four most critical interstate highways (classified as T-1) move more than 10 million tons of freight per year (**Exhibit 4**).[13]

- **Interstate 5**, which connects Mexico and Canada along the West Coast, runs north-south up through the major cities of Vancouver, Tacoma, Seattle, Everett and Bellingham.
- **Interstate 90**, which crosses the North American continent from Seattle to Boston, runs east-west through Seattle, Spokane and Washington's agricultural areas.
- **Interstate 405** is a north-south auxiliary serving the Eastside area of King and Snohomish Counties, including the cities of Renton, Bellevue, Kirkland and Bothell.
- **Interstate 82** connects Interstate 90 and Oregon, serving as a major route for Yakima, the Tri-Cities and developed farmland in the region.

[12] Washington State Department of Transportation, "Trucking," http://www.wsdot.wa.gov/Freight/Trucking/default.htm (accessed June 18, 2018).
[13] Washington State Department of Transportation, "Freight and Goods Transportation," http://www.wsdot.wa.gov/Freight/fgtS/ (accessed June 18, 2018).

Exhibit 4. Washington State Truck Freight Corridors



Illustrative Companies

Transportation, Distribution, and Logistics (TDL)

Washington state is home to 75 public ports, ranging from major containing loading centers such as the Ports of Tacoma and Seattle (Northwest Seaport Alliance), breakbulk operations at the Port of Grays Harbor, to smaller ports along the Columbia and Snake Rivers serving the bulk grain trade.

Rail Transportation

There are two class I railroads in Washington state—Burlington Northern Santa Fe (BSNF) and Union Pacific—and 23 short-line railroads, many supporting the agriculture industry in Eastern Washington. The Washington State Department of Transportation owns the Palouse River and Coulee City (PCC) rail system, the longest short-line freight rail system in Washington. WSDOT contracts with private railroads to operate each of the branches.[14]

- **Burlington Northern Santa Fe (BNSF)** is the larger of the two rail operators in Washington state, with nearly 3,800 employees and

[14] "Freight Rail," Washington State Department of Transportation, http://www.wsdot.wa.gov/Freight/Rail/ (accessed June 4, 2018).

combined payroll in 2017 of more than $304.6 million. BNSF owns 1,334 miles of rail track and in 2017 handled more than 1.7 million carloadings in Washington. BNSF's physical presence in Washington includes intermodal facilities in Seattle (Seattle International Gateway) and Spokane, railyards in Auburn, Bellingham, Centralia, Everett, Pasco, Seattle (Seattle International Gateway), Spokane, Tacoma, Vancouver, Wenatchee, Wishram, and Yakima, and repair shops in Seattle, Spokane, and Vancouver.[15]

- **Union Pacific (UP)** as of 2017 employed a reported 322 employees with an annual payroll of $28.5 million. Serving all major West Coast ports, Union Pacific supports the global supply chain by connecting 23 states by rail. UP owns and operates 532 miles of track and the Argo intermodal facility in Seattle.[16] In early May 2020, UP was forced to permanently close a major cargo depot in Walla Walla, used primarily for produce, due to Covid-19's impact on volume and truck prices.[17]

Air Cargo

A range of businesses provide air cargo services. These include large employers such as **Delta** (which has its own workforce for air cargo ground handling and delivery), and businesses that provide express services such as **FedEx**, **Amazon's Prime Air**, and **DHL**. Major third-party ground handling services include **Swissport**, **WFS**, and **Hanjin Global Logistics**. **Matheson** provides both on and off-airfield air mail processing for the United States Postal Service.

In 2019, an estimated $21 billion in imports and exports were handled—either loaded or unloaded—at Sea-Tac International Airport. Based on a Port of Seattle study, in 2017 an estimated 425,860 metric tons of air cargo was loaded or unloaded at Sea-Tac International Airport alone, 16% more than in 2016. Of this, 43% by tonnage was delivered via express/integrated freight/own-network operations and 31% was delivered by belly freight. Air mail shipments constituted another 14% by tonnage, followed by other freighters (discretionary and allied freight) at 12%.[18]

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[15] "BNSF in Washington," BNSF, https://bnsfnorthwest.com/washington/ (accessed June 4, 2018).

[16] Union Pacific, "Union Pacific in Washington," https://www.up.com/cs/groups/public/@uprr/@corprel/documents/up_pdf_nativedocs/pdf_washington_usguide.pdf (accessed June 4, 2018).

[17] Vicki Hillhouse, "Wallula's Cold Connect shutters its shipping operation," Union-Bulletin, May 12, 2020. https://www.union-bulletin.com/news/health_fitness/coronavirus/wallulas-cold-connect-shutters-its-shipping-operation/article_efaf2b82-e322-5cb2-9b37-9ac9912604ac.html

[18] Port of Seattle, *Sea-Tac International Airport Economic Impacts*, January 2018, p.12.

Marine Freight and Transloading Services
There are marine freight handling facilities across Western Washington. These include at the ports of Vancouver, Longview, Grays Harbor, Tacoma, Seattle, and Bellingham. Marine cargo includes shipping, stevedoring and terminal operations, and transloading. Marine freight destined for or departing from Washington ports ranges from containerized, break bulk (e.g., automobiles, other non-containerized machinery), and bulk (e.g., grain). Shipping activities include both international and domestic shipping lines, such as TOTE Marine serving commerce between Alaska and the lower 48 states. Examples of businesses in this segment include:

- **SSA Marine** was founded in 1949 as Bellingham Stevedoring Company and has since grown into a major cargo handling company with more than 250 locations worldwide. Handling over 113.1 million tons of cargo annually, SSA Marine facilitates loading and unloading of breakbulk, roll-on/roll-off, bulk and perishable goods, as well as intermodal services through its affiliated company Rail Management Services. In Washington, SSA Marine operates 11 terminals in 8 port cities, including Seattle, Tacoma and Everett.
- **Crowley Maritime Corporation** was founded in San Francisco in 1892 and expanded operations into Puget Sound in 1923. Now headquartered in Jacksonville, Florida, the company provides a wide range of services, such as container shipping logistics, freight forwarding, ocean towing, barge transportation, and vessel construction management. In Seattle, Crowley also offers tanker escort and harbor ship assistance.
- **MacMillan-Piper** is one of the Pacific Northwest's largest drayage companies. The business has five facilities located in the region and leverages more than 50 years of experience in the transloading and container freight industry to efficiently move cargo for a wide variety of clients. MacMillan-Piper is partnered with Washington's two largest freight railway companies, BNSF and Union Pacific, providing a link between Washington's rail network and its marine terminal assets.

Trucking Services
A key element in the statewide Global Trade and Supply Chain Management sector is ground transportation. Trucking services enable transfer of cargo between ships and trains (drayage), from ships to warehousing facilities, warehouses to businesses and consumers, and between businesses domestically. Examples of trucking companies include:

- **Allstate Transport**, performing "drayage of ocean containers from the Ports of Seattle, Tacoma and Portland and delivering reliable service to all of Washington State and Northern Oregon." Through its affiliated company Seattle Port Consolidators, Allstate Transport also

provides container loading, unloading and general transloading services. The company has current Interchange Agreements with many steamship lines, rail providers and barge lines, including APL Limited, BNSF, Horizon Lines, Maersk, Nippon Yusen Kaisha, Union Pacific and numerous others. No information is easily accessible online about Allstate Transport's number of employees.

- **United Motor Freight**. United Motor Freight is a transportation company that offers services such as unloading cargo from steamships, transporting cargo directly to container freight stations, transloading, and arranging for transportation from ports to final inland destinations. The company owns and operates freight stations in Tacoma and Seattle, including a 130,680-square feet warehouse and a 6.5-acre yard, as well as 24 trucks that provide movement of cargo throughout Washington state and other states in the Northwest. No employment information is easily accessible online for United Motor Freight, but the company calls itself "the leading project cargo, long and heavy haul, and drayage and intermodal delivery company in the greater U.S. and Canadian Pacific Northwest region."
- **Heartland Express**. Heartland Express is a major truckload carrier based in North Liberty, Iowa, serving shipping lanes across the United States. In 2017, the company acquired Interstate Distributor Co. for approximately $113 million, increasing its presence in Tacoma and its services such as long-haul trucking, irregular route shipping, intermodal services, logistics and warehouse services. When IDC was acquired, it owned a fleet of approximately 1,350 tractors and 4,700 trailers, and it operated in the Seattle-Tacoma region, Oregon, Southern California, Phoenix and Nashville. Little to no information is easily accessible online on Heartland Express' employment numbers.
- **Trans-System**. Trans-System, based in Cheney, Washington, is the parent organization for three transportation companies that make up a fleet of nearly 1000 tractors: System Transport, TW Transport, and James J. Williams. According to its website, "System Transport is the largest flatbed carrier based on the West Coast," and it offers long-haul trucking, third party logistics and regional trucking in areas such as the Pacific Northwest. TW Transport is a refrigerated service transportation company that operates primarily in western states. James J. Williams transports dry and liquid bulk freight in the Pacific Northwest with 80 trucks and 115 trailers. No employment information for these companies is easily accessible online.
- **Oak Harbor Freight Lines**. Founded in 1916, Oak Harbor Freight Lines primarily provides less than truckload (LTL) shipping. It also provides logistics services for businesses requiring truckload, partial-load, flatbed, refrigerated and intermodal shipping, as well as freight forwarding, importing/exporting and warehousing. Oak Harbor

operates 35 terminals, with 8 in Washington state, and employs over 1,300 total workers.

Freight forwarding and warehousing

Freight forwarders range from large, multinational operations such as Expeditors International, which deals with both air and marine cargo, to smaller family-run operations that specialize in a product or cargo type. Freight forwarding and warehousing entail a suite of services on behalf of shippers. These include tracking inland transportation, preparation of shipping and export documents, storage, booking cargo space, negotiating freight charges, freight consolidation, cargo insurance, and filing of insurance claims.[19] Examples of these service providers in Washington include:

- **Expeditors** provides a variety of logistics services including freight forwarding, warehousing, supply chain consulting and transportation by air, ocean, truck and rail. Headquartered in Seattle, over 16,500 Expeditors employees operate in locations across 103 countries. In 2017, 42 percent of the company's $6.92 billion revenue came from operations related to air transportation and 30 percent came from the ocean transportation sector. The many industries served by Expeditors include retail, healthcare and aerospace.
- **Lineage Logistics** is a warehousing and logistics company with over 100 facilities across the United States. 11 of these locations are in Washington state, including 3 port facilities in Seattle and Tacoma. Specialized in food storage, Lineage Logistics offers refrigerated warehousing, seafood processing, export/import services and rail and truck transloading.
- **Radiant Global Logistics** is a global transportation and supply chain management company headquartered in Bellevue, Washington. Since its launch in 2005, the company has acquired a network of brands, such as Airgroup, Adcom Worldwide and Wheels Group, which have expanded Radiant Logistics' reach to more than 100 locations in the United States, Canada and worldwide. Radiant Logistics serves an array of industries with import/export management, warehousing, assembly and transportation by air, ocean, truck and rail.

Materials Handling

There are several companies in Washington state which sell and lease materials handling equipment. **DACO Corporation**, for example, is based in Kent, Washington and offers pallets, conveyors, lift tables, cleaning items and other supplies to materials handling companies and companies with

[19] *Business Dictionary*, "Freight Forwarder," http://www.businessdictionary.com/definition/freight-forwarder.html (accessed June 4, 2018).

loading docks. Suppliers like DACO also have special equipment for the safe and secure handling of agricultural products and seafood.[20]

Materials handling equipment extends to vehicles as well. **Papé Material Handling** offers forklifts, railcar movers, aerial positioning devices and container handlers from 8 locations in Washington state.[21] These are used in ports, container yards and warehouses.

Supply Chain Management in Other Industries

E-Commerce

This industry is dominated by **Amazon**, which has approximately 566,000 employees worldwide[22] with many who call Washington state home. The company's fulfillment services consist of obtaining and warehousing inventories, processing customer orders and transaction costs, packaging items and supply chain management for Amazon's manufactured electronic devices.[23] Additionally, Amazon Logistics coordinates with local delivery providers to transport packages from central locations such as the company's fulfillment centers. Amazon Seller Central also allows individual businesses to import and sell products through Amazon.com, connecting these sellers with container and truck shipping companies.

While the majority of the company's 45,000 employees are located at its corporate headquarters in Seattle, there are also many thousands of others in Washington state in supply chain-related occupations. Approximately 2,500 employees are located at fulfillment centers in Kent, DuPont, and Sumner.[24] Supply chain activities at AmazonFresh and Whole Foods Market, both subsidiaries of Amazon, also have a strong presence in the state.

Local Manufacturers

Boeing, Paccar, and many other firms engaged in product assemblage rely on the importation of key components and raw materials, either from overseas

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[20] DACO Corporation, "Contact Us," 2018: https://www.dacocorp.com/contact-us.
[21] Papé Material Handling, 2018: www.papehm.com.
[22] Amazon.com, Inc., *Form 10-K 2017*, retrieved from SEC EDGAR website, https://www.sec.gov/Archives/edgar/data/1018724/000101872418000005/amzn-20171231x10k.htm.
[23] Ibid.
[24] Todd Bishop, "Amazon hiring 1,200 people at new fulfillment center in Seattle region," *GeekWire*, January 18, 2016, https://www.geekwire.com/2016/amazon-hiring-1200-people-at-new-fulfillment-center-in-seattle-region/; John Gillie, "Amazon formally opening new DuPont fulfillment center Friday," *The News Tribune*, February 12, 2015, http://www.thenewstribune.com/news/business/article26254849.html; Angel Gonzalez, "Amazon to open new warehouse in Sumner," *The Seattle Times*, June 1, 2017, https://www.seattletimes.com/business/amazon/amazon-to-open-new-warehouse-in-sumner/.

or other parts of the U.S. Similarly, many of these firms are active exporters and rely on workers skilled in international trade and sales.

Supply Chain Services

Compliance and certifications
While most larger companies have their own internal compliance departments, **Allocca Enterprises** is an example of a firm that provides training to smaller businesses on trade finance and compliance with import and export laws.[25]

Law firms that specialize in International Trade in Arms Regulations (ITAR) provide another support service to exporters. ITAR is comprised of federal regulations designed to control the trade of defense-related technology.[26]

Trade Finance
Trade finance encompasses the handling of payments and financing of international sales and purchases. It can be divided into four types of finance: providing cash in advance (when trade buyers lack strong credit), handling letters of credit, documentary collection and creating open account payment terms.[27] Banks that provide these services include **U.S. Bank**, **Chase Bank**, **Wells Fargo**, **Bank of America** and the **Export-Import Bank**.

The Export-Import Bank exists as a U.S. government corporation, supporting transactions that private banks ordinarily would not. Export credit insurance, which covers financial and political risks of international trade, comprises a bulk of its transactions.[28]

Managing procurement costs, receiving payment, and paying bills are all aligned in the supply chain, from procurement to sales. Examples of banks that offer small and medium enterprise (SME) financing for trade include **Banner Bank**, **Umpqua Bank,** and **Washington Trust Bank**.[29]

[25] Interview with Doug Kemper, Director of International Banking, Washington Trust Bank, June 8, 2018.
[26] Ibid.
[27] Interview with John Brislin, Regional Director, Export-Import Bank of the United States, June 21, 2018.
[28] Ibid.
[29] Interview with Doug Kemper, Director of International Banking, Washington Trust Bank, June 8, 2018.

WORKFORCE SYSTEM

Washington's educational system for training students for fields in global trade and supply chain management includes certification programs, associate degrees, Bachelor of Applied Science and BA and BS degrees, and master's degrees programs. Illustrative programs are detailed below.

Highline College

Students at Highline College with an associate degree can earn a Bachelor of Applied Science degree in Global Trade and Logistics. This program provides skills and knowledge relevant to current professionals in the supply chain sector, as well as students positioning themselves to enter this sector prepared. It is offered in collaboration with Central Washington University's Supply Chain Management certificate program. Highline College' hosts the Center of Excellence for Global Trade and Supply Chain Management which conducts research, provides training and connects students with industry members across Washington state.

Lake Washington Institute of Technology (LWTech)

Located in Kirkland, Washington, Lake Washington Institute of Technology offers a Bachelor of Applied Science degree in Transportation, Logistics, and Supply Chain Management. This program is designed for students who have previously earned an associate degree, and it aims to prepare them for supply chain management positions. LWTech's Diesel and Heavy Equipment Technician program is also relevant, educating and mentoring students in the latest technology, equipment and systems that power Washington state's supply chain sector.

University of Washington

The largest educational institution in Washington state, the University of Washington is home to thousands of undergraduate and graduates, many of whom are enrolled in the Foster School of Business and its Master of Supply Chain Management program. This accelerated, work-compatible program is designed to produce leaders in logistics and supply chain fields. The university also offers undergraduate courses and degrees in Labor Studies and International Business.

Tacoma Community College

Students who earn Tacoma Community College's Associate Degree in Applied Science, Business can choose to concentrate in Global Logistics, and they complete a for-credit internship as part of the program. Students can also independently pursue a certificate in Global Transportation and Secure Logistics.

Shoreline Community College

Shoreline Community College offers two programs in purchasing and supply chain management: an associate degree in Applied Arts and Sciences and a Certificate of Proficiency.

North Seattle College

Students at North Seattle College can earn a Bachelor of Applied Science in International Business degree and a certificate in International Business. These programs are for those already with business and accounting associate degrees or those seeking increased upward mobility in the international trade sector.

Central Washington University

A partner of Highline College, Central Washington University offers a certificate program for undergraduate students studying business. The university states that this program prepares students for careers as analysts, decision makers and managers in any and all segments of an organization's supply, production and distribution chain. Students in the program have completed internships with leading regional companies like Boeing.[30]

Western Washington University

Western Washington University students can earn a Bachelor of Science in Manufacturing and Supply Chain Management (MSCM), completing an education covering the areas of operations management, business and engineering technology. Approximately 100 to 130 students participate in the program, and each completes two internships during their time of study. Some of the many companies at which MSCM students have interned include Boeing, Crane Aerospace, Microsoft, PACCAR and Target Distribution. Western Washington University reports that there is a high industry demand for the MSCM program, with 97 percent of graduates landing jobs like supply managers, purchasing managers, senior planners or others by graduation.[31]

Origin and Destination Markets and Cargo Handling

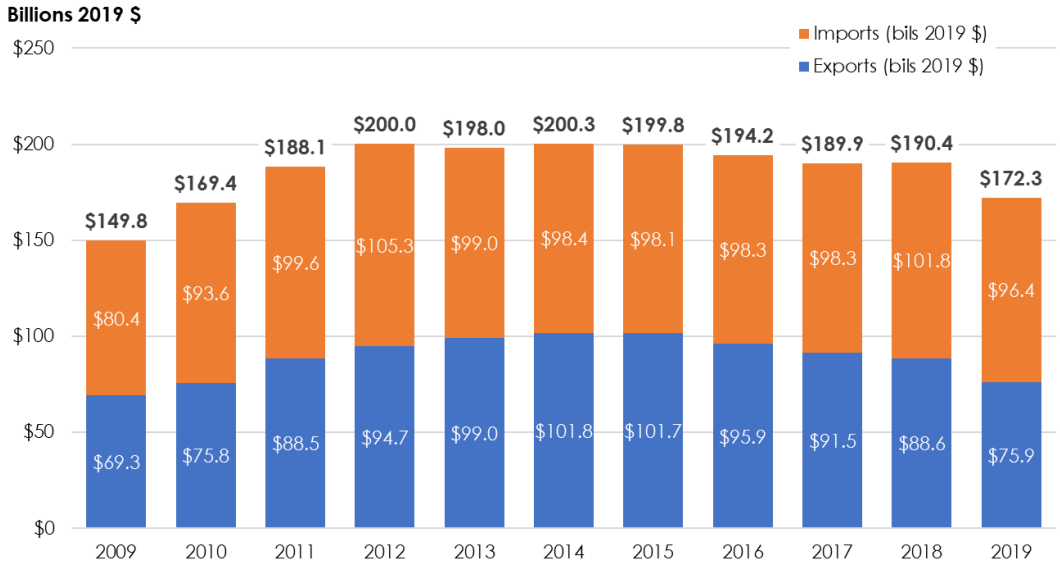
Washington is a major hub for both the import and export of goods between the U.S. and foreign markets and between origins and destinations within the U.S. In 2019, Washington state ports facilitated the movement of $172.3 billion in imports and exports across rail, truck, airplane, and maritime

[30] Tasha, *Central Washington University School of Business*, http://www.cwu.edu/business/tasha.
[31] Manufacturing and Supply Chain Management, BS, *Western Washington University*, https://www.wwu.edu/majors/manufacturing-and-supply-chain-management-bs.

vessel modes (**Exhibit 5**). Some of these goods either originate or are destined for Washington state businesses, such as key components and raw materials used as inputs by local manufacturers. Likewise, a share of imports is destined for local markets to meet demand from local individual and household consumers. However, a significant share of trade, particularly imports, is handled in Washington but ultimately destined for the Midwest. The handling of this pass-through cargo is a value-added activity that benefits the Washington state economy and households.

After a low of $149.8 billion in imports and exports in 2009, trade through Washington ports returned to previous levels by 2011 and grew to a high of $200.3 billion in 2014. Imports have stayed fairly consistent between 2011 and 2019, while exports grew from 2011 to highs of $101.8 billion and $101.7 billion in 2014 and 2015 before declining to $75.9 billion in 2019.

Exhibit 5. International Trade, Imports and Exports through Washington State Ports, 2009-2019 (2019 $)



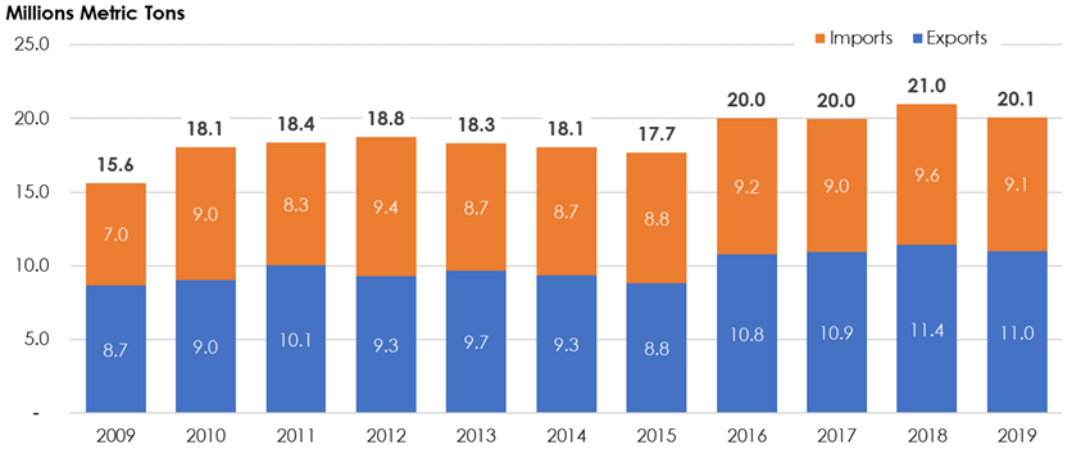
Sources: U.S. Census Bureau, 2020; Federal Reserve Bank of St. Louis, 2020; Community Attributes Inc., 2020.

Similarly, the amount of containerized cargo by weight through Washington state ports has recovered from a low in 2009 of 15.6 billion kg. Since 2016, containerized marine cargo weights have been fairly consistent, averaging 20 billion kg containerized cargo (**Exhibit 6**).

The first months of 2020 have seen a dramatic decrease in containerized shipments through the Northwest Seaport Alliance. The number of containers shipped in March and April dropped by more than 20% with 32 and 39 blank sailings respectively. Auto imports and breakbulk have also been affected, though less so than containerized trade. Imported autos from

January to April 2020 decreased by 7.8% compared to 2019 and breakbulk experienced a drop of less than 1%.[32] By weight, containerized cargo in the first quarter of 2020 is down 16.7% for imports and 6.7% for exports compared to the same period in 2019. Two-way trade decreased by 11.9%, excluding commodities that pass through Washington but do not originate in the state.

Exhibit 6. Containerized Cargo through Washington State Ports, Imports and Exports (by weight), 2009-2019

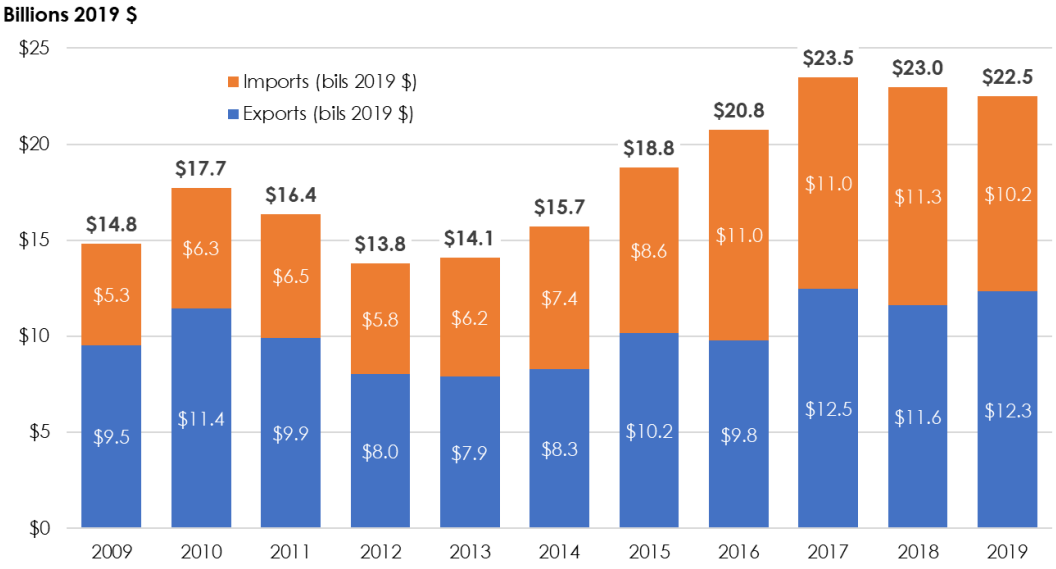


Sources: U.S. Census Bureau, 2020; Community Attributes Inc., 2020.

Air cargo value has grown consistently over this period with exports outpacing imports for the majority of these years. Starting in 2014 imports are a noticeably greater share of the total value with imports making up 53% of the total in 2016. Air cargo value has grown significantly since 2013 while total international trade has remained flat over the same period (**Exhibit 7**).

[32] Andrew McIntosh, "Seattle, Tacoma marine cargo volumes plunge for second month in a row," Puget Sound Business Journal, May 18, 2020.

Exhibit 7. Air Cargo Total Value, 2009-2019 (2019$)



Sources: U.S. Census Bureau, 2020; Federal Reserve Bank of St. Louis, 2020; Community Attributes Inc., 2020.

The aerospace industry is particularly reliant on exports in Washington state. Other major industries reliant on imports and exports include petroleum products and various agriculture and manufacturing activities (**Exhibit 8**).

Exhibit 8. Largest Merchandise and Commodities Industries in Washington by Sales and Reliance on Imports and Exports, 2019

Rank	Industry	Estimated Total Sales, 2019	Total Trade/ Sales
1	Aerospace Products & Parts	$85.2	1.03
2	Petroleum & Coal Products	$23.4	1.03
3	Navigational/measuring/medical/control Instrument	$6.2	0.85
4	Fruits & Veg Preserves & Specialty Foods	$4.9	0.93
5	Miscellaneous Manufactured Commodities	$4.8	0.66
6	Pulp, Paper & Paperboard Mill Products	$4.8	0.76
7	Other Wood Products	$3.5	0.37
8	Sawmill & Wood Products	$3.4	0.48
9	Semiconductors & Other Electronic Components	$3.3	0.67
10	Plastics Products	$3.2	0.62
11	Dairy Products	$2.8	0.78
12	Seafood Prods, Prepared, Canned & Packaged	$2.7	0.60
13	Foods, Nesoi	$2.7	0.72
14	Architectural & Structural Metals	$2.7	0.45
15	Beverages	$2.7	0.57
16	Pharmaceuticals & Medicines	$2.3	0.76
17	Basic Chemicals	$2.2	0.89
18	Meat Products & Meat Packaging Products	$2.1	0.80
19	Converted Paper Products	$2.1	0.81
20	Bakery & Tortilla Products	$2.0	0.56

Sources: U.S. Census Bureau, 2020; Washington State Office of Financial Management, 2019; Washington State Department of Revenue, 2020; Community Attributes Inc., 2020.

DIRECT ACTIVITIES

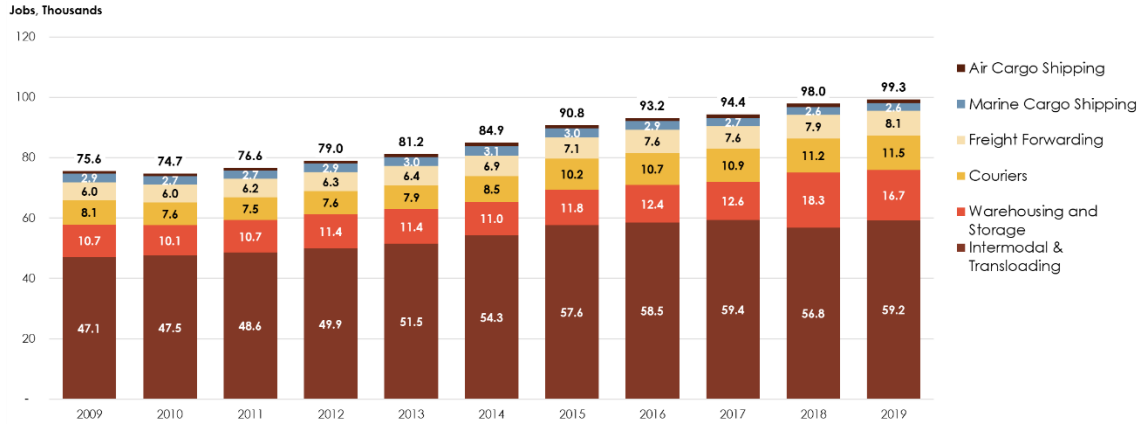
Jobs, Wages, Business Revenues

The following key metrics are reported by: 1) firms and industries primarily engaged in global trade and supply chain management, or what will be referred to as "all in" activities; and 2) additional jobs, wages, and revenues associated with workers engaged in global trade and supply chain management in other industries across the economy.

In 2019, an estimated 99,300 workers were employed in businesses wholly or primarily engaged in global trade and supply chain management; this was up from 94,000 in 2017, the first year this data was tracked. The largest category of activities was intermodal & transloading (59,200), a group that includes marine cargo handling, rail, trucking, and transloading. The second largest category of jobs were in warehousing & storage, with an estimated 16,700 workers **(Exhibit 9**). This was a decline from 2018, when more than 18,000 workers were employed, but well above 2017.

Since 2010, industries engaged in global trade and supply chain management have added nearly 25,000 jobs, representing a 33% increase. Intermodal & transloading added 11,700 jobs, followed by 6,600 in warehousing and storage, and 3,900 jobs in courier businesses.

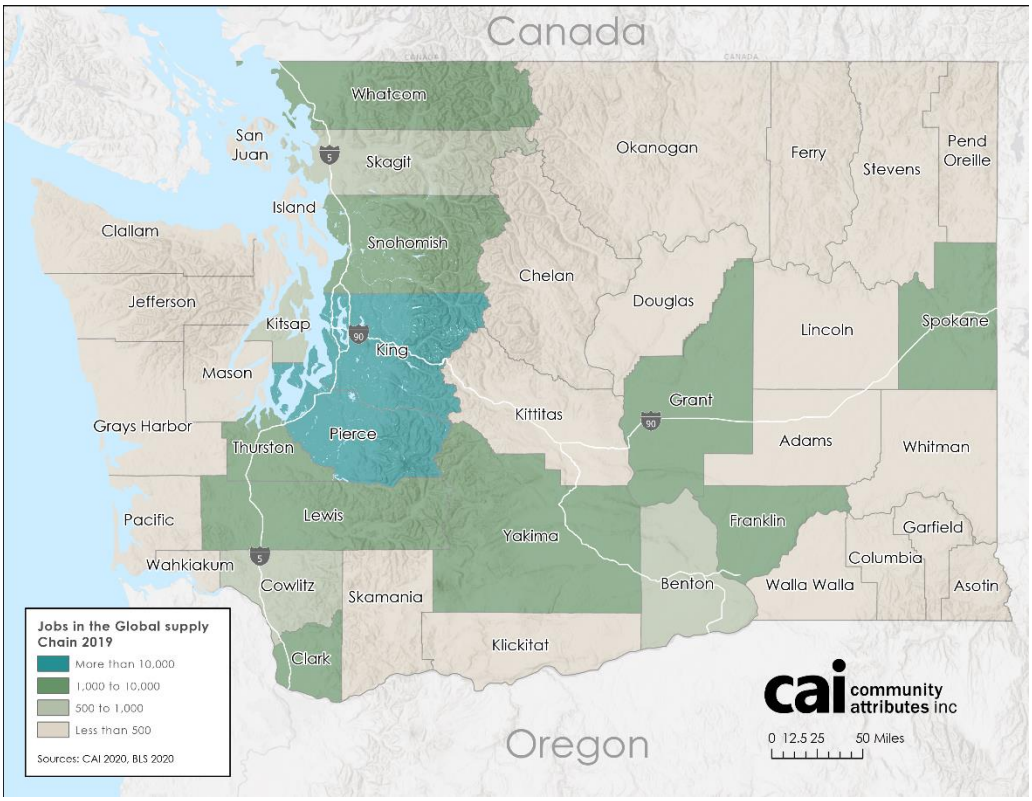
Exhibit 9. Total Jobs in Global Trade and Supply Chain Management, Washington State, 2009-2019



Sources: U.S. Bureau of Labor Statistics, 2020, U.S. Census Bureau, 2019; Community Attributes Inc., 2020.

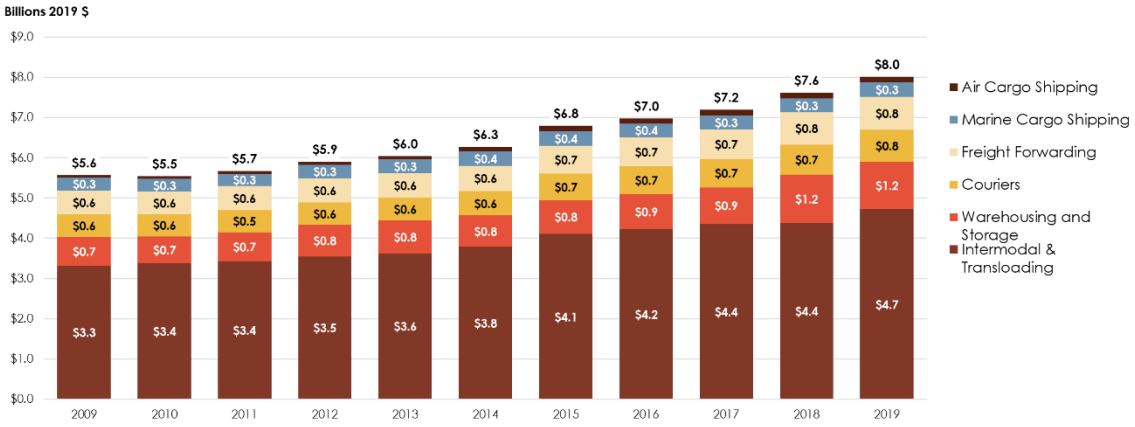
King County was the largest hub for global trade and supply chain management jobs (**Exhibit 10**) with more than 45,000 positions, followed by Pierce County with 24,000 workers (home to the Port of Tacoma facilities and an extensive logistics and warehousing system). There are also several other counties with sizable concentrations of jobs, including Spokane, Snohomish, and Yakima counties.

Exhibit 10. Map of Jobs by County, 2019



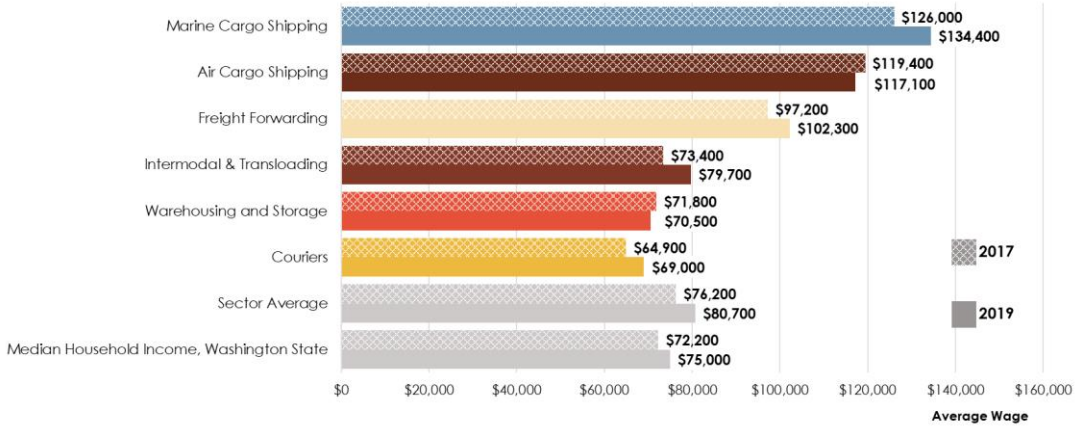
Sectoral income, included supplemental benefits, summed to more than $8.0 billion in 2019, or $80,700 per worker across all sectors. Total income, after adjusting for inflation, increased 44% overall since 2010, while the sector-wide average wage increased nearly 9% over this same period. Marine cargo shipping workers enjoyed the largest average income—including estimated benefits—in 2019, at $134,400 per worker, followed by air cargo shipping with an estimated income of $117,100 (**Exhibit 11** and **Exhibit 12**).

Exhibit 11. Income (estimated) by Subsector, 2009-2019 (2019 $)



Sources: U.S. Bureau of Labor Statistics, 2020, U.S. Census Bureau, 2019; Community Attributes Inc., 2020.

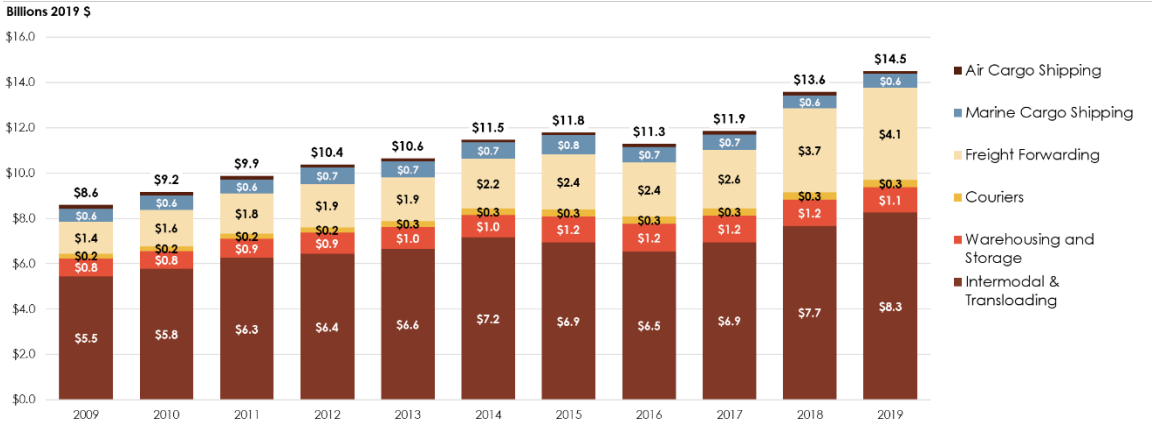
Exhibit 12. Average Wage, by Subsector, 2017 and 2019 estimated, (2019 $)



Sources: U.S. Bureau of Labor Statistics, 2020, U.S. Census Bureau, 2020; Community Attributes Inc., 2020.

Business revenues were estimated through use of gross business income data collected from the Washington State Department of Revenue and various auxiliary data sources, such as news reports and SEC filings. Sector revenues in 2019 reached $14.5 billion. Since a recent low in 2009, sector revenues have grown 68% in real, inflation-adjusted terms. The largest gains over this period were in freight forwarding, which saw revenues increase by more than $2.7 billion in real, inflation-adjusted terms, or 190% (**Exhibit 13**).

Exhibit 13. Business Revenues by Subsector, 2009-2019 (2019 $)



Sources: U.S. Bureau of Labor Statistics, 2020, U.S. Census Bureau, 2019; Washington State Department of Revenue, 2020; Community Attributes Inc., 2020.

Occupations in Other Industries and Total Sectoral Direct Impact

In addition to businesses primarily involved in global trade and supply chain management, there are a large number of workers in other industries also directly engaged in this work. Examples include procurement and logistics in aerospace, e-commerce, and commodity producer industries such as agriculture. A list of relevant supply chain management positions was developed in consultation with educational institutions, other reports and studies, and occupational data sources. These positions are summarized for 2019 in **Exhibit 14** below.

Exhibit 14. Leading Occupations in Global Trade and Supply Chain Management, 2019

Occupation	Statewide GT & SCM Jobs
Buyers and Purchasing Agents	16,100
Production, Planning, and Expediting Clerks	10,900
Compliance Officers	10,760
Logisticians	6,710
Transportation, Storage, and Distribution Managers	2,880
Purchasing Managers	2,170
Cargo and Freight Agents	2,020
Procurement Clerks	980
Aircraft Cargo Handling Supervisors	120
Total	**52,640**

Sources: Washington State Employment Security Department, 2020; Community Attributes Inc., 2020.

Supplementing these jobs estimates, further analysis was done to assess the number of workers in e-commerce engaged in supply chain management. Companies such as Amazon support global supply chain across an extensive range of activities, including logistics, transportation (e.g., Prime Air), and warehouses and fulfilment centers, as well as back office software engineering and data science to develop online platforms and systems for managing inventory, delivering products to consumers, and working with third-party vendors.

Factoring in these considerations, an estimated 72,700 workers were employed in other industries in various roles and capacities, up from 62,800 in 2017. These include 10,300 in aerospace, 4,000 in other manufacturing operations in the state, and an estimated 30,500 in e-commerce, primarily at Amazon but also at other businesses such as Zulily, based on custom analysis for this report (**Exhibit 15**).

Workers engaged in supply chain management in other industries earned an estimated more than $13.5 billion in labor income in 2019 and supported revenues within their businesses of employment of $31.1 billion. Workers in these industries in many cases actually earned more than in industries fully engaged in global trade and supply chain management services; the average wage for these workers in 2019, including benefits, was $125,100, compared to $80,700 among the latter. E-commerce global trade and supply chain management jobs were the highest paying, with an average total compensation per worker of $257,000 in 2019.

Exhibit 15. Jobs Summary, Washington State, 2019

Segment of Sector	Jobs	Income (Mils $)	Average Compensation	Revenues (Mils $)
A. Industry Subsectors				
Intermodal & Transloading	59,200	$4,719.6	$79,700	$8,258.1
Air Cargo Shipping	1,200	$140.5	$117,100	$124.2
Marine Cargo Shipping	2,600	$349.6	$134,400	$605.0
Freight Forwarding	8,100	$828.5	$102,300	$4,075.1
Warehousing and Storage	16,700	$1,177.2	$70,500	$1,115.5
Couriers	11,500	$793.5	$69,000	$321.2
Subtotal	*99,300*	*$8,008.9*	*$80,700*	*$14,499.1*
B. Supply Chain Management Workers in Other Industries				
Aerospace	10,300	$1,558.7	$151,300	$9,576.3
Agriculture and Food & Beverage Processing	600	$36.1	$60,200	$264.8
Other Manufacturing	4,000	$380.8	$95,200	$1,933.0
E-commerce	30,500	$7,839.4	$257,000	$10,721.7
Other Industries	27,300	$3,686.4	$135,000	$8,582.1
Subtotal	*72,700*	*$13,501.4*	*$185,700*	*$31,077.9*
Total (A+B)	**172,000**	**$21,510.2**	**$125,100**	**$45,577.0**

Sources: Washington State Employment Security Department, 2020; U.S. Bureau of Labor Statistics, 2020; Washington State Office of Financial Management, 2019; Community Attributes Inc., 2020.

ECONOMIC IMPACTS OF THE SECTOR

Sectoral impacts to the statewide economy are computed through us of the Washington State Input-Output Model. Estimates represent total jobs, labor compensation, and business revenues supported directly and through upstream business-to-business transactions (indirect impacts) and worker and household income expenditures on goods and services (induced impacts).

In 2019, those businesses and activities accounted for as "all-in" for the global trade and supply chain management sector had a total statewide impact of 211,300 jobs (up from 192,500 jobs in 2017), $14.4 billion in labor income (including benefits), and nearly $34.3 billion in business revenues (**Exhibit 16**).

Exhibit 16. Table of Economic Impacts, All-In Activities, Statewide, 2019

	Direct	Indirect	Induced	Total
Jobs	99,300	31,300	80,700	211,300
Total Compensation (mils 2019 $)	$8,008.9	$1,940.8	$4,459.5	$14,409.1
Business Revenue (mils 2019 $)	$14,499.1	$6,593.5	$13,160.2	$34,252.8

Sources: Washington State Office of Financial Management, 2019; Community Attributes Inc., 2020.

These impacts can be translated into industry impact multipliers. For each job in global trade and supply chain management, a total of 2.1 jobs were supported across the economy. Likewise, each million dollars in final demand (revenues) supported, either directly or through multiplier effects, nearly 15 jobs across the state (**Exhibit 17**).

Exhibit 17. Sector Impact Multipliers, All-In Businesses and Activities

Type	Multiplier
Total output per $ final demand	2.4
Total jobs per direct job	2.1
Total compensation per $ direct income	1.8
Total jobs per $ mil final demand	14.6

Impacts are also assessed for workers and related activities outside the above "all-in" industries, such as supply chain jobs and associated income and revenues among e-commerce and manufacturing businesses. For example, in 2019 these activities had a total statewide impact of 217,700 jobs (up from 170,600 jobs in 2017) and $21.8 billion in labor income (**Exhibit 18**). For each job engaged in supply chain management in a manufacturer, e-commerce, or other industry across the state, a total of 3.0 jobs are supported throughout the state economy (**Exhibit 19**).

Exhibit 18. Table of Economic Impacts, Activities in Other Industries, Statewide, 2019

	Direct	Indirect	Induced	Total
Jobs	72,700	23,100	121,900	217,700
Total Compensation (mils 2019 $)	$13,501.4	$1,524.3	$6,734.7	$21,760.4
Business Revenue (mils 2019 $)	$22,516.0	$4,770.2	$19,874.3	$47,160.5

Sources: Washington State Office of Financial Management, 2019; Community Attributes Inc., 2020.
Note: reported direct revenues in the impact summary above is less than reported in the summary table of direct revenues earlier in this report. This is due to an adjustment, for the purposes of impact modeling, in gross margins for retail and wholesale activities.

Exhibit 19. Sector Impact Multipliers, All-In Businesses and Activities

Type	Multiplier
Total output per $ final demand	2.1
Total jobs per direct job	3.0
Total compensation per $ direct income	1.6
Total jobs per $ mil final demand	9.7

Tracking the Impacts of Covid-19 on Washington State's Global Trade and Supply Chain Management System

The economic impacts of the pandemic are felt across nearly all aspects of the global trade and supply chain management system in Washington state. Washington state has designated several supply chain sector activities "essential," including warehouse workers, employees of logistics firms, and packaging materials manufacturers and distributors.[33] In addition, longshoremen have been able to maintain work during the crisis, but the economic slowdown has meant fewer hours for "casual" workers; these are individuals who support longshore activities and aspire to join the International Longshore and Warehouse Union (ILWU) but need to accumulate sufficient labor hours to apply.

The first economic effects of the Covid-19 pandemic were felt after the virus disrupted manufacturing in China, creating a "supply shock." Closed factories and quarantined workers in the world's largest final assemblage hub dramatically reduced the volume of physical goods produced and shipped to the U.S. and other markets. In Washington state, the early effect of this supply shock was a sharp increase in blank sailings, or cancellations of scheduled cargo vessel arrivals at Washington state ports.

Following the supply shock, the virus has caused a significant reduction in demand in the U.S., such as from temporary shuttering of retailers, social distancing, and reduced household consumption. These effects have further reduced demand of shipments, in turn further reducing port and logistics activities.

Consumer Demand

The pernicious extent of the virus and economic costs is now being deeply felt across the U.S. and the world, affecting trade, supply chains, and household consumption. While China has seemingly thus far succeeded in defeating the virus, what was once a supply shock has transformed into a global demand shock, as consumption has fallen precipitously.

For Washington state, consumer spending at the end of April is down 26.7% compared to early January 2020.[34] The largest decrease in spending has been on restaurants and hotels, transportation, and entertainment and recreation, which averaged a 69.2% drop. Over the same period spending on apparel and

[33] Washington State Coronavirus Response. https://coronavirus.wa.gov/what-you-need-know/whats-open-and-closed/essential-business

[34] Opportunity Insights. Economic Tracker. May 17, 2020. https://tracker.opportunityinsights.org/

general merchandise and healthcare fell approximately 40% and 49% respectively, while grocery spending increased 13%. Consumer spending in the Seattle Metro Area dropped sooner and more precipitously than the nation at large, but less than San Francisco, New York, or Washington D.C.

It is still unclear how effective government policies are at encouraging spending during this pandemic. Consumer spending rose slightly after federal stimulus payments were dispersed in mid-April but leveled off again at less than 80% of January levels. Even as some states begin to experiment with reopening parts of the economy, early evidence indicates that lifting or relaxing stay-at-home orders may not stimulate consumer spending. Georgia began opening sections of the economy on April 24th, the first state to do so. The number of businesses open and hours worked only slightly increased after lifting the stay-at-home order. The share of small businesses open in Georgia continued to hover at approximately 70% of January levels.[35]

Another strong indication that consumer spending patterns are not directly affected by government policies is that consumer spending began to drop before stay-at-home orders were issued. Even in states that implemented social distancing policies relatively early, like Washington, economic measurements including consumer spending, share of small businesses open, time spent at work, and hours worked at small businesses began to fall approximately 10-days before orders were issued. The same pattern can be seen in areas that have yet to issue stay-at-home orders. This behavior points to consumers making their own decisions about the safety of shopping rather than relying on government advice. Until consumers feel confident that the public health crisis is under control and the economy is back on track, this decreased demand means less work for the global trade and supply chain management sector.

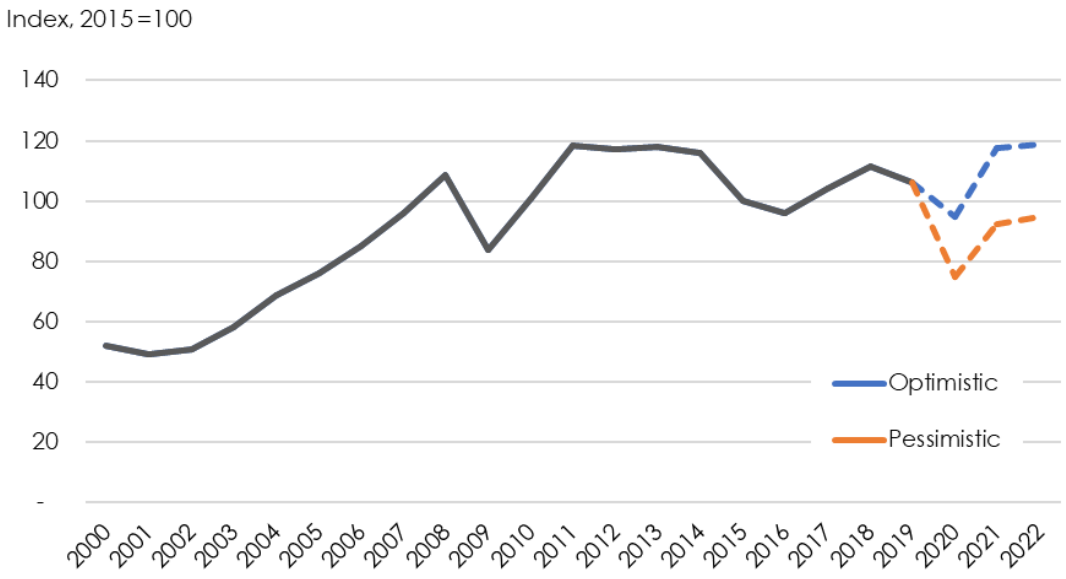
Global Economic Forecasts

This unprecedented economic upheaval comes at a time when global trade was already declining due to trade tensions and a slowing global economy. The value of world trade in goods was down 3% in 2019 compared to the year before, while trade volume decreased 0.1%.[36] The World Trade Organization forecasts significantly lower trade in 2020, even in the most optimistic scenario (**Exhibit 20**). The largest difference between optimistic and pessimistic forecasts are in how quickly the world economy rebounds from this crisis. Under the WTO's more hopeful predictions, world trade volume

[35] Emily Badger and Alicia Parlapiano. *The New York Times*. May 7, 2020. Link to article.
[36] World Trade Organization. Press Release. April 8, 2020. https://www.wto.org/english/news_e/pres20_e/pr855_e.htm

could be fully recovered by 2021 and be at its highest level in the past five years.

Exhibit 20. Global Merchandise Trade Volume Forecast



Source: World Trade Organization, 2020; St. Louis FRED, 2020.

The International Monetary Fund has revised GDP forecasts down due to the Covid-19 pandemic. Across Washington's ten largest merchandise and commodity export markets, the IMF is now forecasting a 6.6% decrease in GDP (**Exhibit 21**). Canada and Mexico, the state's largest trade partners alongside China, are both forecast to contract by more than 6%.

Exhibit 21. International Monetary Fund Forecast Adjustments for Washington's Largest Goods Export Markets

Country	WA Exports 2019 (mils $)	IMF Oct. 2019 Forecast for 2020	IMF April 2020 Forecast for 2020	Change
Canada	$8,255	1.8%	-6.2%	-8.0%
Japan	$6,905	0.5%	-5.2%	-5.6%
China	$4,725	5.8%	1.2%	-4.6%
Korea, South	$2,388	2.2%	-1.2%	-3.4%
Mexico	$2,366	1.3%	-6.6%	-7.9%
Qatar	$2,200	2.8%	-4.3%	-7.1%
United Kingdom	$1,851	1.4%	-6.5%	-8.0%
Germany	$1,737	1.2%	-7.0%	-8.2%
Taiwan	$1,604	1.9%	-4.0%	-6.0%
Turkey	$1,418	3.0%	-5.0%	-8.0%
Rest of the world	*$20,278*			
World	**$53,727**	**3.6%**	**-3.0%**	**-6.6%**

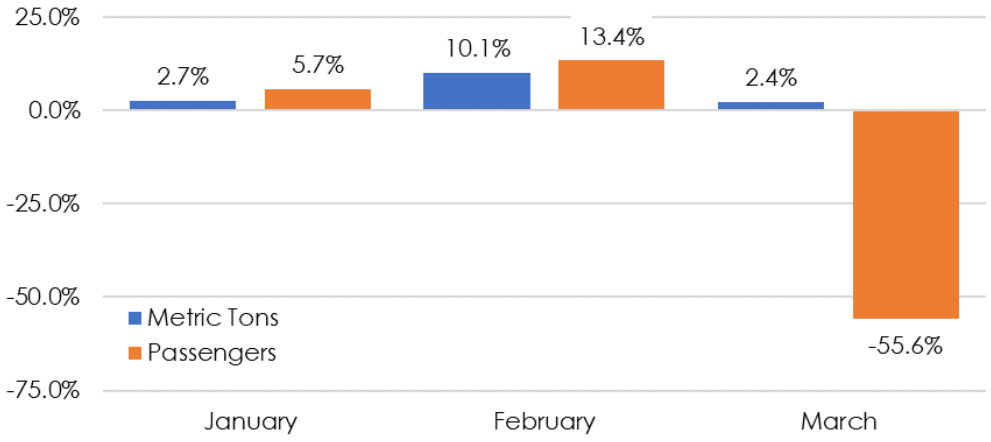
Sources: U.S. Census Bureau, 2020; International Monetary Fund World Economic Outlook Database, October 2019 and April 2020; Community Attributes Inc., 2020.
Export figures have been adjusted for pass-throughs.

Air Cargo

One of the most impacted areas of the global trade and supply chain management sectors is the airline and airfreight industries. Passenger air travel is an important aspect of international trade. Air freight not flown on dedicated cargo planes is often carried by belly freight in the hold of passenger airplanes. These commodities usually have a high value-to-weight ratio or are perishable, such as Washington state cherries.

Passenger air travel plummeted starting in March. This translates into fewer planes and belly freight capacity, higher transportation costs, and narrower margins for exporters. In January, February, and March of 2020, monthly air cargo tons through Sea-Tac were slightly above 2019 levels, while passenger counts in March are 55.6% less than in March last year (**Exhibit 22**). Passenger volume in April and May are likely down similar amounts in April and May, but the scale of the impact on freight has yet to be seen.

Exhibit 22. Air Cargo and Passenger Volume Change, 2019-2020



Sources: Port of Seattle, 2020.

Freight volumes may not change as drastically as passenger volumes due to airlines substituting cargo for passengers. Some airlines, such as American, have almost doubled their cargo-only flights.[37] American is currently flying empty cabins with freight in the belly of the plane as usual, but other airlines have begun removing seats in the passenger area to make room for more cargo.[38]

How rapidly passenger volumes return, and with them the resumption of normal air freight capacity, depends in part on how airports can adapt to new social distancing practices. Some safety measures are relatively easy to implement, such as temperature screening devices. These machines are in use in several Asian countries as well as at Paine Field.[39] Several other adaptions are being tested, including health screenings, masks, increased disinfecting practices, and reducing cabin capacity. However, some experts believe social distancing is physically impossible in air travel and other forms of public transportations given the infrastructure we have today, and a vaccine will be the only way to resume normal operations.[40]

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[37] Kyle Arnold, "American Airlines ramps up cargo flights to fill passenger void," The Dallas Morning News, May 13, 2020. https://www.dallasnews.com/business/airlines/2020/05/13/american-airlines-ramps-up-cargo-flights-to-fill-passenger-void/

[38] Tom Reed, "As Cargo Capacity Crisis Mounts, More Airlines Take Out Seats To Make Room," Forbes, April 28, 2020. https://www.forbes.com/sites/tedreed/2020/04/28/as-cargo-capacity-crisis-mounts-more-airlines-take-out-seats-to-make-room/#5fae0cda2f9c

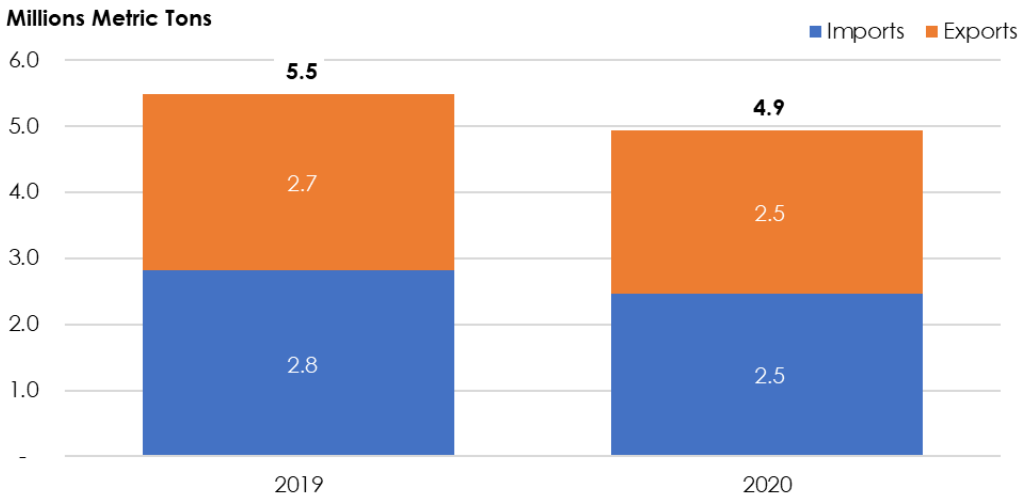
[39] Edward Russel, "Paine Field near Seattle among the first US airports to start screening flyers for fevers," The Points Guy, April 29, 2020. https://thepointsguy.com/news/paine-field-everett-passenger-temperature-checks/

[40] BBC News, "Social-distancing at airports is 'impossible', says Heathrow boss," May 1, 2020. https://www.bbc.com/news/business-52504183

Washington State Trade Flows During Covid-19

Containerized marine cargo through Washington ports declined by 10% in the first four months of 2020 compared to the same period last year. Imports fell from 2.8 million metric tons to 2.5 million (-12%) while exports dropped from 2.7 million to 2.5 million (-8%) (Error! Not a valid bookmark self-reference.).

Exhibit 23. Marine Cargo Flows by Commodity Group, Imports and Exports, through Washington State Ports (April YTD)



Employment Impacts

Between early March and the middle of June 2020, statewide there were more than 17,000 new unemployment insurance claims from workers in global trade and supply chain management industries. Nearly half of all these workers were employed in support activities for transportation, including marine cargo handling, packing and crating, and rail support. In addition, more than 4,000 freight truck drivers filed new claims for unemployment, and 2,400 workers in warehousing and storage submitted claims for unemployment.

Among global trade and supply occupations (spread across both core industries and other businesses and activities throughout the economy), statewide between early March and mid-June there were more than 19,000 new claims (**Exhibit 24**). Of these, 6,630 new claims among workers whose occupation had been "Transportation, Storage, and Distribution Managers," representing a third of all such new claims, followed by "Buyers and Purchasing Agents" (3,250) and "Purchasing Managers" (2,350).

Exhibit 24. New Unemployment Insurance Claims Among Global Trade and Supply Chain Management Occupations, Statewide, March to Mid-June 2020

Occupation	UI Claims
Transportation, Storage, and Distribution Managers	6,630
Buyers and Purchasing Agents	3,250
Purchasing Managers	2,350
Logisticians	1,850
Production, Planning, and Expediting Clerks	1,810
Cargo and Freight Agents	1,630
Compliance Officers	1,060
Procurement Clerks	360
Aircraft Cargo Handling Supervisors	350
Total	**19,290**

Sources: Washington State Employment Security Department, 2020; Community Attributes Inc., 2020.

SUMMARY AND CONCLUSIONS

The global trade and supply chain management sector in Washington state is large, diverse in activities, and critical driver of wealth creation and economic development in Washington state. The sector includes near all phases in the movement of physical goods—imports, exports, and domestic trade—including raw materials, intermediate components, and final consumer products.

In this study, the sector was evaluated in two levels. Firstly, all businesses and organizations directly and primarily engaged in services for the movement of goods were grouped together. These include carriers, courier services, air and marine cargo handling, trucking, rail operations, warehousing, freight forwarding, and materials handlers. These operations employed an estimated 99,300 workers in Washington state in 2019—more than the statewide aerospace sector—up from 92,400 workers in 2017. The average income, including wages and benefits, among these businesses was $80,700 per worker, though some industries, such as marine cargo shipping and air cargo shipping, paid above or nearly $134,400 on average.

A second category of activities are those additional jobs among businesses in other industries that, while not entirely engaged in the sector, conduct many of the same roles in such areas as freight cargo handling, logistics, and procurement. The largest single employer of supply chain management workers was Amazon, whose business model includes a range of activities

tied to optimizing the location, storage, and transport of goods between suppliers, producers, and end user customers. The aerospace industry, likewise, has an extensive number of logisticians, purchasing agents, and other supply chain positions critical to the receipt and assembly of major aircraft parts. There were an estimated 72,700 such workers in Washington state in 2019, with average annual earnings, including benefits, of $185,700.

The economic impacts of these activities reach into nearly every corner of the state economy. In 2019, "all-in" operations had a total economic impact of 211,300 jobs, $14.4 billion in labor income, and $34.3 billion in business revenues. Work tied to supply chain management in other industries across the economy had a total economic impact of 217,700 jobs, $21.8 billion in labor income, and $47.2 billion in business revenues.

The advent of the Covid-19 global pandemic is creating unprecedented stresses on the state's global trade and supply chain management system. Trade will recover, though the next year may see a sustained lowering of trade volumes and activities in Washington, adversely impacting this important sector of the economy.