PACIFIC NORTHWEST CONTAINER AVAILABILITY STUDY

West Coast Container Traffic Analysis

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I. BACKGROUND

Ports serve a vital and common function in most urban regions, connecting regional manufacturing and economic activity to and from markets abroad. Yet while ports have common activities and functions, they are each unique in many facets, including operating characteristics, geographic scope, industrial breadth supported, commodity profile, and dependence upon local/regional vs. international freight movements. The primary container port of the Pacific Northwest (PNW), the Northwest Seaport Alliance, represents the merging of marine operations between the Ports of Tacoma and Seattle, WA. This partnership between these two ports is a first of its kind in the U.S. as the two ports strive to leverage their combined, competitive strength and scale to compete with larger ports to the south (Port of L.A./Long Beach and Oakland, CA). The Northwest Seaport Alliance represents the fourth largest container gateway in the U.S., but unlike most of the larger container ports, the large majority of import container traffic into the PNW is destined to the Midwest U.S., predominately Chicago, IL. The ocean container lines primarily rely upon contract services with two Class I railroads: Union Pacific (UP) and Burlington Northern Santa Fe (BNSF). These railroads connect this northwest gateway to the Midwest and Eastern U.S. markets. Likewise, these two railroads return containers, both loaded and empty, to the PNW ports for return service to Asia.

This fundamental reality, driven by population density and economic geography, puts shippers in the PNW trying to access containers for export at a distinct disadvantage, given that the majority of containers end up in Chicago, IL or Memphis, TN. The PNW possesses a diverse, high-value agriculture industry, mostly within 400-500 miles from the ports, but access to containers to support agricultural exports from this region has historically been a major challenge for shippers. Additional factors that complicate container exports from the PNW region:

- Periodic Port Labor Challenges:
  Labor challenges are common to most ports and particularly to the west coast ports leading up to and during contract negotiations. But the PNW ports have had some prolonged labor disputes recently that have created significant regional and national freight challenges.

- Port Congestion/Operations:
  The terminal operators within each of the container ports operate their facilities to serve their clients, but across the port properties of the Northwest Seaport Alliance, there are many different terminal operators. This often leads to terminal operations that are not in sync with each other and often exacerbates regional landside transportation bottlenecks associated with vessel arrivals/departures.

- Ocean Carrier Demands:
  Ocean carriers are seeking to maximize equipment utilization, both for vessels and containers. This is generally achieved by increasing the number of turns per year, which translates into shorter load/unload times at ports and also places greater demands on shippers adhering to tighter service windows. This also makes it more difficult for regional shippers accessing the port via truck or drayage (particular during heavy regional congestion periods) and also places greater emphasis on getting containers back to Asia, whether loaded or not. This only adds to the container scarcity challenge in the PNW.

- Larger Container Vessels:
  The evolution of increasingly larger container ships has created several local/regional transportation challenges, particularly as the geographic footprint of container terminals decreases. There simply isn't enough space to put containers and the need for unloading/loading quickly places more significance on rail transportation, since rail can move large volumes quickly. It also contributes to peak congestion on the port terminal and on highways accessing the port for trucks moving containers within the required load/unload scheduled window. This exacerbates challenges of local shippers trying to utilize container exports.

- Class I Railroads Business Model:
  The Class I railroads maximize efficiency over longer distances and typically prefer to minimize costly stops and transfers at smaller facilities. This is primarily related to scale efficiencies, but also related to the difference in marginal operating costs between truck and rail once moving. Thus, the proposed inland intermodal hubs just east of the Cascade mountains have mostly struggled to gain traction due to the fact that the Class I railroads would rather not stop and break up trains some 150 miles from the port, and still offer service to the ports. If they do, the rates will reflect this and generally be cost prohibitive.

- Regional Urban Growth:
  The Puget Sound region has experienced significant population growth over the past 10 years and this continues to create several challenges to region container exporters. The congestion on the highway system is the most visible and costly for shippers accessing the ports, but the increasing real estate values has led to increasing pressure for the ports to develop properties for commercial and real estate gains over freight operational and expansion needs.

These and other potential issues create periodic challenges for regional PNW container shippers seeking to access containers for exports. This research effort aims to address the challenges by identifying the specific problems, incorporating the perspectives of each participating entity, and developing an implementation strategy to mitigate these challenges.

II. STUDY OBJECTIVES

Agriculture shippers in the PNW are having increasing difficulties accessing containers for export of agriculture and other high-value commodities. The issues creating these difficulties are due to many factors, some highlighted above and others yet to be revealed. What is needed is a thorough analytical and economic evaluation, incorporating the business and economic realities of each participating entity. This information will be utilized to develop an implementation plan that addresses container access and availability issues throughout the PNW.

The specific objectives of the study are to:

- Conduct an in-depth analysis of inbound/outbound container traffic at the PNW ports, over the past five years to identify commodity mix of local/regional vs. through traffic.

- Obtain information and perspectives of the participating entities (via individual meetings) on container challenges in the PNW. This included the following groups/organizations: agriculture shippers, freight forwarders, trans-loaders, port authorities, Class I railroads, and labor groups.

- Provide a realistic assessment of the challenges and problems faced by container shippers in the PNW and offer an achievable plan for mitigating these challenges, both near and long term.

- Educate and inform regional stakeholders and industry participants.

The following section provides analysis on container traffic through the primary west coast ocean ports in the U.S. It does not include container freight through the Canadian west coast ports, which has increased in relative significance over the past ten years as the ports at Prince Rupert and Delta Port have invested in greater container capacity and intermodal pricing to Chicago, IL with CN and CP rail has increased relative attractiveness. This analysis utilizes shipping manifest (Bill of Lading) data from the company Descartes Datamyne which is similar (although not identical) to that information available from Port Import & Export Reporting Service (PIERS) that is available from IHS Markit. In both cases, there are limitations to this information, particularly for use in identifying precise origin/destinations and also total volumes moving through each specific port. Each port normally monitors total container traffic moving through their terminals and any comparison to manifest information from either Datamyne or PIERS will reveal discrepancies.

III. WEST COAST PORT PROFILES

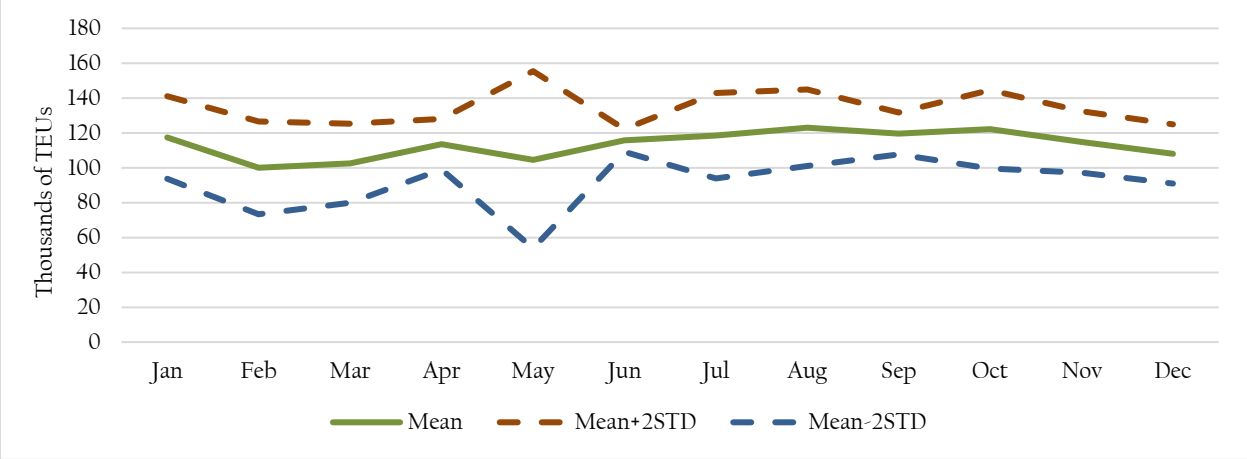
The characteristics of each port along the West Coast of the United States is varied in many aspects, such as volume, destination, product mix, and the ratio of empty and loaded containers. The largest and most prominent of these west coast ports are analyzed here: 1) the Ports of Seattle and Tacoma, 2) the Port of Oakland, and 3) the Ports of Los Angeles and Long Beach. Multiple graphs and maps are presented to visualize the unique characteristics of each port and to provide a basis of current trends and statistics for future analysis.

NORTHWEST SEAPORT ALLIANCE: PORTS OF SEATTLE & TACOMA, WA

LOADED CONTAINER IMPORTS

The Northwest Seaport Alliance handles between 100 and 123 thousand loaded TEU imports (Figure 1). This is about twice the volume of loaded container imports at the Port of Oakland, CA, but considerable less than that imported at the Ports of L.A./Long Beach which varies between 600-700 thousand TEU imports per month. The total number of imported loaded containers, however, remained relatively stable throughout each year at around 113 thousand per month, on average. Container traffic is generally lowest in February, with higher volumes occurring in January and the August to October time period. The greatest variation in traffic occurs in the month of May.

Figure 1: Ports of Seattle and Tacoma Average Monthly Loaded Container Imports, 2012-2017



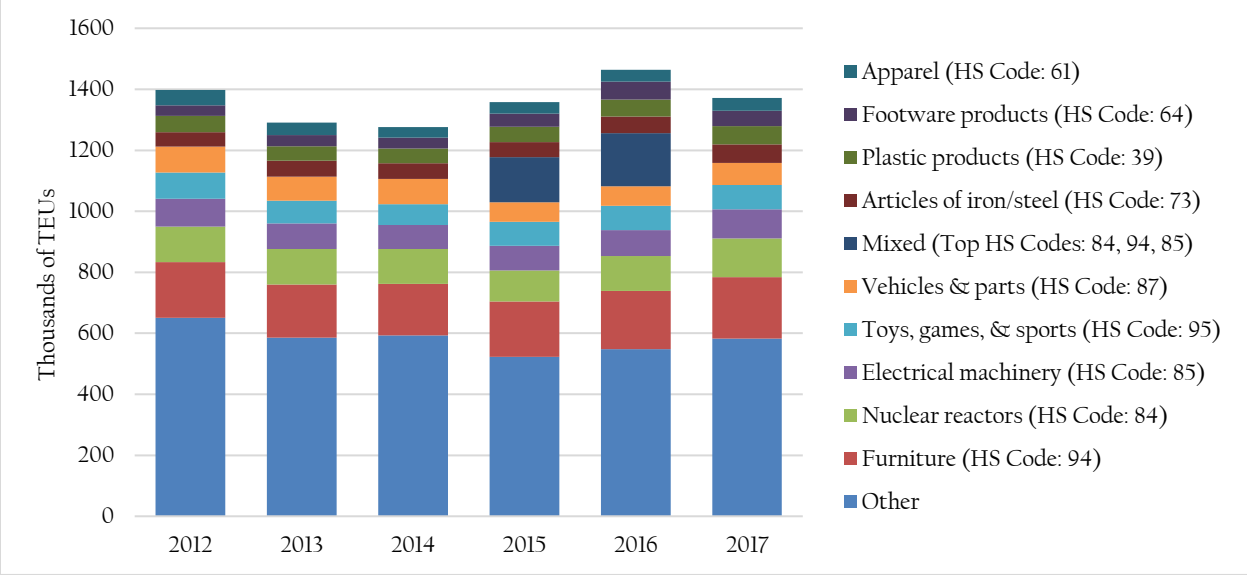
Once processed at the port, these loaded containers are sent to each state in the continental United States (Figure 2). The number one destination of these container imports is Washington, with an average of over 152 thousand containers a year (17.5 percent of all containers delivered to the lower 48 states). There are a significant amount of these containers that are off-loaded at the Ports of Seattle and Tacoma, taken to warehouse distribution centers in the Sea-Tac, WA area, and then converted into 53 ft. containers and shipped via truck for regional distribution to states outside of Washington. It's not possible to determine exactly what percentage of those Washington bound containers end up being trans-loaded into 53 ft. boxes, but discussions with area transportation providers indicate that it's relatively large. Of the remaining loaded inbound containers arriving to the ports of Seattle and Tacoma, California and Illinois receive a large proportion (8.9 and 10.3 percent, respectively). A large percentage of the loaded container imports make their way to the Midwest as can be seen in Figure 2, illustrating the destination of loaded container imports through the ports of Seattle and Tacoma.

Figure 2: Ports of Seattle and Tacoma Annual Loaded Container Imports by Destination State, 2012-2017

The top three commodity types for imported containers between 2012 and 2017 are furniture, nuclear reactors[1], and electrical machinery (Figure 3). The top 10 commodity types in Figure 3 account for over 50 percent of imported goods over the past 6 years. This illustrates the wide variety of different commodities arriving through the ports of Seattle and Tacoma, particularly given the proportion that falls into the "other" category. This speaks to the variety of industries and business supported for loaded container imports. The overall number of loaded container imports averages around 1.36 million per year through the ports of Seattle and Tacoma. Comparing the commodity mix for loaded container imports with the Ports of L.A./Long Beach and the Port of Oakland reveals a very similar mix for all three port areas. The Port of L.A./Long Beach is almost identical to the composition of loaded inbound container commodities through the ports of Seattle and Tacoma. The Port of Oakland has a wider diversity of inbound commodities as compared to the other two areas.

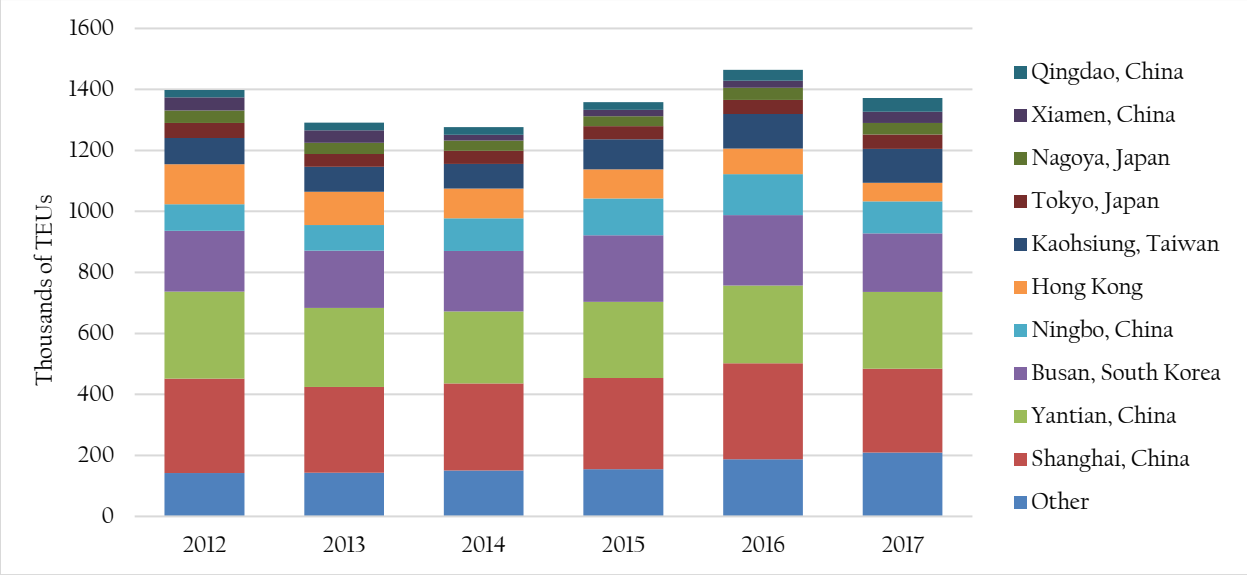
[1] This harmonized system code (HS) represents a wide variety of products that fall under code 84, not only nuclear reactors. This includes boilers, steam generators, mechanical appliances, engines, pumps, furnaces, air conditioners, etc.

Figure 3: Ports of Seattle and Tacoma Annual Loaded Container Imports by Top 10 Commodity Types, 2012-2017



The top 10 import trading partners for the ports of Seattle and Tacoma (2012-2017) are displayed in Figure 4, including a heavy concentration with China, South Korea, Taiwan, and Japan (Figure 4). The top three departure ports for loaded containers arriving at the Northwest Seaport Alliance are ports in Shanghai (China), Yantian (China), and Busan (South Korea). Each port of departure has held steady or slightly changed in volume of loaded container exports throughout the past 6 years except for Hong Kong, which has a decrease in exports destined for Seattle or Tacoma each year. It is noteworthy the reliance on China and South Korea for loaded container imports through Seattle and Tacoma. This is similar at the ports of L.A./Long Beach as well but to a much lesser degree at the port of Oakland.

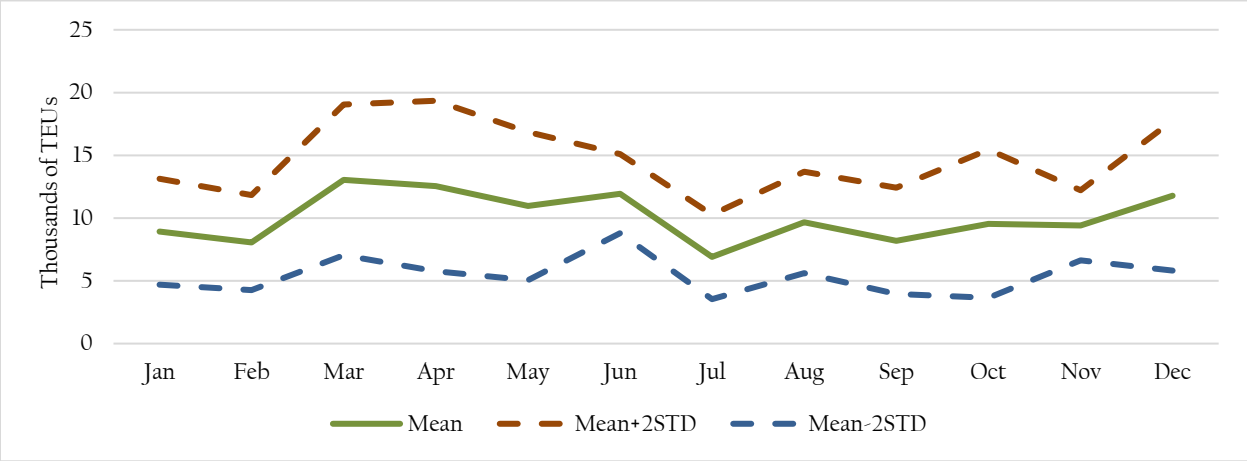
Figure 4: Ports of Seattle and Tacoma Annual Loaded Container Imports by Top 10 Ports of Departure, 2012-2017



EMPTY CONTAINER IMPORTS

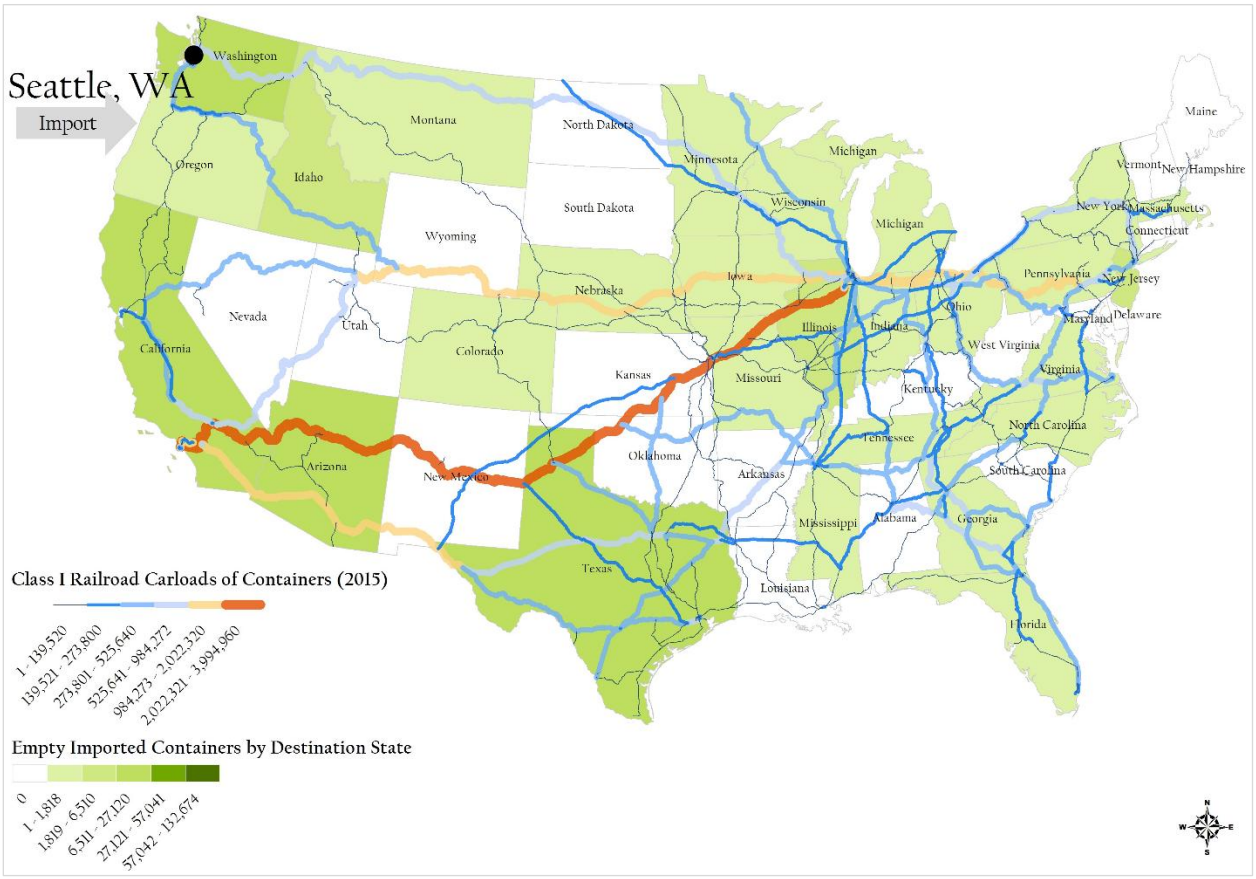
The average volume of empty containers destined for Seattle and Tacoma ports is roughly 10 times lower than for loaded containers (Figures 1 and 5). The number of empty containers fluctuates around 10 thousand TEUs each month (Figure 5), and is considerably more than the volume of inbound empties arriving at the Port of Oakland or ports of L.A./Long Beach (around 6 thousand TEUs per month). The import of empty containers peaks during the spring months (i.e., March and April) at an average of 13 thousand per month and this is also the period which possesses the widest variation in volumes over the past 5 years. The ports of Seattle and Tacoma and the port of Oakland are relatively similar in terms of less variation in monthly inbound empty volumes throughout the year. The port of L.A./Long Beach has a very wide variability, consistently throughout the year for inbound empty containers.

Figure 5: Ports of Seattle and Tacoma Average Monthly Empty Container Imports, 2013-2017



The top four destination states (as specified on the bill of laden) for the empty inbound containers moving through the ports of Seattle and Tacoma, in order of volume, are Washington (30.9%), California (24.7%), Arizona (13.8%), and Texas (11.7%) (Figure 6). Idaho and New Jersey also received a significant number of empty containers (5.6 and 7 percent, respectively). The percent of inbound empty containers destined within the state is considerably less than that at the port of Oakland (62% stays in California) or the ports of L.A./Long Beach (55% stays in California). This reality contributes to the lack of available empty containers for outbound exports, including that for agricultural products produced in the Pacific Northwest.

Figure 6: Ports of Seattle and Tacoma Annual Empty Container Imports by Destination State, 2013-2017

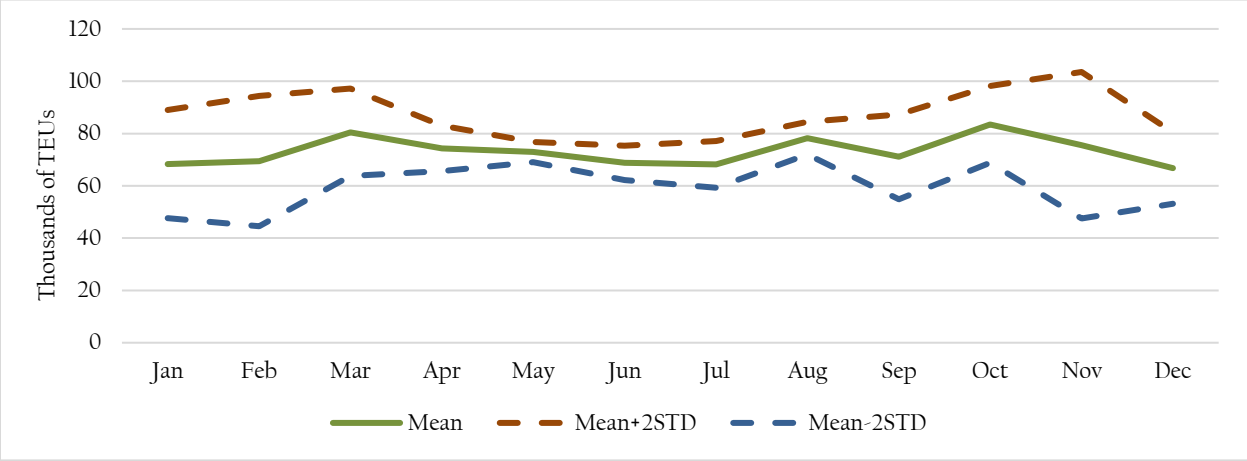


LOADED CONTAINER EXPORTS

While the ports of Seattle and Tacoma are importing nearly 113 thousand loaded containers every month on average (Figure 1), about two-thirds that number are exported out of the country fully loaded via these ports (Figure 7). The number of exported loaded containers fluctuate around 73 thousand per month, rising slightly during the spring and fall months. The months with the greatest variability of loaded export containers from the ports of Seattle and Tacoma is Jan-Mar and Sept-Dec, with the remaining months of the year being very consistent. This same pattern is evident at the port of Oakland and the ports of L.A./Long Beach, but more pronounced at Seattle and Tacoma. The imbalance between loaded import and loaded export containers is a reflection of the trade imbalance that the U.S. has with trading partners in Asia, primarily China, Japan and Southeast Asian countries. The imbalance at the ports of Seattle and Tacoma isn't as severe at that exhibited at the significantly larger ports of L.A./Long Beach, which has loaded export containers representing only about 35 percent of loaded import containers. The port of Oakland is very balanced with respect to loaded import and export containers, maintaining approximately the same volumes for each. The difference in volumes of loaded import and export containers is also reflective of the commodity mix leaving each port and the differences in volume/weight density of inbound/outbound products. Inbound computer and apparel products are often significant lighter as compared to many agricultural products (grain, hay, potatoes, apples, etc.) which are heavy, dense products. This reality alone dictates that most ocean carriers develop schedules that allow adequate empties to be repositioned where most needed and results in many container vessels

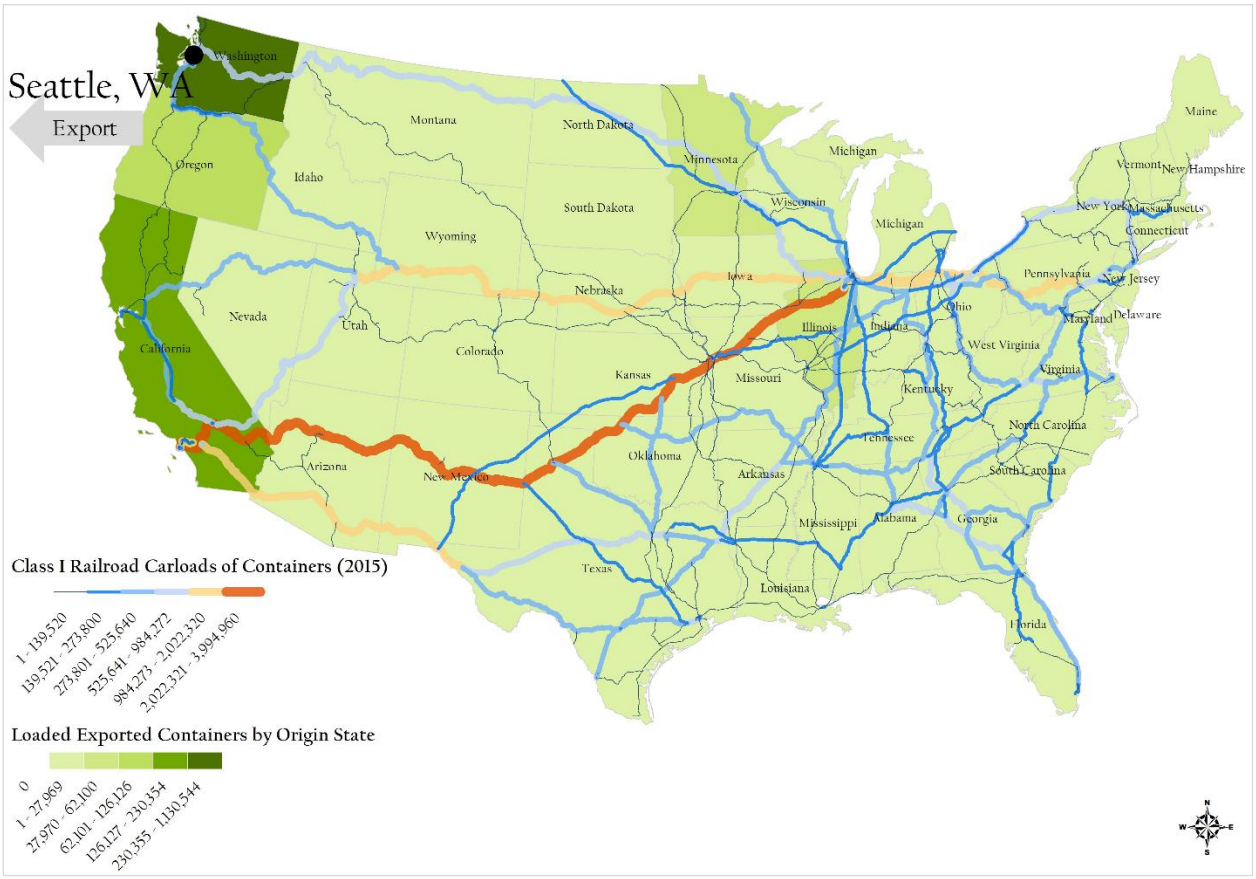
being loaded with a large number of empties as fewer loaded containers result in the vessel reaching the weight limit capacity.

Figure 7: Ports of Seattle and Tacoma Average Monthly Loaded Container Exports, 2013-2017



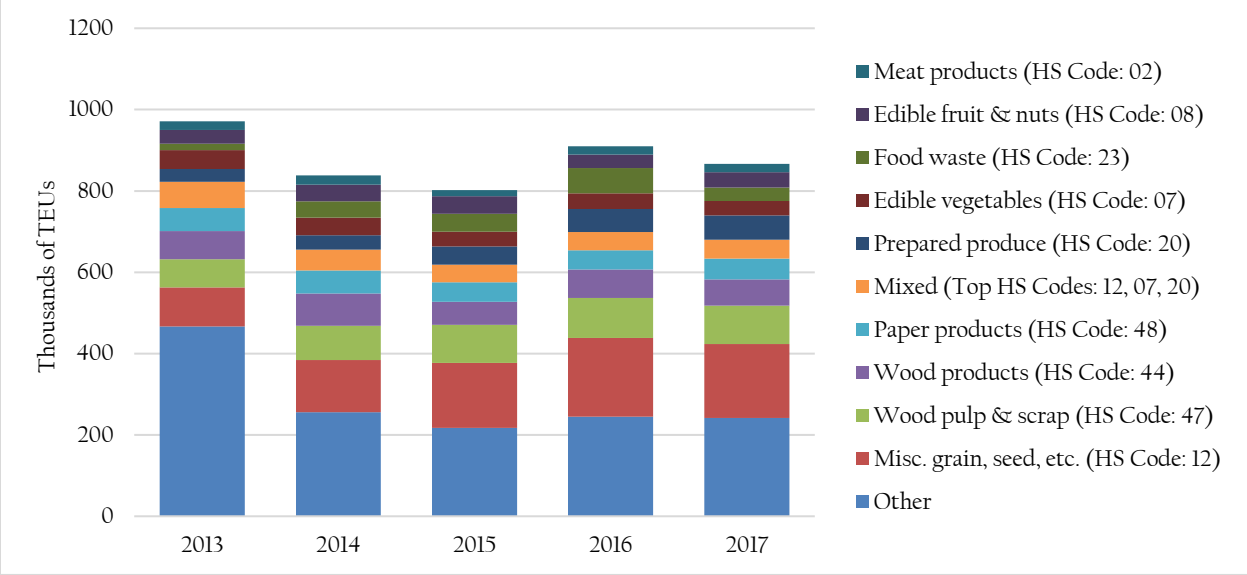
Most loaded containers processed through the Ports of Seattle and Tacoma for export originate along the west coast (Figure 8); Washington, California, and Oregon send the highest volume of loaded containers to be loaded on cargo ships for international destinations. However, unlike the large volume of loaded imports destined for the Midwest (Figure 2), containers do not return loaded to the Ports of Seattle and Tacoma in a much higher volume than the rest of the United States.

Figure 8: Ports of Seattle and Tacoma Annual Loaded Container Exports by Origin State, 2013-2017



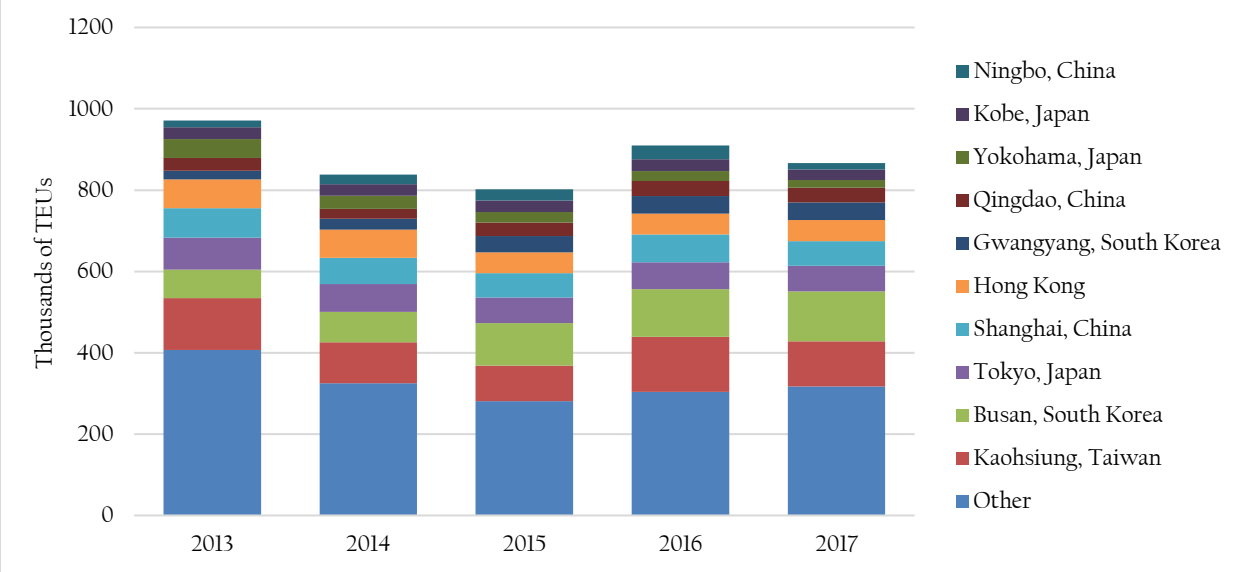
Miscellaneous grains and seeds, wood pulp products, and wood products are the top three commodities exported through the Northwest Seaport Alliance over the past 5 years (Figure 9). The share of container exports of miscellaneous grains and seeds has seen the largest growth over the study period (2013-2017). The commodity mix of loaded export containers from the ports of Seattle and Tacoma reflect the heavier, dense products that are agricultural (grain, seed, vegetables, produce, fruit, meat, wood) based.

Figure 9: Ports of Seattle and Tacoma Annual Loaded Container Exports by Top 10 Commodity Types, 2013-2017



The top three destination ports for loaded exported containers are Kaohsiung (Taiwan), Busan (South Korea), and Tokyo (Japan) (Figure 10). The top 10 destination ports represent two-thirds of all loaded containers exported through the Ports of Seattle and Tacoma, with Busan increasing in exported share each year. The mix of destination ports for loaded export containers is not exactly the same as the departure ports for loaded inbound containers arriving at the ports of Seattle and Tacoma.

Figure 10: Ports of Seattle and Tacoma Annual Loaded Container Exports by Top 10 Ports of Arrival, 2013-2017

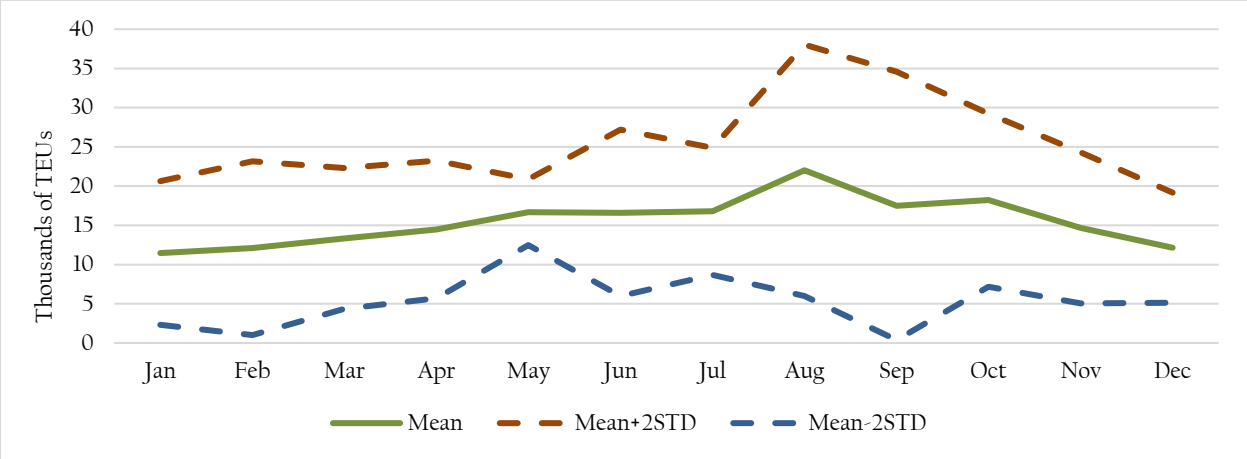


The loaded export destinations are more varied and less dependent on China ports, but still broadly geographically focused in Asia.

EMPTY CONTAINER EXPORTS

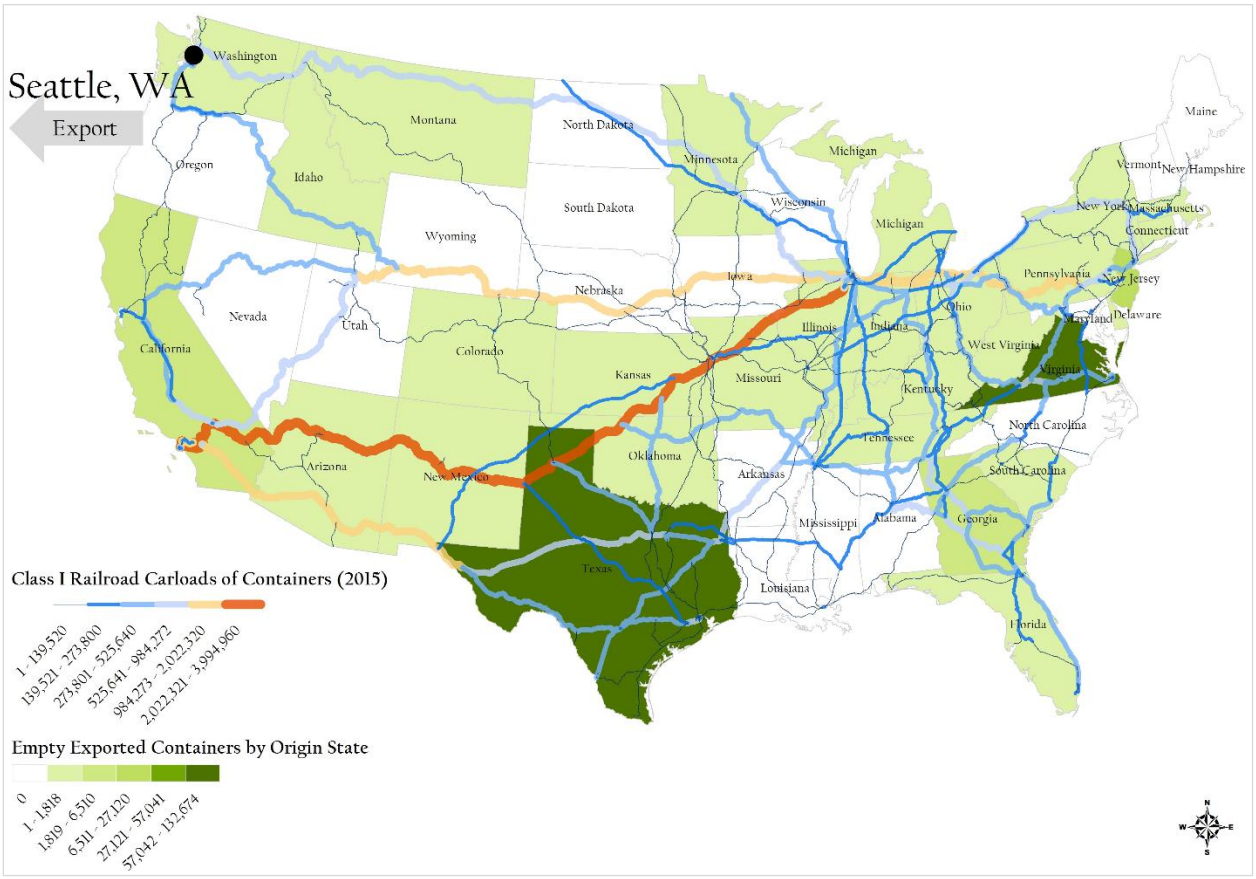
The Ports of Seattle and Tacoma export slightly more empty containers than are imported each month on average (Figures 5 and 11). The number of containers which leave the ports empty bottom out during the winter months at 12 thousand TEUs (Figure 11). The volume of containers, on average, peak in August at 22 thousand containers. The months between Aug.-Oct. also represent the period of greatest variability for exported empty containers leaving the ports of Seattle and Tacoma.

Figure 11: Ports of Seattle and Tacoma Average Monthly Empty Container Exports, 2014-2017



The top two originating states of empty containers processed and exported through the Northwest Seaport Alliance are Texas and Virginia (Figure 12). These two states combined account for nearly 80 percent of empty container exports, followed by New Jersey (12.8%). However, this information on the originating state for empty exported containers may also reflect the business location of the party scheduling the shipment and not necessarily the location from where the container was shipped. In general, this is a limitation of the data and is true for all outbound (export) container data whether from Datamyne or PIERs, given that failure to capture or report this information is not the same for containers leaving the country as with those arriving within the country and required to be tracked via customs for assignment of duties or import taxes.

Figure 12: Ports of Seattle and Tacoma Annual Empty Container Exports by Origin State, 2014-2017



CONTAINER AVAILABILITY[2]

The monthly availability of various types of containers at the Ports of Seattle and Tacoma are presented in Figures 13, 14, 15, 16, and 17. A negative value indicates that demand exceeded supply. For each type of container, negative values are within 2 standard deviations of the mean over the years 2012 to 2017; hence, demand frequently outpaces supply for dry containers, high-cube containers, and refrigerated containers. This is reflective of the limited availability for export containers for shippers in the PNW interested in obtaining access for export.

There are a few important features to note regarding Figures 13-17. First, the average number of containers supplied meet demand throughout the year. Taking into account the variance (i.e., 2 standard deviations) over 5 years includes many instances of demand not keeping pace with supply. The availability of 20 ft. and 40 ft. dry containers is relatively similar throughout the year, but the variance on the 20 ft. containers peaks between Mar.-Apr. while on the 40 ft. containers it peaks about one month later between Apr.-May. The 20 ft. refrigerated containers are the least available on average, with usually

[2] This information comes from the Ocean Container Shipping Availability Report (OSCAR) which is compiled and reported by the USDA/AMS/TSD. It represents a voluntary survey of ocean carriers regarding available equipment by type at different U.S. container ports.

only less than 100 available per month. On average, 40 foot high-cube containers are frequently demanded, but not adequately supplied in the month of March (Figure 15). Lastly, while the average supply of containers for each type do fluctuate, the supply is more or less constant throughout the year.

Figure 13: Ports of Seattle and Tacoma 20 Foot Dry Container Availability, 2012-2017

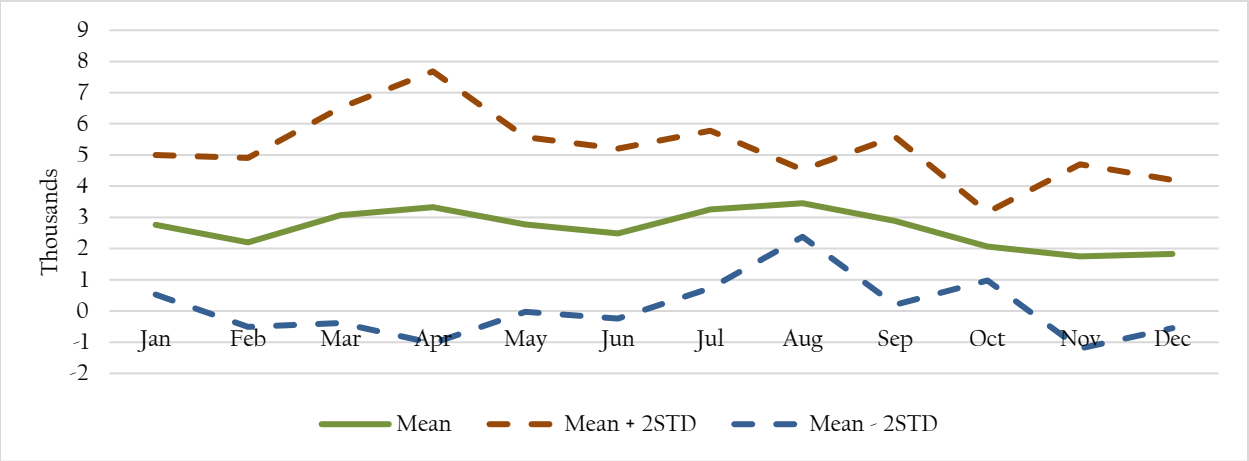


Figure 14: Ports of Seattle and Tacoma 40 Foot Dry Container Availability, 2012-2017

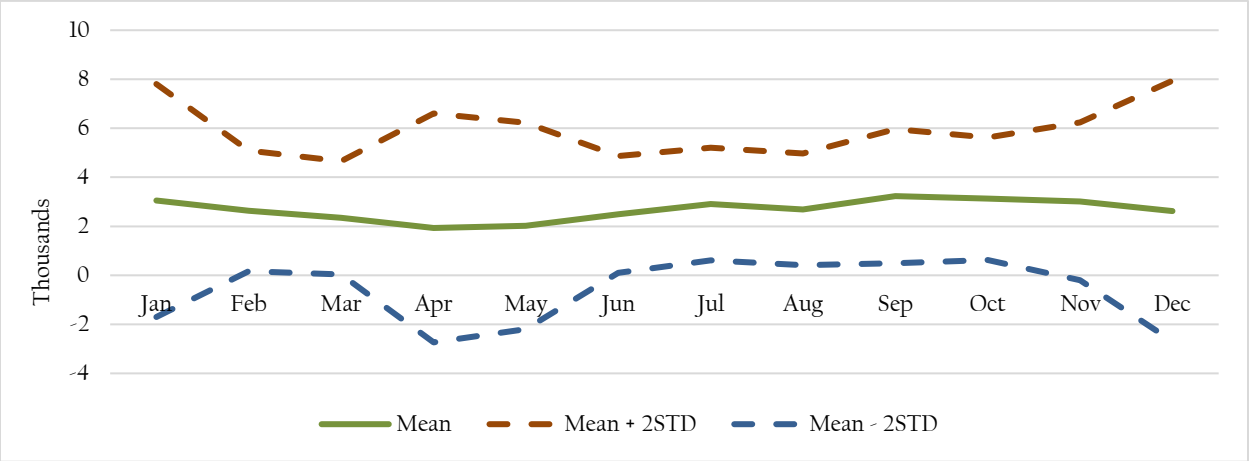


Figure 15: Ports of Seattle and Tacoma 40 Foot High-Cube Container Availability, 2012-2017

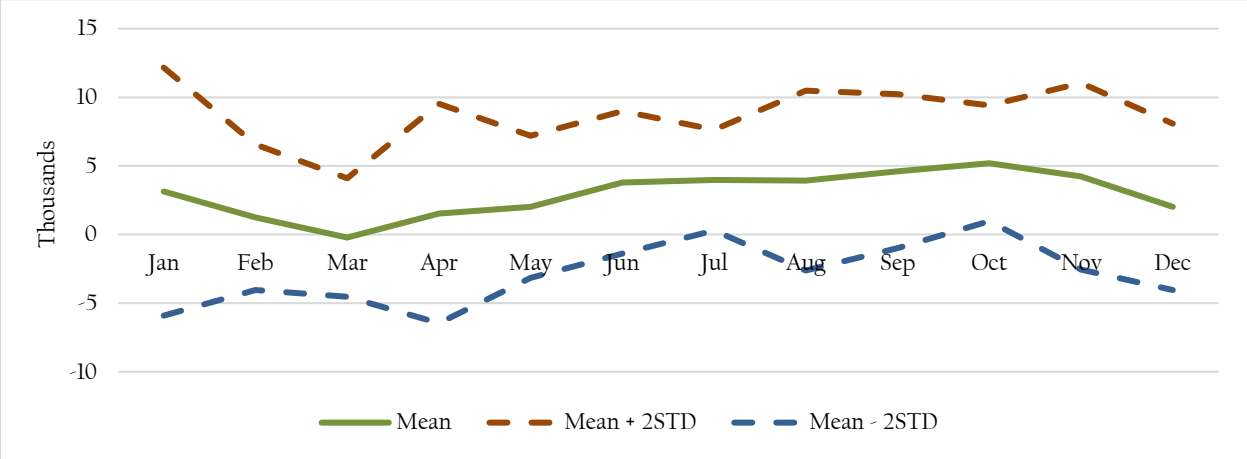


Figure 16: Ports of Seattle and Tacoma 20 Foot Refrigerated Container Availability, 2012-2017

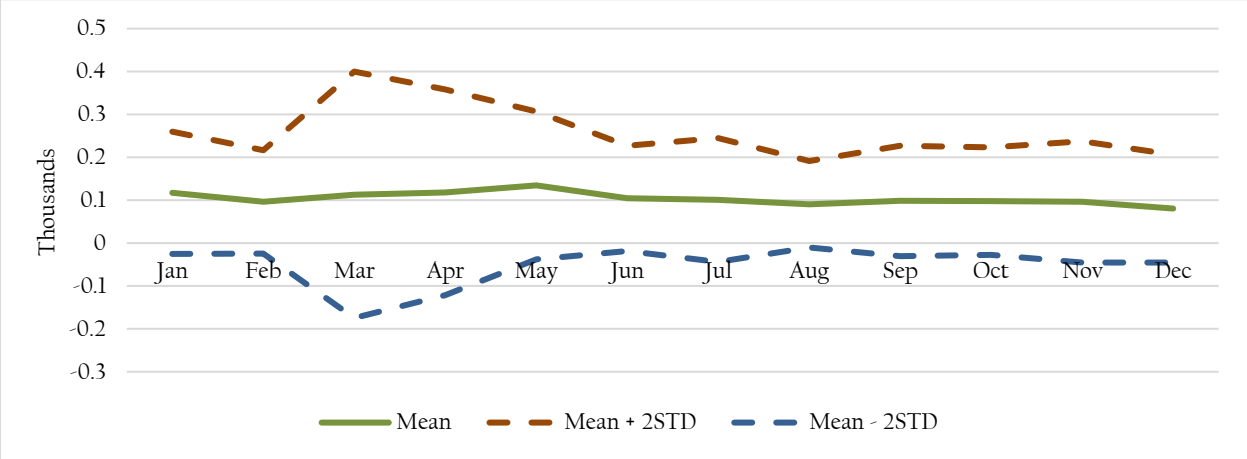
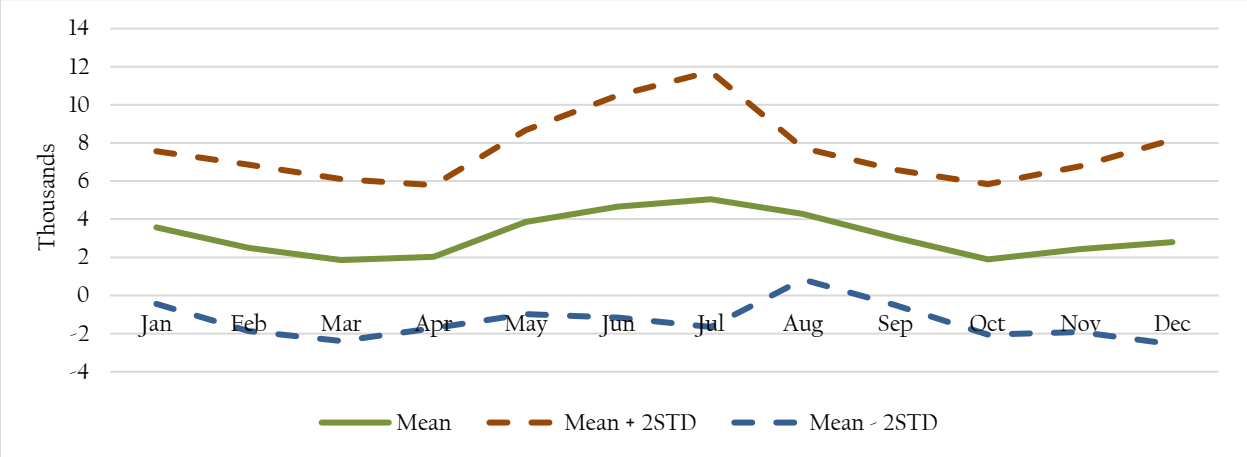


Figure 17: Ports of Seattle and Tacoma 40 Foot Refrigerated Container Availability, 2012-2017

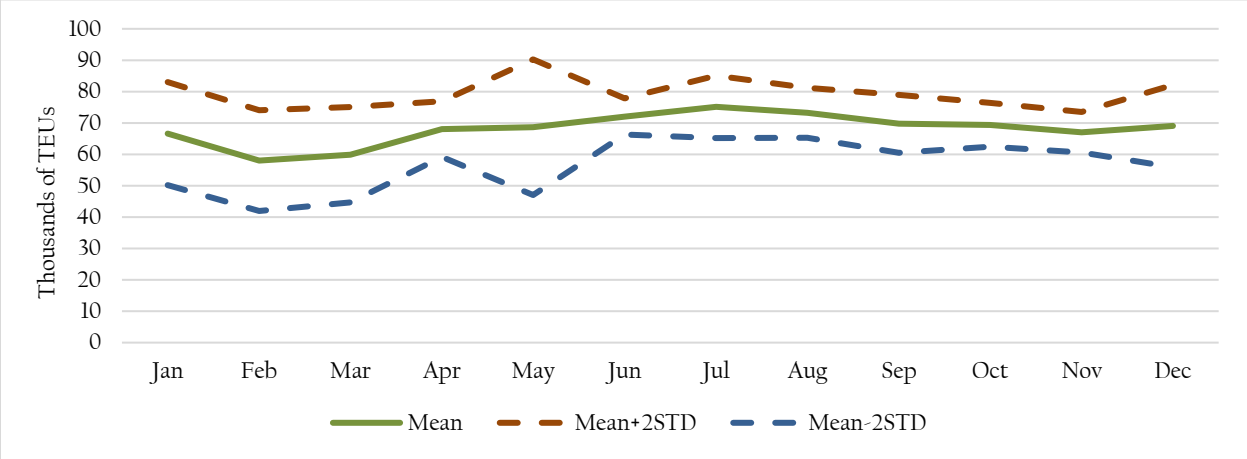


PORT OF OAKLAND, CA

LOADED CONTAINER IMPORTS

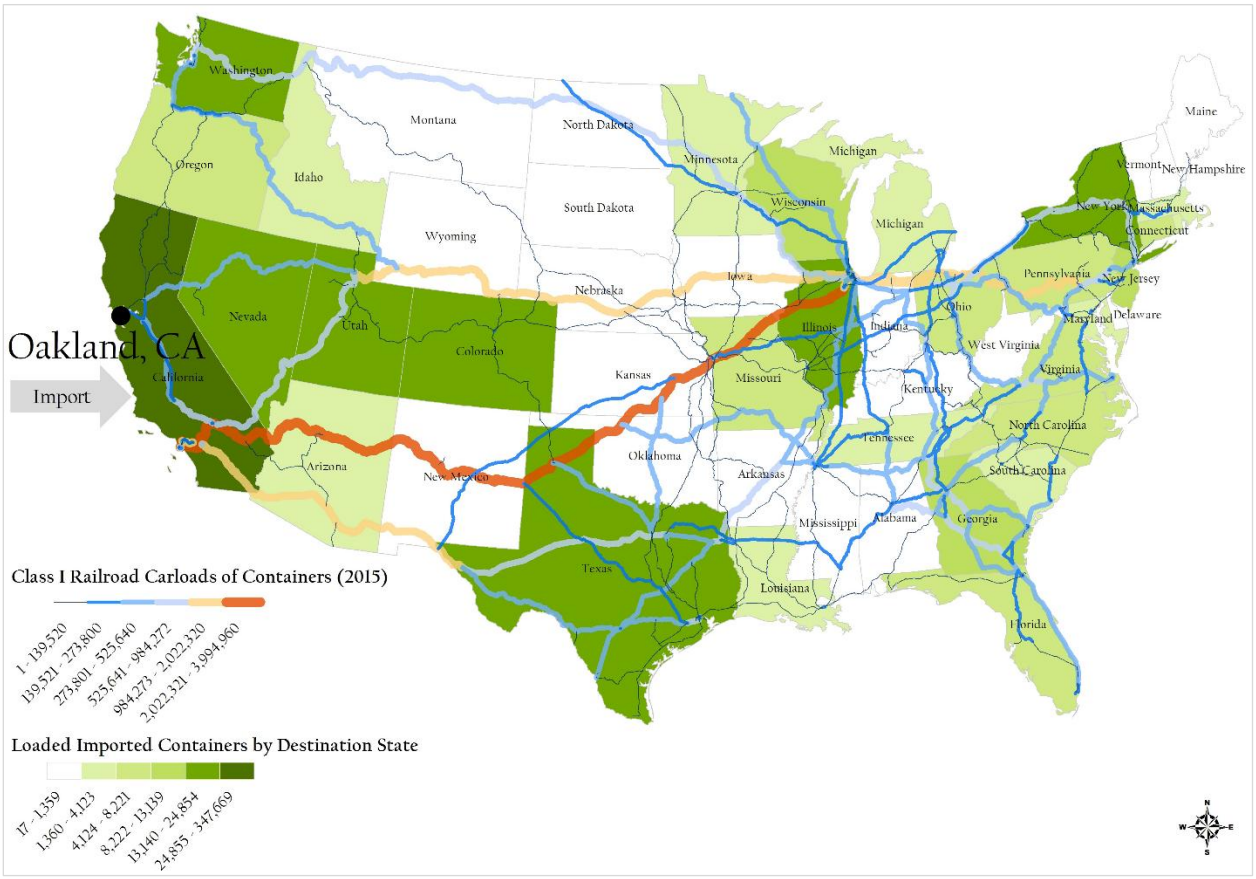
For most of the year, the Port of Oakland imports around 68 thousand containers each month (Figure 18), relatively close to the volume of loaded exported containers moving through the port. However, in February and March, the volume of containers processed at the Port of Oakland for import falls below 60 thousand on average. The variance of imported loaded containers is higher during the first half of the year.

Figure 18: Port of Oakland Average Monthly Loaded Container Imports, 2012-2017



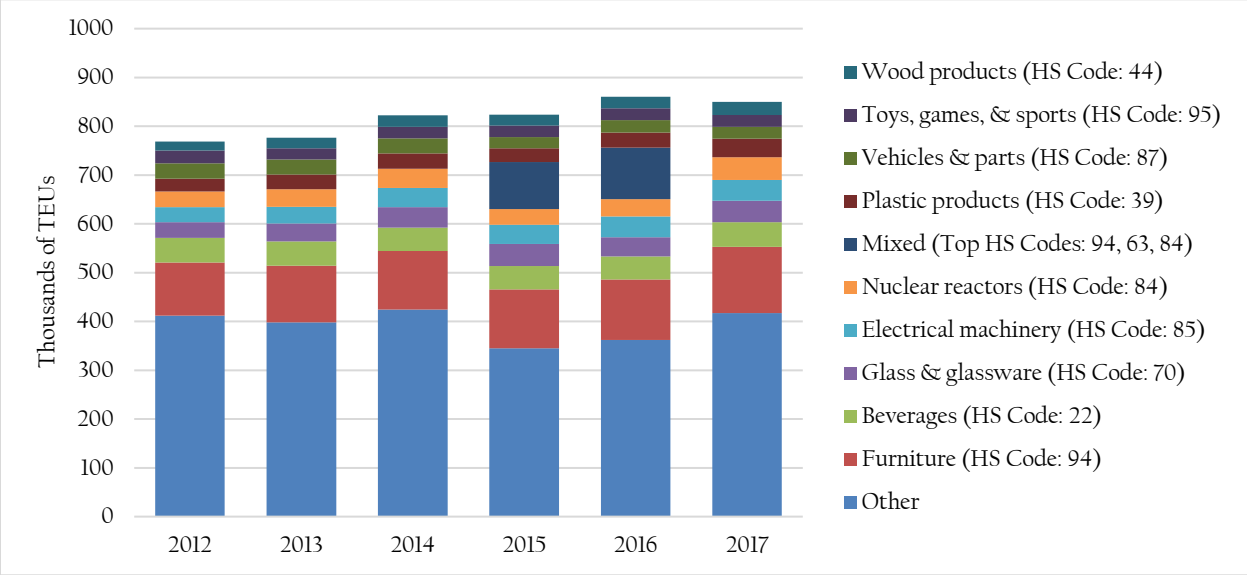
Over 50 percent of all loaded container imports processed through the Port of Oakland stay in California (Figure 19). Outside of California, the top 5 states that receive these loaded containers are Illinois (4.1%), Texas (3.6%), New York (3.3%), Utah (3%), and Nevada (2.9%). Unlike the ports to the south and north, the port of Oakland doesn't serve as a primary conduit for inbound container freight supplying Chicago, IL and the Midwest consumer market. The primary destination for loaded inbound containers is California and also those states just to the east (Nevada, Utah and Colorado), illustrating many of the loaded inbound containers remain within relative close proximity of the port, as compared to the ports of L.A./Long Beach and Seattle/Tacoma where a large percentage goes to Chicago, IL.

Figure 19: Port of Oakland Annual Loaded Container Imports by Destination State, 2012-2017



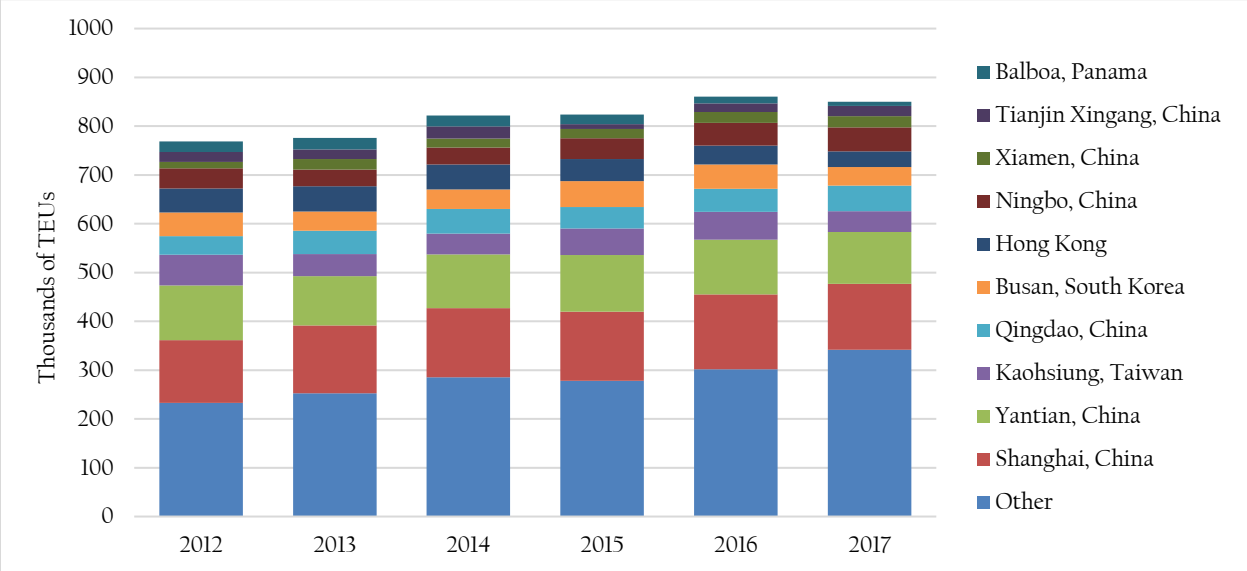
The top category of imported products passing through the Port of Oakland over the past 6 years is furniture, which accounts for almost 15 percent of all container imports (Figure 20). The top 10 commodity types in Figure 16 account for just over 50 percent container imports. In general, the volume of loaded containers is slightly increasing through the years.

Figure 20: Port of Oakland Annual Loaded Container Imports by Top 10 Commodity Types, 2012-2017



The ports of Shanghai (China) and Yantian (China) accounted for nearly one-third of containers imported through Oakland (Figure 21). The structure of loaded container imports stayed relatively stable during 2012 through 2017, with each commodity type, on average, exhibiting a slight upward trend.

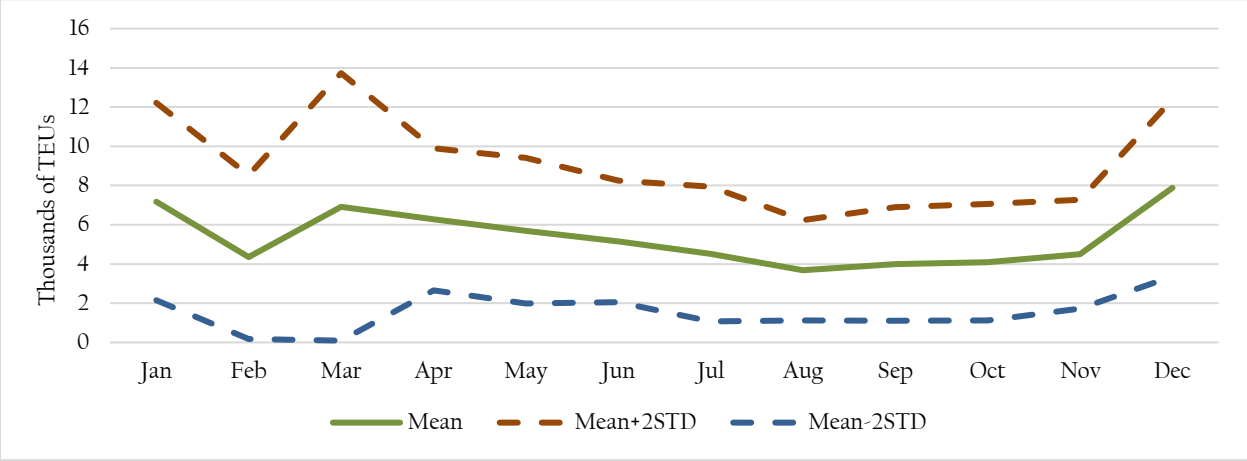
Figure 21: Port of Oakland Annual Loaded Container Imports by Top 10 Ports of Departure, 2012-2017



EMPTY CONTAINER IMPORTS

Similar to the average monthly import of loaded containers, the monthly volume of empty containers imported has a higher variance during the first half of the year (Figure 22). Over the year, around 5.5 thousand empty containers pass through the Port of Oakland each month on average, peaking during the winter months at nearly 8 thousand empty containers.

Figure 22: Port of Oakland Average Monthly Empty Container Imports, 2013-2017



California is the number one destination for empty container imports (over 62% or 34 thousand containers each year, on average) after arrival at the Port of Oakland (Figure 23). The remainder of empty containers are distributed among nearly two-thirds of the States in the continental United States.

Figure 23: Port of Oakland Annual Empty Container Imports by Destination State, 2013-2017

LOADED CONTAINER EXPORTS

The difference between the volumes of imported and exported loaded containers for all ports in this study is smallest for the Port of Oakland. While loaded imports averaged just under 70 thousand per month (Figure 18), loaded container exports average around 63 thousand per month (Figure 24). California is the largest contributor of loaded containers for export (nearly two-thirds of all exports); however, each state in the lower 48 fill (or partially fill) containers for export via the Port of Oakland each year (Figure 25). New York, Illinois, and Texas each export over 20 thousand loaded containers per year. As previously mentioned, the state of origination for exported containers may not be entirely accurate given that in some cases it represents the location of the business scheduling the shipment.

Figure 24: Port of Oakland Average Monthly Loaded Container Exports, 2013-2017

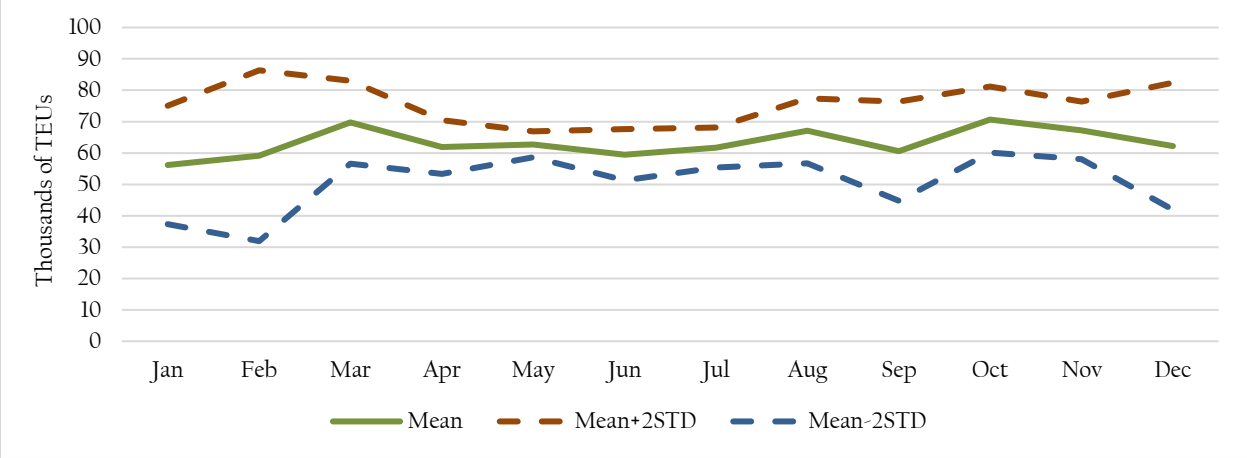
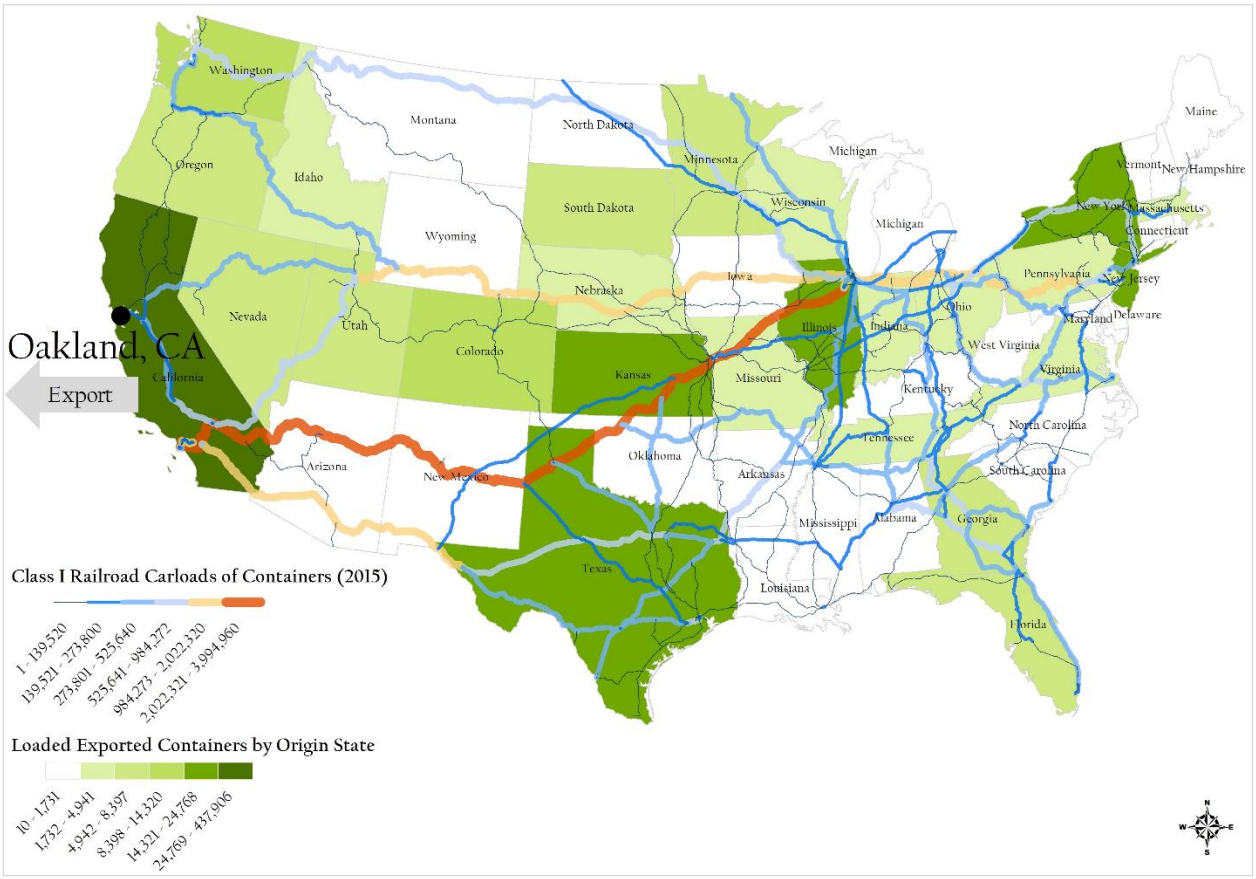
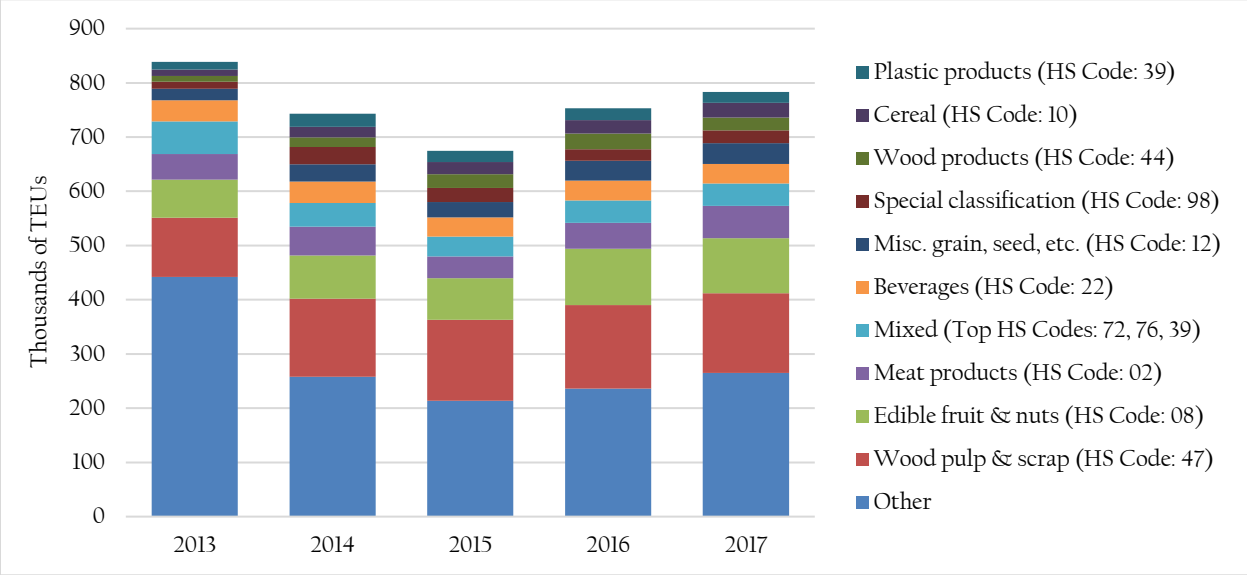


Figure 25: Port of Oakland Annual Loaded Container Exports by Origin State, 2014-2017



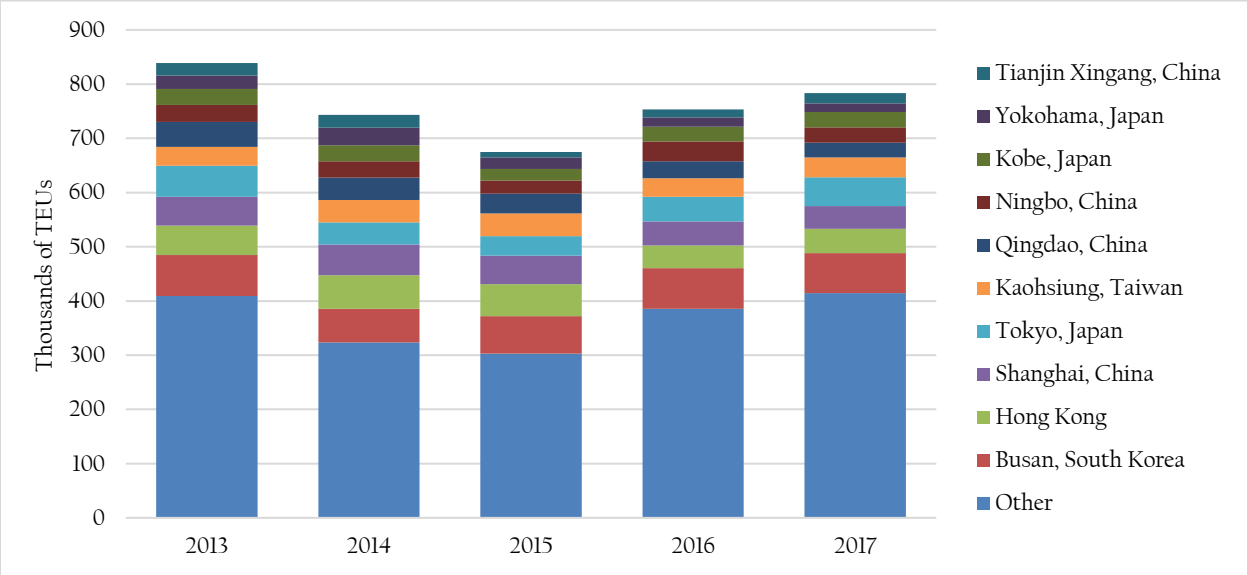
Overall, containers with wood pulp products and edible fruit and nuts made up the largest share of exports through Oakland from 2013 to 2017 (18.5 and 11.4 percent, respectively) (Figure 26). The volume of the top 10 commodity containers increased slightly during the same time span. Containers filled with commodities outside the top 10 fluctuated over the past 5 years between 214 thousand and 442 thousand TEUs per year.

Figure 26: Port of Oakland Annual Loaded Container Exports by Top 10 Commodity Types, 2013-2017



As Figure 27 illustrates, Busan (South Korea), Hong Kong (China), and Shanghai (China) were the primary export partners of Oakland during 2013-2017. The shares of each of the top 10 ports receiving exports remained stable through the years. The top 10 ports of arrival account for roughly half of the exports shipped from the Port of Oakland.

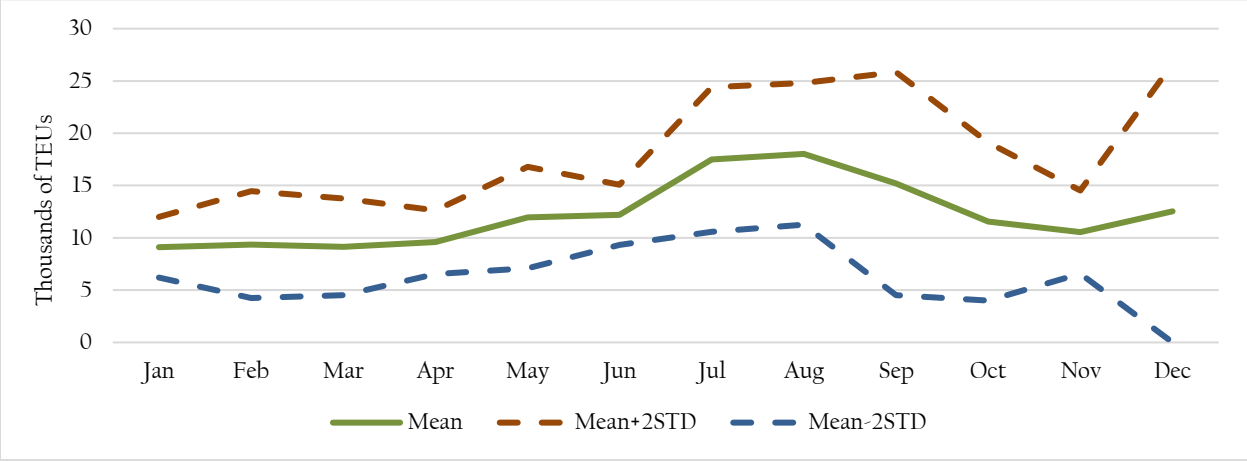
Figure 27: Port of Oakland Annual Loaded Container Exports by Top 10 Ports of Arrival, 2013-2017



EMPTY CONTAINER EXPORTS

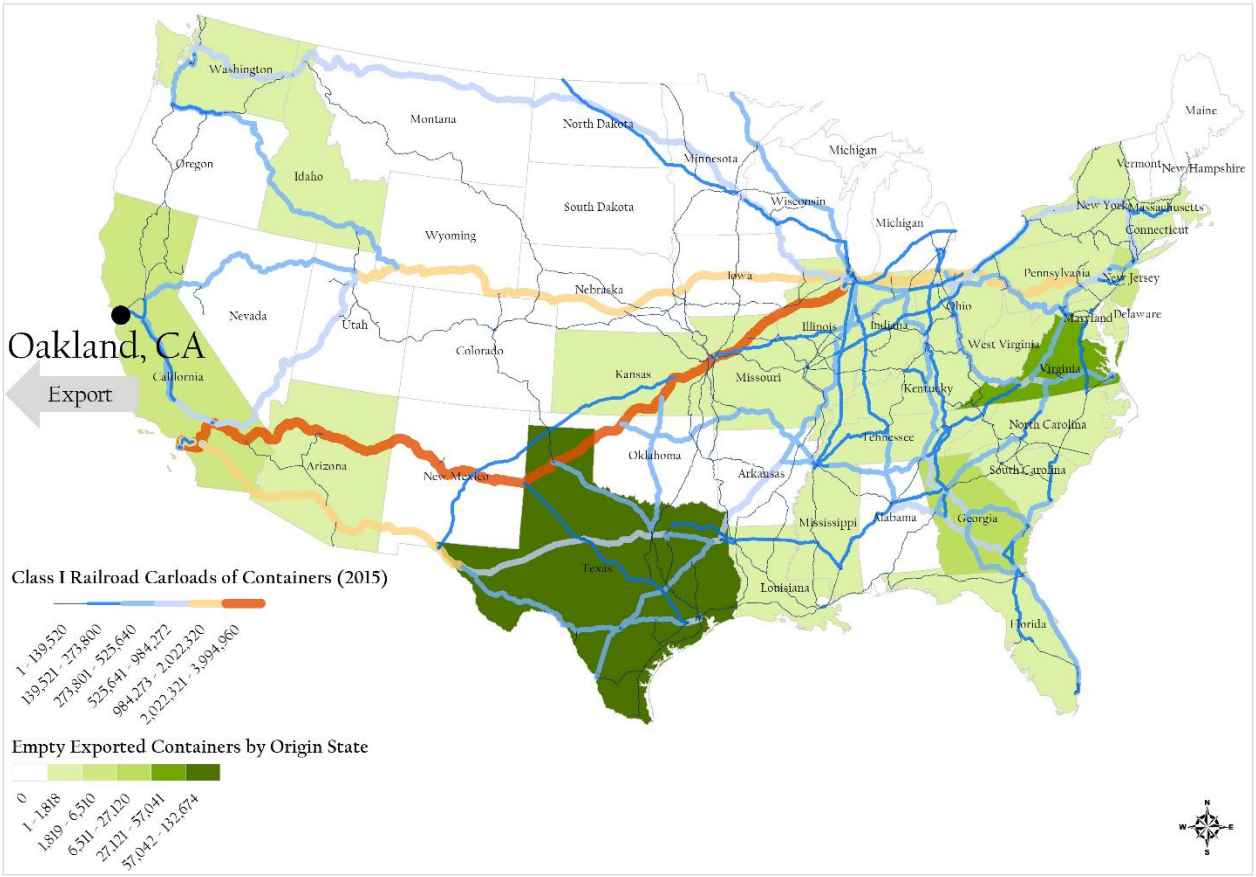
The monthly volume of containers exported through the Port of Oakland varies throughout the year (Figure 28). For most of the year, it averages around 10 thousand empty containers per month; however, during the summer months (i.e., July and August), just under 18 thousand empty containers are exported via the Port of Oakland.

Figure 28: Port of Oakland Average Monthly Empty Container Exports, 2014-2017



Similar to the ports of Seattle and Tacoma, the states of Texas and Virginia send the largest share of empty containers back to the west coast for export via the Port of Oakland (Figure 29). These two states account for over 85 percent of all empty containers processed through the Port of Oakland. It is interesting to note that empty export containers rise significantly during the summer months of Jul.-Aug. as compared to the other months of the year.

Figure 29: Port of Oakland Annual Empty Container Exports by Origin State, 2014-2017



CONTAINER AVAILABILITY

The monthly availability of various types of empty containers at the Port of Oakland are presented in Figures 30, 31, 32, 33, and 34e. As denoted above, a negative value indicates that demand exceeded supply. For each type of container, negative values are within 2 standard deviations of the mean over the years 2012 to 2017; hence, demand frequently outpaces supply for dry containers, high-cube containers, and refrigerated containers. On average, the monthly supply of containers has been positive over the past five years for each type of container. There are, however, many instances of negative supply (i.e., demand with insufficient supply) as indicated by the number of months with negative values for each container type that lie within 2 standard deviations of mean. The 20 ft. refrigerated containers are in the shortest supply, similar to the Ports of Seattle and Tacoma.

Figure 30: Port of Oakland 20 Foot Dry Container Availability, 2012-2017

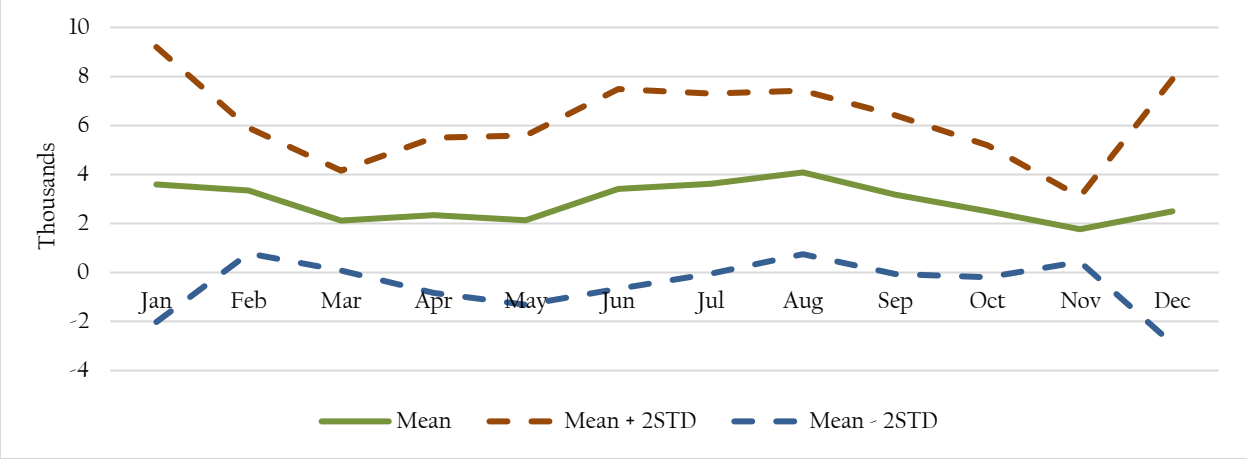


Figure 31: Port of Oakland 40 Foot Dry Container Availability, 2012-2017

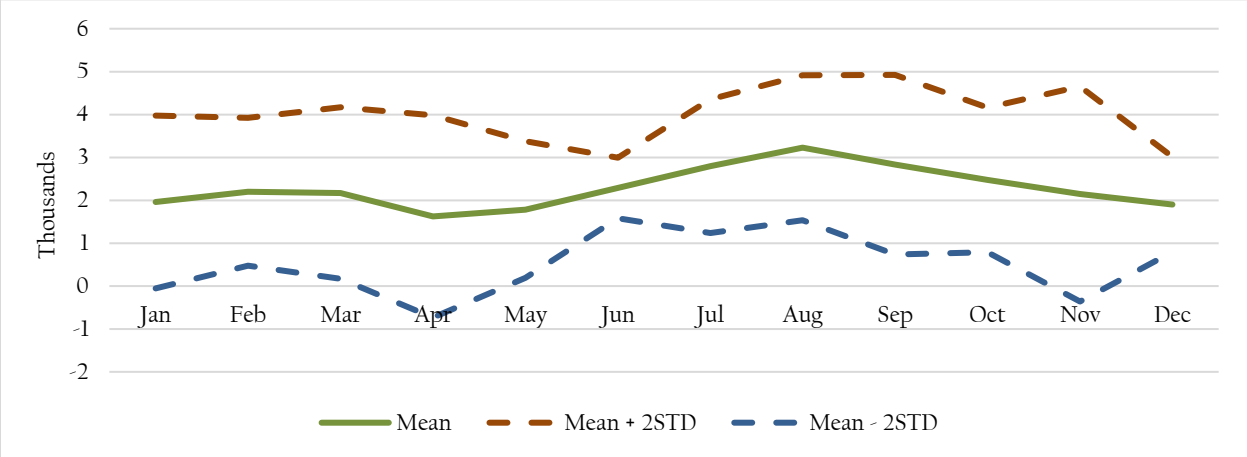


Figure 32: Port of Oakland 40 Foot High-Cube Container Availability, 2012-2017

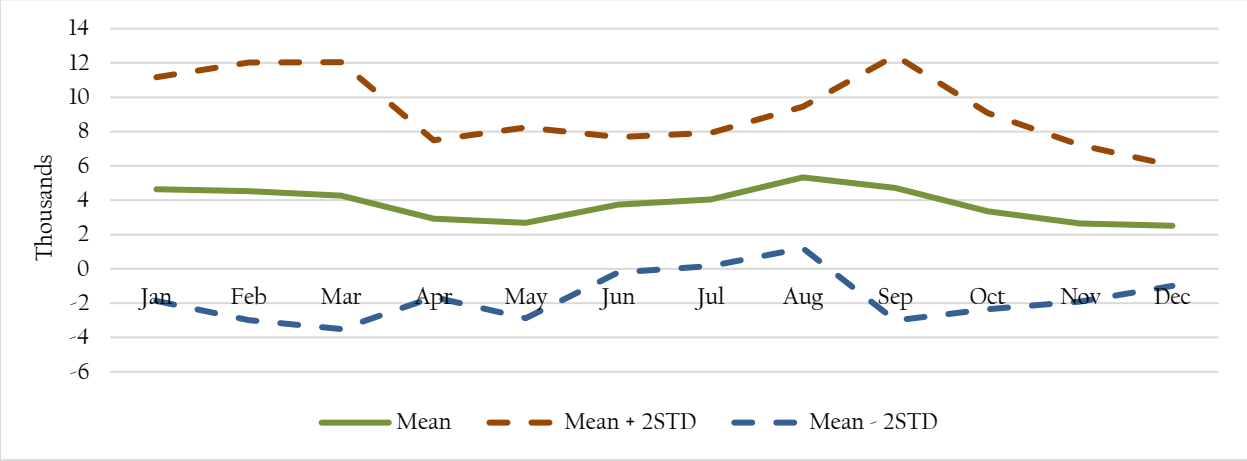


Figure 33: Port of Oakland 20 Foot Refrigerated Container Availability, 2012-2017

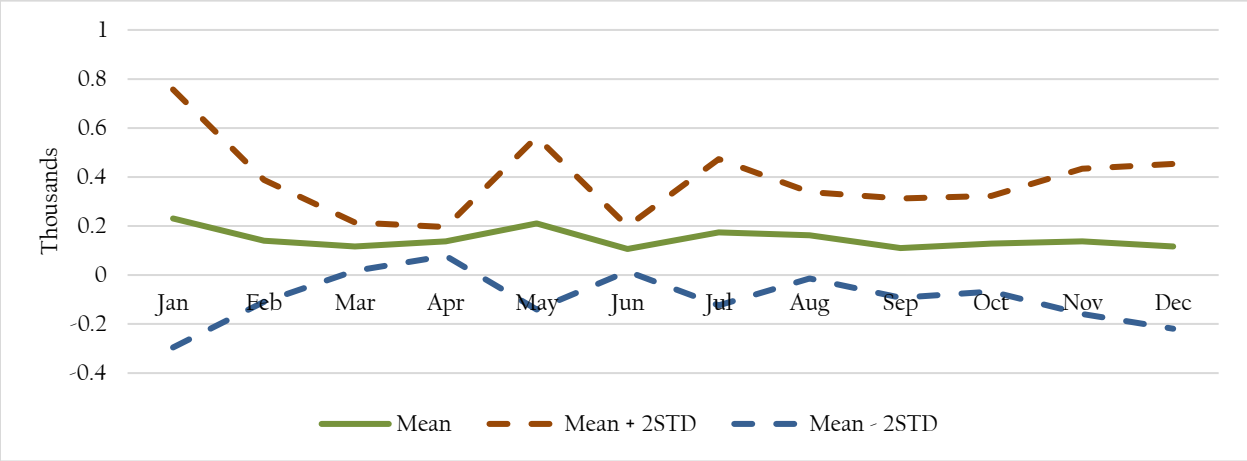
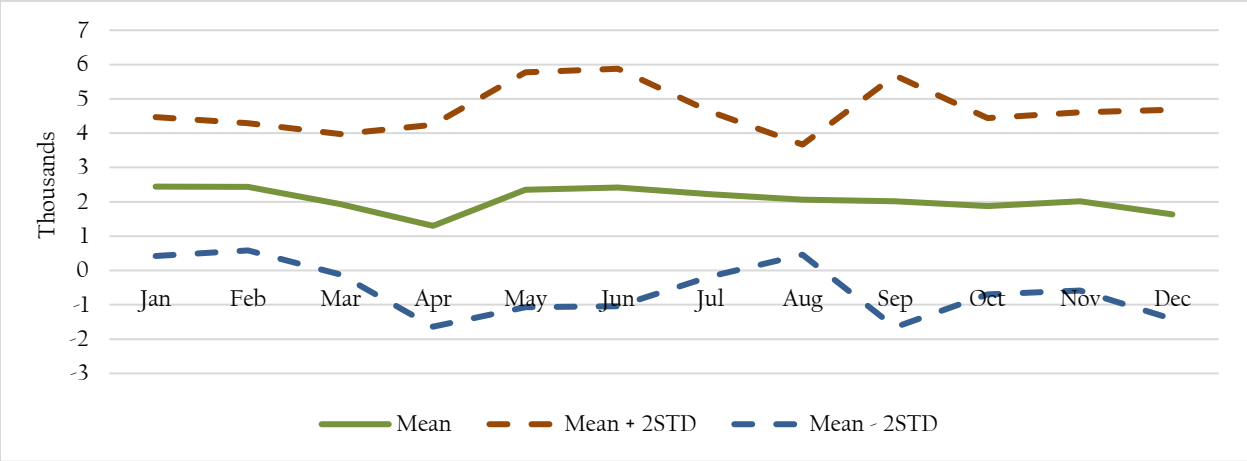


Figure 34: Port of Oakland 40 Foot Refrigerated Container Availability, 2012-2017

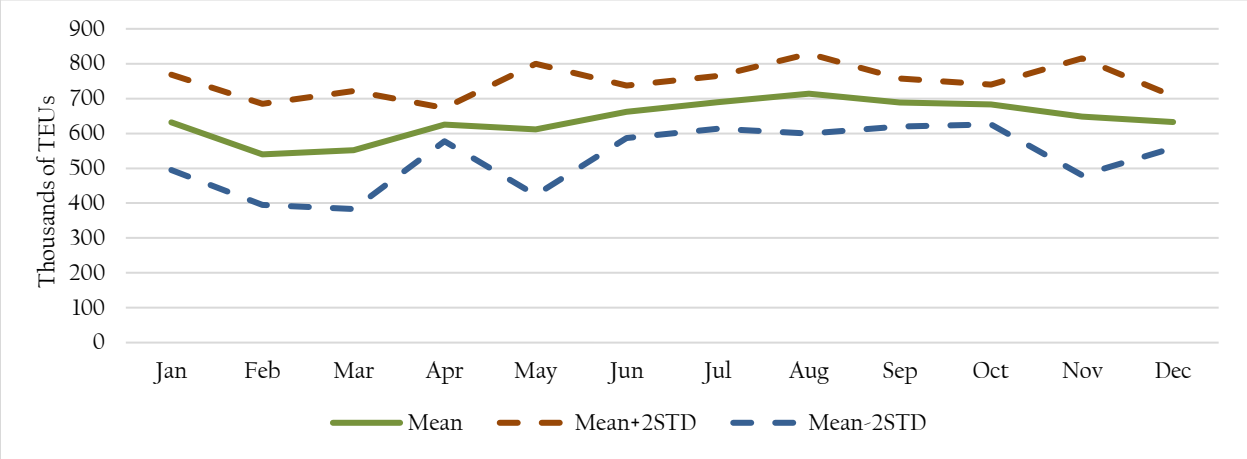


PORTS OF LOS ANGELES & LONG BEACH, CA

LOADED CONTAINER IMPORTS

The Ports of Los Angeles and Long Beach combined are the largest container ports in North America. They vastly out-import and out-export the other ports in this study. Import trade volume in these ports was more than 5 times the import volumes in the Ports of Seattle and Tacoma and over 9 times the import volume of the Port of Oakland (Figures 1, 18, and 35). On average, the Ports of Los Angeles and Long Beach process a combined 640 thousand loaded containers per month (Figure 35). The first quarter is lower in terms of container volume compared to the remainder of year.

Figure 35: Ports of Los Angeles and Long Beach Average Monthly Loaded Container Imports, 2012-2017

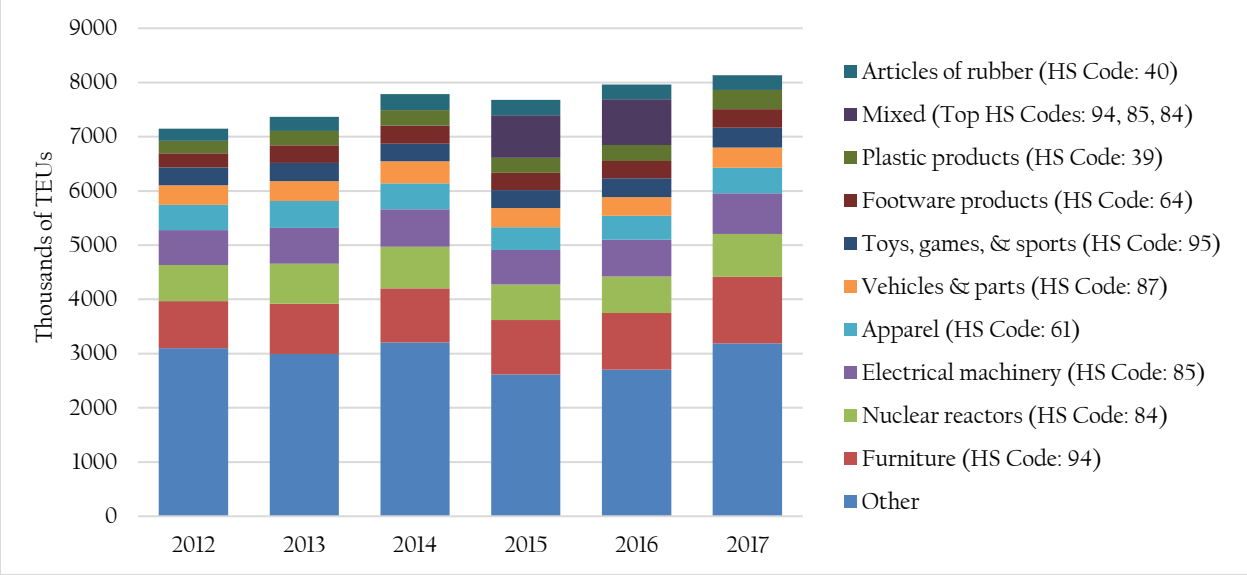


California was the top destination of loaded container imports via the Southern California ports for the years 2012 through 2017, importing, on average, over 2 million loaded containers each year (Figure 36). Texas, New Jersey, Illinois and New York each import over a quarter million containers a year on average through the Ports of L.A./Long Beach.

Figure 36: Ports of Los Angeles and Long Beach Annual Loaded Container Imports by Destination State, 2012-2017

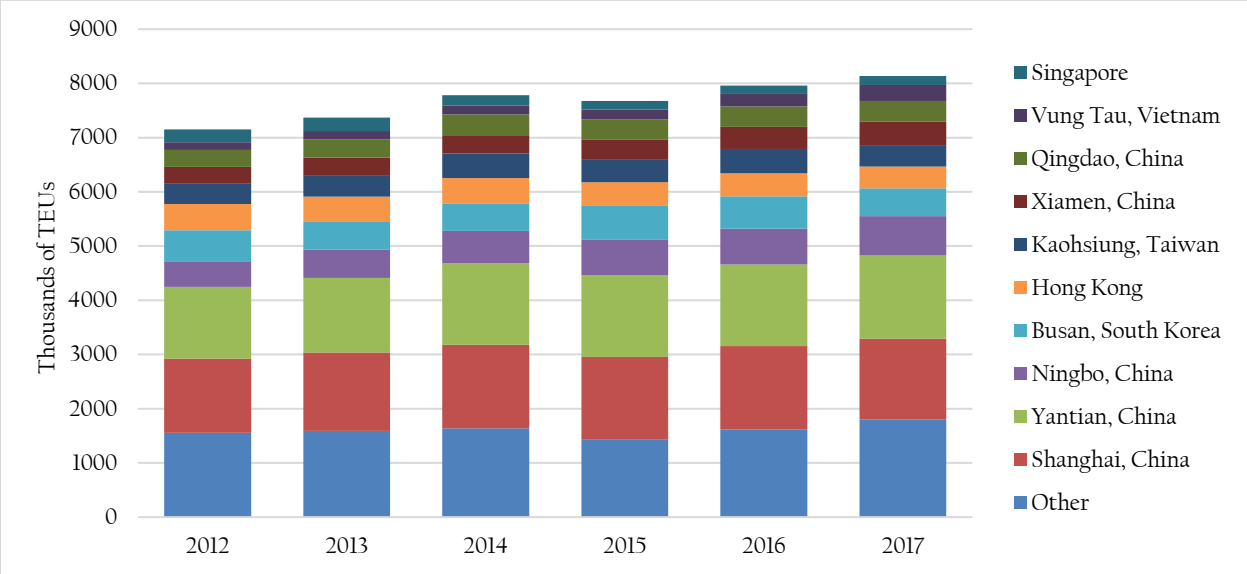
The top three imported commodities are furniture, nuclear reactors, and electrical machinery (Figure 37). While furniture has steadily increased through the years in total annual volume of containers, nuclear reactors and electrical equipment have held steady. The top 10 commodity types represent over 60 percent of the share of imports.

Figure 37: Ports of Los Angeles and Long Beach Annual Loaded Container Imports by Top 10 Commodity Types, 2012-2017



The ports of Shanghai (China) and Yantian (China) are the primary locations from which Los Angeles and Long Beach import most of their containers (Figure 38). Together they represent over a third of all imports. The total volume of loaded containers processed through the ports in Southern California is steadily increasing year over year.

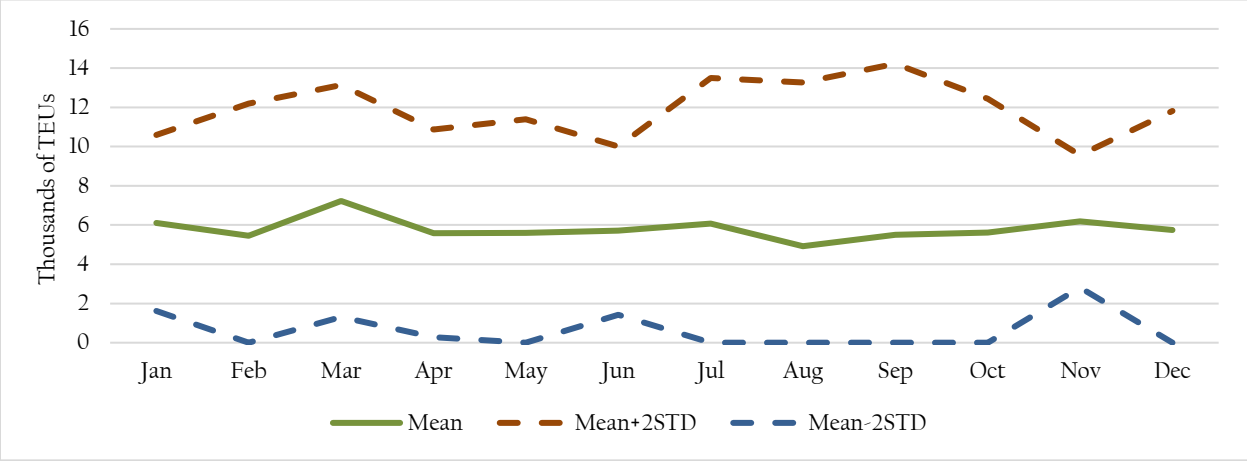
Figure 38: Ports of Los Angeles and Long Beach Annual Loaded Container Imports by Top 10 Ports of Departure, 2012-2017



EMPTY CONTAINER IMPORTS

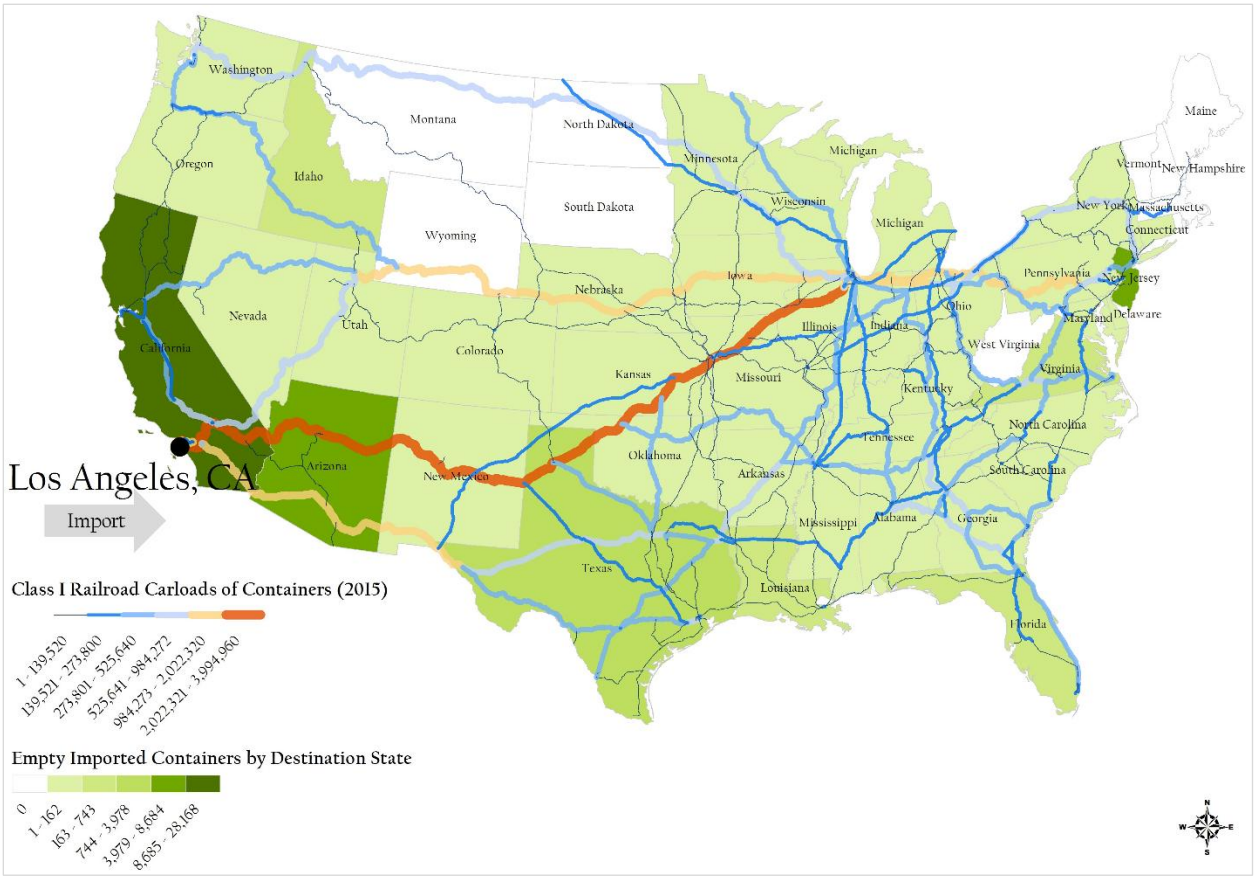
The average monthly import of empty containers remained relatively stable at just under 6 thousand containers; however, the variance throughout the year was large, especially during the late-summer and early-fall months (Figure 39). Despite the size of the Ports of Los Angeles and Long Beach, fewer empty containers were imported than through the Ports of Seattle and Tacoma (Figures 5 and 39).

Figure 39: Ports of Los Angeles and Long Beach Average Monthly Empty Container Imports, 2013-2017



The largest share (54.6%) of empty containers stayed in California (Figure 40). The only other states that received more than 1,000 empty containers each year over the last 5 years are New Jersey, Arizona, and Texas.

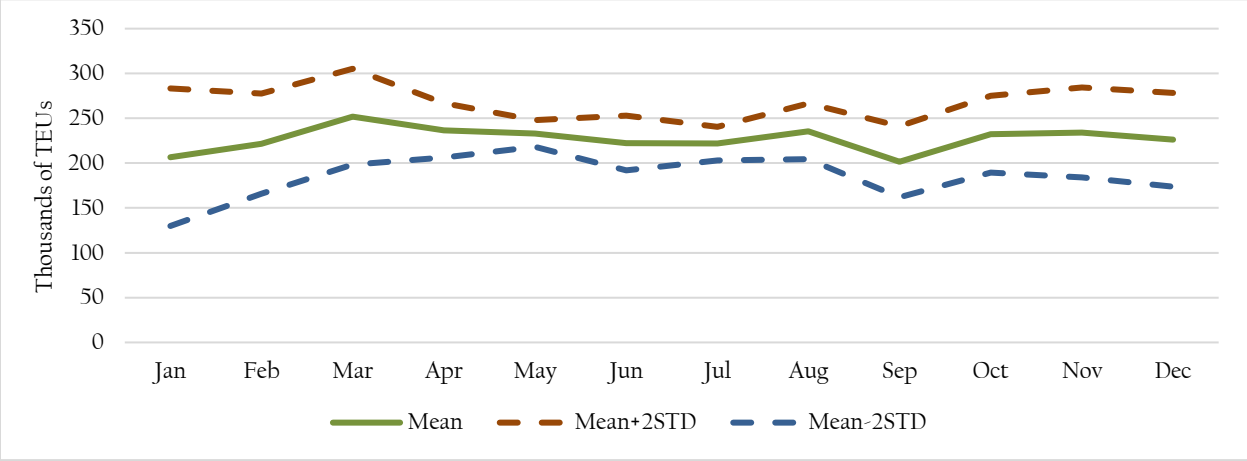
Figure 40: Ports of Los Angeles and Long Beach Annual Empty Container Imports by Destination State, 2013-2017



LOADED CONTAINER EXPORTS

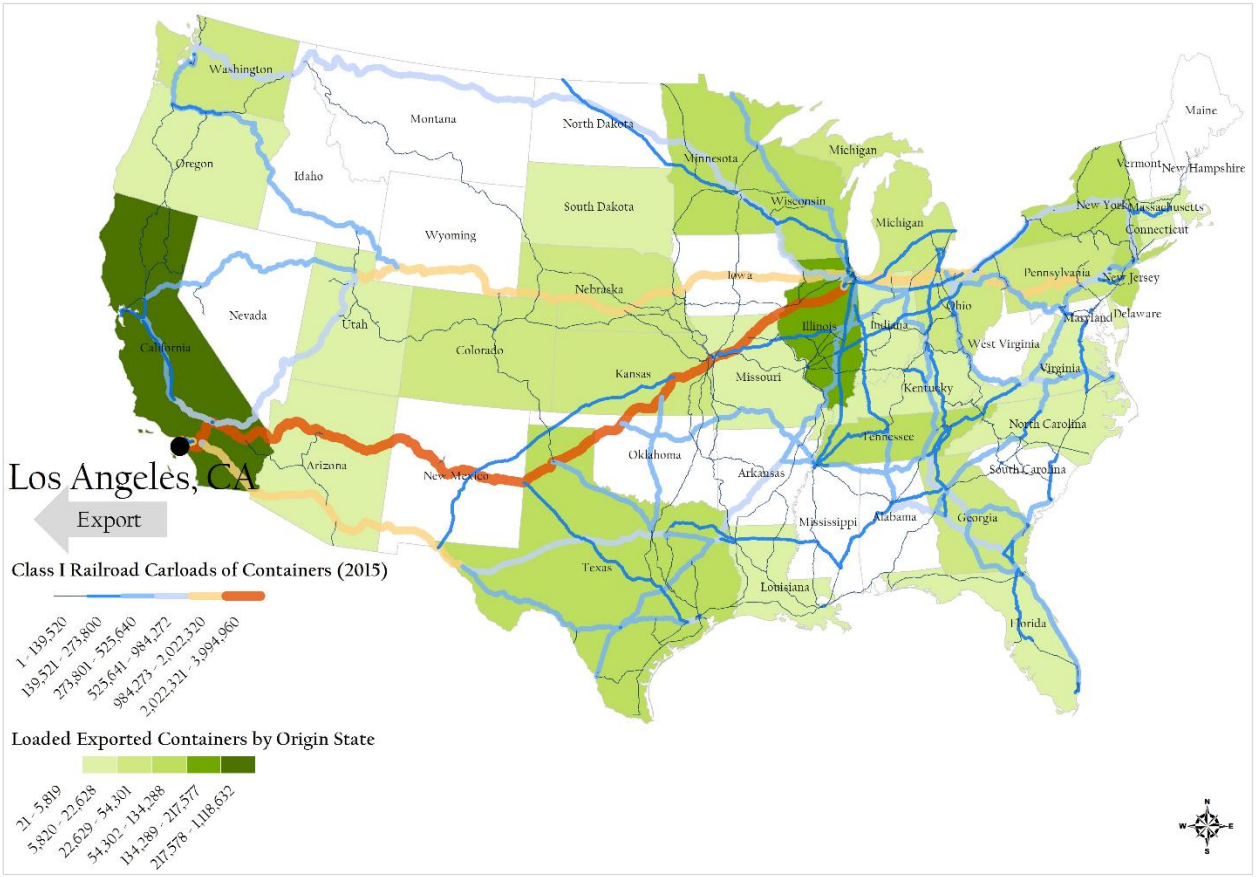
Export trade volume in the ports of Los Angeles and Long Beach was more than three times the export volumes in the ports of Seattle and Tacoma and the Port of Oakland (Figures 7, 24, and 41). The trade imbalance for the ports of Los Angeles and Long Beach is large: the import of loaded containers exceeded the number of loaded containers exported by nearly three times (Figures 35 and 41). The average monthly volume of loaded exported containers was relatively stable and fluctuated around 227 thousand containers over the past 5 years (Figure 41).

Figure 41: Ports of Los Angeles and Long Beach Average Monthly Loaded Container Exports, 2013-2017



Most of the loaded container exports originated in California (over 1.1 million containers a year); however, Illinois, Texas, and New York exported over 100 thousand loaded containers each year on average (Figure 42). Loaded containers bound for export via the two largest Southern California ports originated in every state in the continental United States over the past 5 years.

Figure 42: Ports of Los Angeles and Long Beach Annual Loaded Container Exports by Origin State, 2013-2017



The top commodity for export over the years 2013 through 2017 was wood pulp and scrap (Figure 43). In 2013 all other commodities (outside the top 10) contribute to a larger share of the exports (roughly two-thirds) as opposed to the 36 percent during the remaining years.

In terms of nations receiving exports from the ports of Los Angeles and Long Beach, Shanghai (China), Kaohsiung (Taiwan), and Busan (South Korea) were the top three destinations over the past 5 years (Figure 44). The exporting share of loaded containers for the top 10 destinations held steady through the years at over 50 percent. Shanghai (China), Kaohsiung (Taiwan), and Qingdao (China) are each importing at least 25% less in 2017 than 5 years previous through Southern California ports (Figure 44).

Figure 43: Ports of Los Angeles and Long Beach Annual Loaded Container Exports by Top 10 Commodity Types, 2013-2017

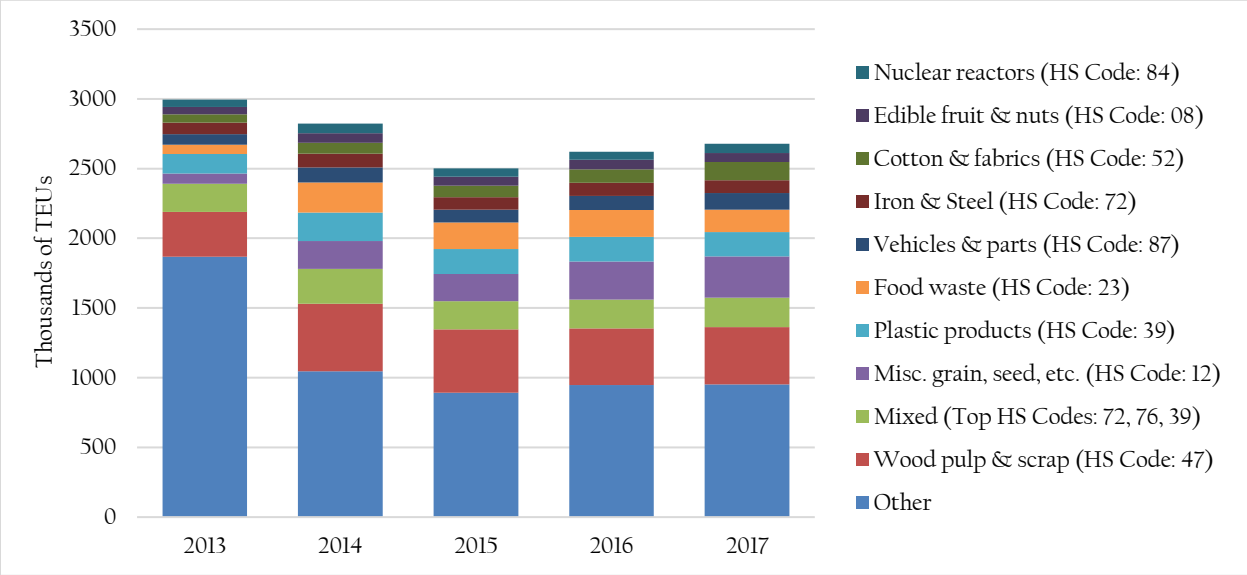
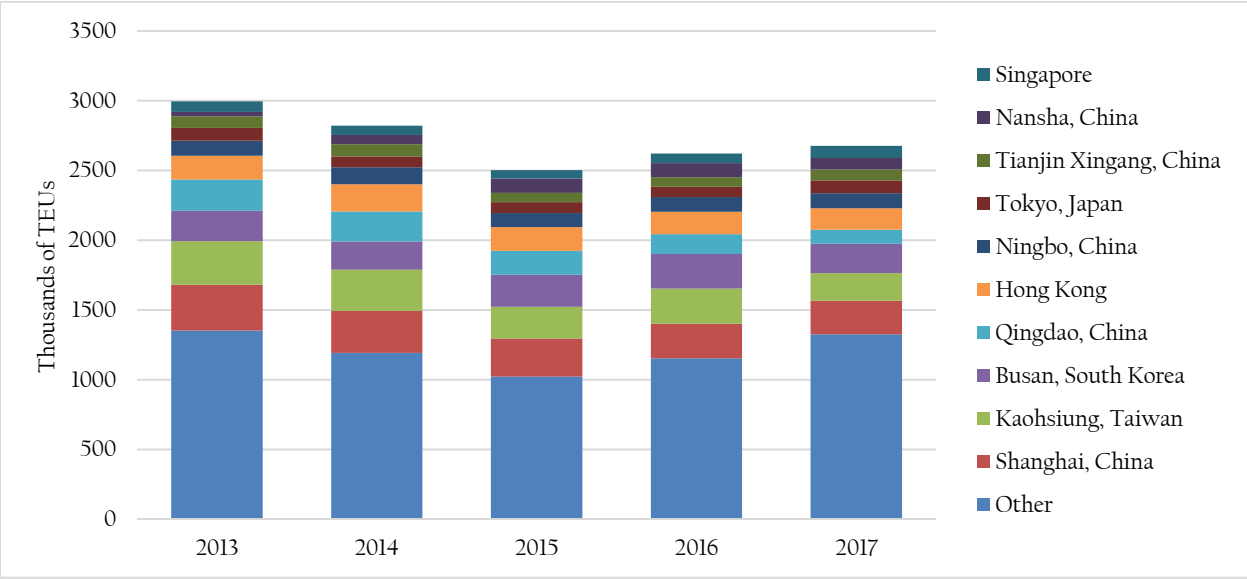


Figure 44: Ports of Los Angeles and Long Beach Annual Loaded Container Exports by Top 10 Ports of Arrival, 2013-2017



EMPTY CONTAINER EXPORTS

The ports of Los Angeles and Long Beach exported more empty containers than the Port of Oakland imported in loaded containers over the same period (Figures 18 and 45). The average monthly number of empty containers peaks in the spring and summer months at over 90 thousand per month and bottomed out in the winter months at just above 60 thousand empty containers per month (Figure 45). Texas was the largest exporter of empty containers, followed by Virginia and California (47, 31.1, and 13.3 percent, respectively) (Figure 46).

Figure 45: Ports of Los Angeles and Long Beach Average Monthly Empty Container Exports, 2014-2017

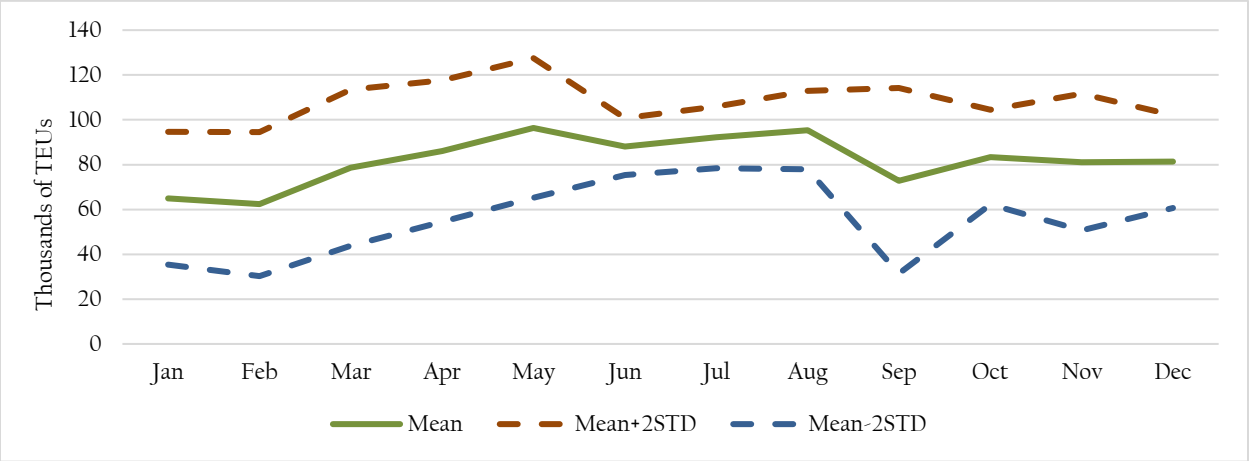
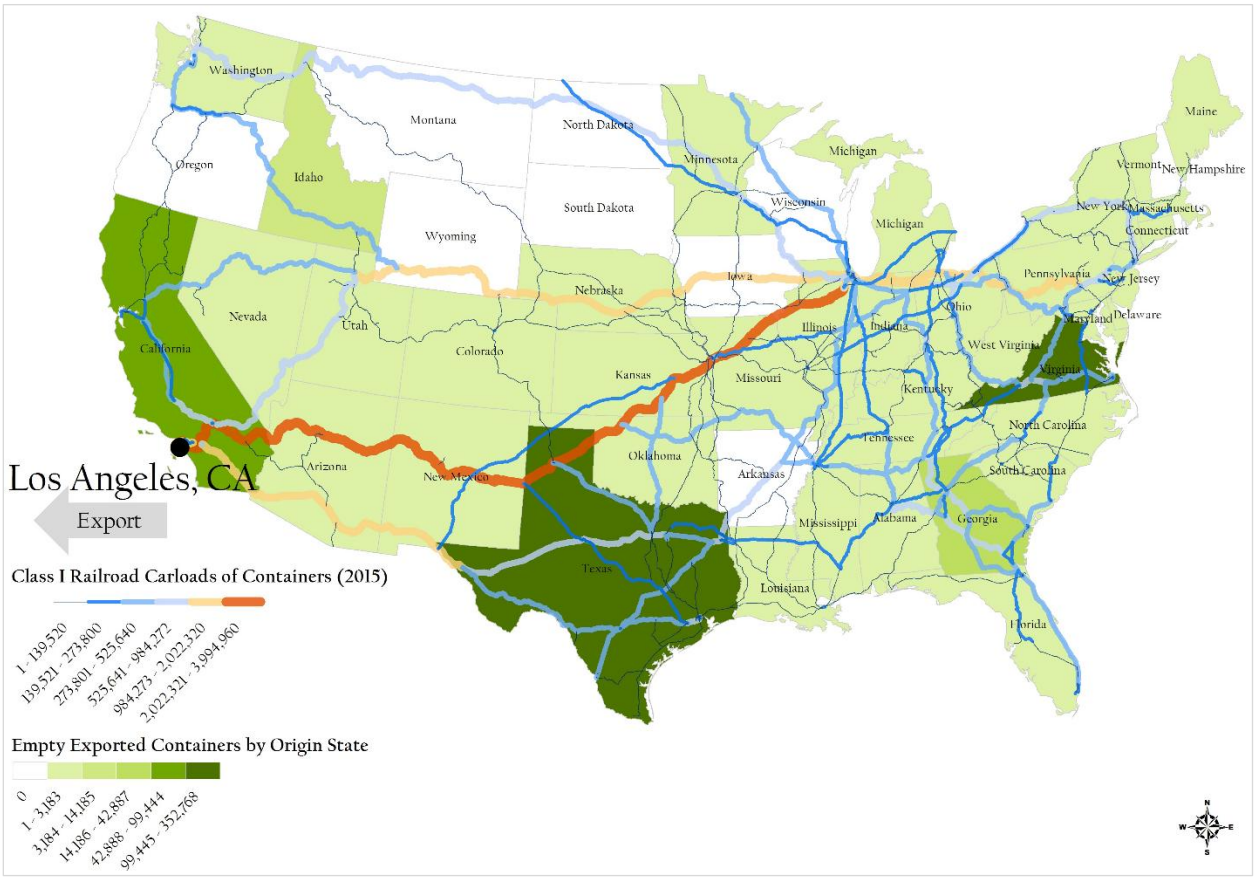


Figure 46: Ports of Los Angeles and Long Beach Annual Empty Container Exports by Origin State, 2014-2017



CONTAINER AVAILABILITY

Generally, the availability of empty containers is the greatest at the Ports of L.A. and Long Beach, particularly for 20 ft. 40 ft. dry and the 40 ft. high cube containers. This is partly due to the greater volume of containers moving through these ports as compared to other west coast ports. The monthly supply of various types of containers at the Ports of Los Angeles and Long Beach are presented in Figures 47, 48, 49, 50, and 51. As denoted above, a negative value indicates that demand exceeded supply. Negative values are within 2 standard deviations of the mean over the years 2012 to 2017 for only the refrigerated containers. The monthly supply of containers has been positive over the past five years for each type of container; except for the 20-foot and 40-foot refrigerated containers, which had at least one instance of negative supply (i.e., demand with insufficient supply). The 40-foot high-cube containers have the highest supply of over 45 thousand containers per month, on average (Figure 49).

Figure 47: Ports of Los Angeles and Long Beach 20 Foot Dry Container Availability, 2012-2017

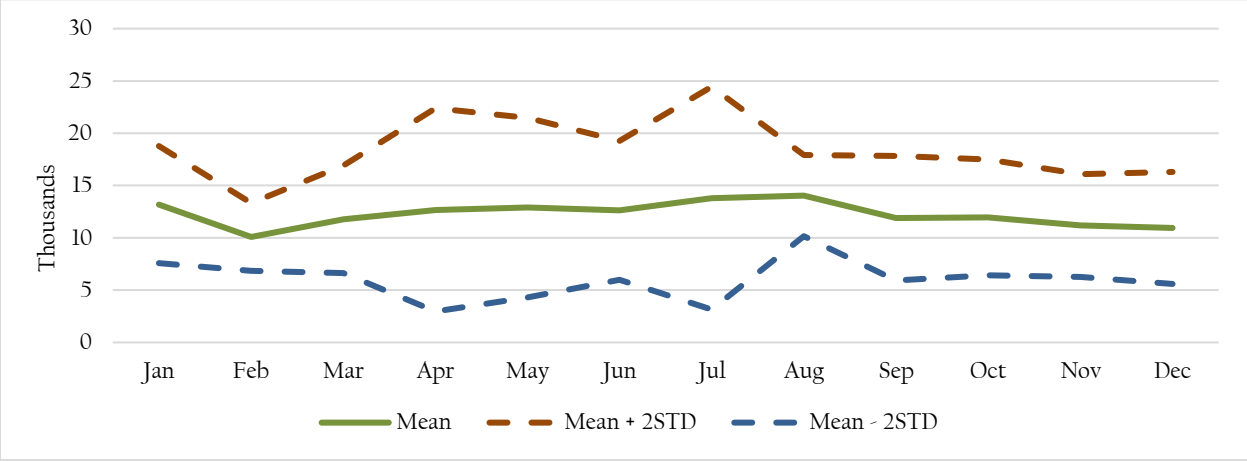


Figure 48: Ports of Los Angeles and Long Beach 40 Foot Dry Container Availability, 2012-2017

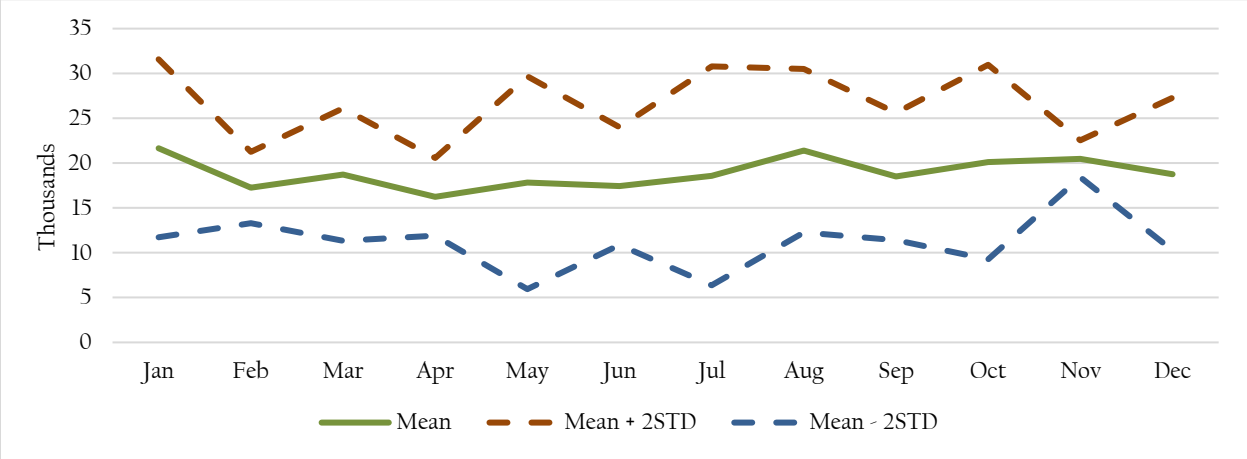


Figure 49: Ports of Los Angeles and Long Beach 40 Foot High-Cube Container Availability, 2012-2017

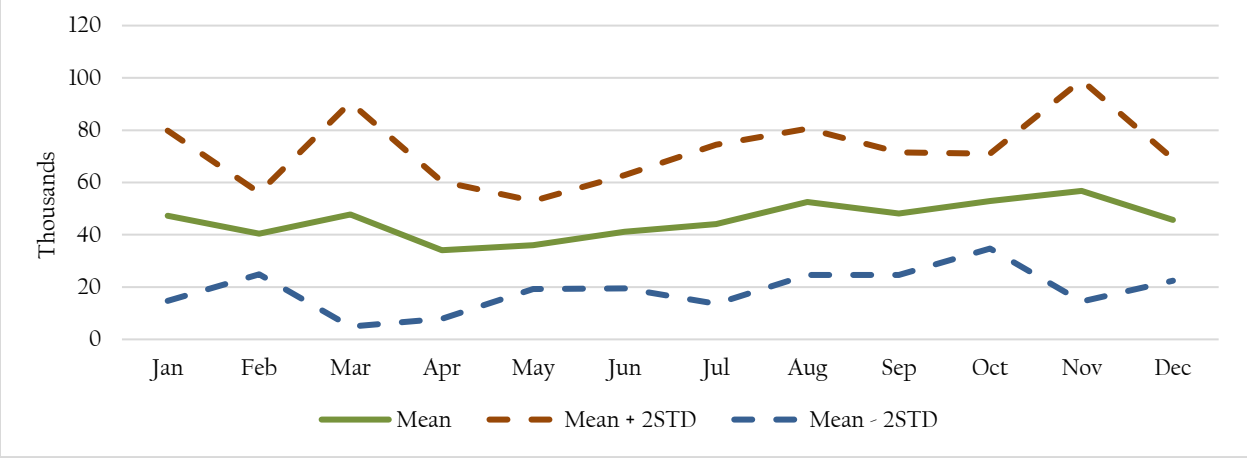


Figure 50: Ports of Los Angeles and Long Beach 20 Foot Refrigerated Container Availability, 2012-2017

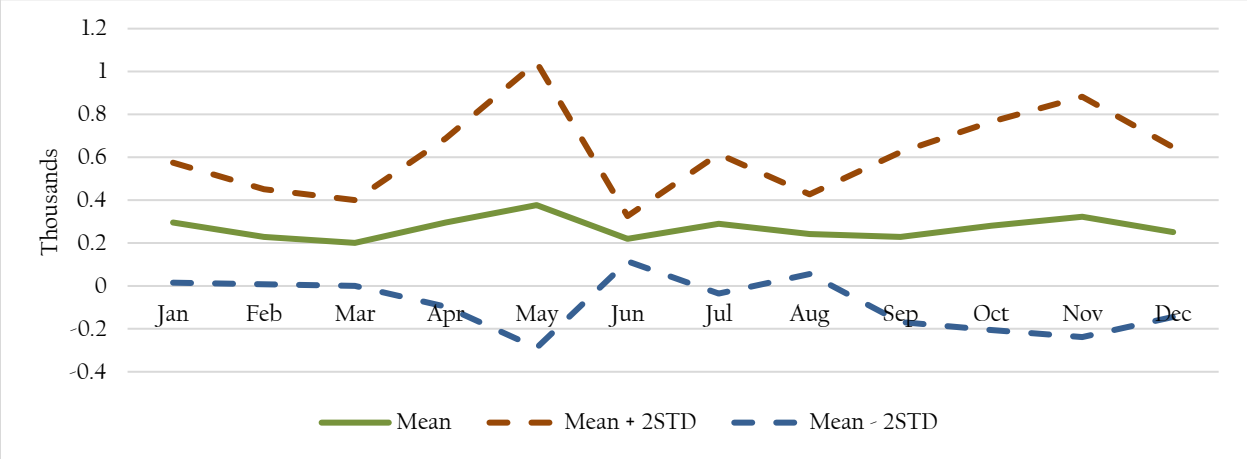
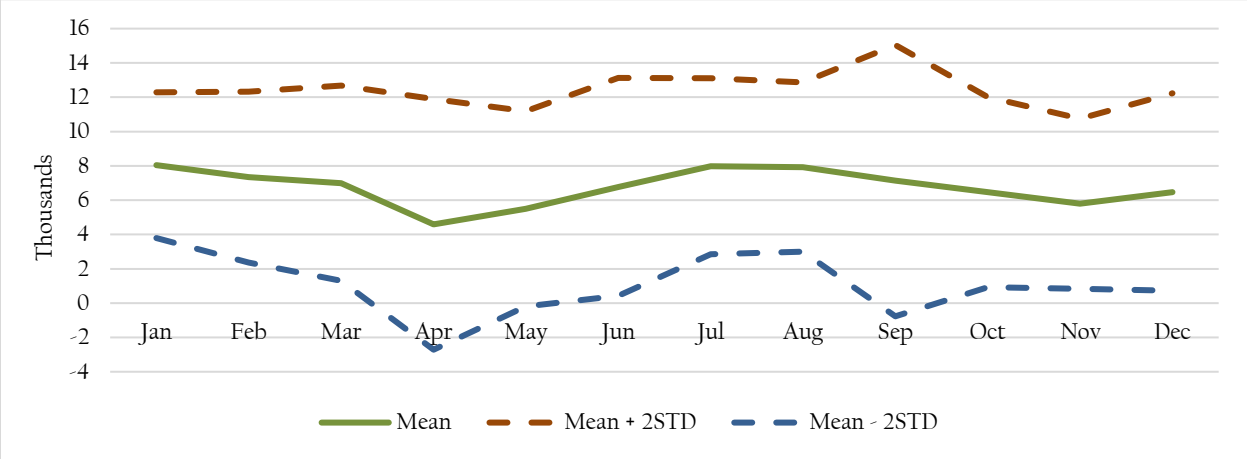


Figure 51: Port of Oakland 40 Foot Refrigerated Container Availability, 2012-2017



SUMMARY ANALYSIS

The three primary U.S. west coast container port areas are compared below in the following tables. The import and export yearly container volume statistics are provide in Table 1. The Ports of Los Angeles and Long Beach processed vastly more containers (for both import and export) than either the Ports of Seattle and Tacoma or the Port of Oakland. The Port of Oakland had the closest balance of trade volume between imports and exports (Table 1). The last two Figures, Table 2 and Table 3, summarize the top commodities, origin ports, and destination states of each of the ports for imports and exports, respectively.

Table 1: Import/Export Container Volume Statistics (Yearly Average TEUs 2012-2017, thousands)

Port/s	Import/Export All	Import/Export Loaded	Import/Export Empty	Loaded/Empty Import	Loaded/Empty Export
Sea/Tac	1,481 / 1,064	1,360 / 878*	121* / 186**	1,360 / 121*	878* / 186**
Oakland	935 / 906	817 / 759*	64* / 147**	817 / 64*	759* / 147**
L.A./Long Beach	7,748 / 3,707	7,678 / 2,724*	70* / 983**	7,678 / 70*	2,724* / 983**

* 2013-2017 yearly average
** 2014-2017 yearly average

PORTS OF SEATTLE & TACOMA, WA

The Ports of Seattle and Tacoma import just under 115 thousand loaded containers each month. These are primarily destined to Washington, Illinois, and California, in order of volume (17.5, 10.3, and 8.9 percent, respectively). About 10 thousand empty containers are imported each month and they are destined primarily to Arizona, California, Washington, and Texas (81.1% combined). It is revealing, when compared to the other Ports of Oakland, L.A. and Long Beach, the relatively low proportion of loaded inbound containers that are destined to Washington State. This is primarily driven by population demographics and the demand for consumer durables for purchases from Asia. The region around the Ports of Seattle and Tacoma, while growing fast, still don't represent the market that is present within 500 miles of the Ports of Oakland or L.A./Long Beach. As a result, much of the inbound loaded container freight passing through the Ports of Seattle and Tacoma are destined to markets in the interior U.S. This reality limits availability of empty containers for agricultural exporters in the PNW region. Comparing the origination point of exported loaded containers, a relatively large proportion leaving the Ports of Seattle and Tacoma originate from either Washington or Oregon, comparable to that originating from California for the container ports in California. This fact implies that agricultural shippers in the PNW searching for export boxes compete for fewer available boxes, as compared to shippers in California.

Just under 75 thousand loaded containers per month return to the Ports of Seattle and Tacoma. These containers primarily originate in Washington and California, followed by Oregon in container volume (30.9, 26.3, and 11.1 percent, respectively). Around 15 thousand empty containers per month also make their way to the PNW for export at the ports. Texas and Virginia are the primary states of origination for these empty containers (79.8% combined).

PORT OF OAKLAND, CA

The Port of Oakland imports roughly 60 percent of the volume that moves through the Northwest Seaport Alliance. The final destination of these loaded containers is primarily within the state of California (57.9%); however, each of the lower 48 states receives these containers. Only 5 thousand empty containers are processed by the Port of Oakland on average per month and a large share (62.1%) never make it beyond the borders of California.

Around 63 thousand loaded containers are loaded on freighters and shipped out of Oakland every month. California originates a large percentage of these containers (65.6%), but each state in the lower 48 originates loaded containers for export. As was the case for the Ports of Seattle and Tacoma, the Port of Oakland exports empty containers (about 12 thousand per month) which primarily originate in Texas and Virginia (85.6% combined).

Table 2: Import Summary: Top Commodities, Origin and Destination by Port, Average over 2012-2017

Imports received via Port/s	Top Commodities	Top Origin Ports (Loaded)	Top Dest. States (Loaded)	Top Dest. States (Empty)
Seattle and Tacoma	Furniture (13.5%); nuclear reactors (8.4%); electrical machinery (6.3%); Other (outside top 10) accounts for 42.7%	Shanghai, China (21.6%); Yantian, China (18.8%); Busan, South Korea (15%); Other (outside top 10) accounts for 12.1%	Washington (17.5%); Illinois (10.3%); California (8.9%); Ohio, Minnesota, Oregon, and Michigan contribute at least 5% each	Washington (30.9 %); California (24.7%); Arizona (13.8%); Texas (11.7%); New Jersey and Idaho contribute at least 5% each
Oakland	Furniture (14.8%); beverages (6%); glass & glassware (4.9%); Other (outside top 10) accounts for 48.1%	Shanghai, China (17.1%); Yantian, China (13.4%); Kaohsiung, Taiwan (6.2%); Other (outside top 10) accounts for 34.5%	California (57.9%); Illinois (4.1%); Texas (3.6%)	California (62.1%); Texas (10.3%); Arizona (7.9%); Utah (5.7%)
Los Angeles and Long Beach	Furniture (13.2%); nuclear reactors (9.3%); electrical machinery (8.8%); Other (outside top 10) accounts for 38.7%	Shanghai, China (19.3%); Yantian, China (19%); Ningbo, China (7.9%); Other (outside top 10) accounts for 20.9%	California (40.2%); Texas (7.9%); New Jersey (5.7%); New York (5.7%)	California (54.6%); New Jersey (16.8%); Arizona (15.3%); Texas (7.7%)

PORTS OF LOS ANGELES & LONG BEACH, CA

The Ports of Los Angeles and Long Beach vastly dwarf the container volume that passes through the other ports on the west coast of North America. Nearly 640 thousand loaded containers are imported through these two ports each month, compared to 113 thousand loaded containers for the Northwest Seaport Alliance and 68 thousand loaded containers for the Port of Oakland. The primary destination for these loaded containers is California (40.2%). Texas, New Jersey, and New York also import a significant quantity (19.3% combined). A relatively tiny amount (6 thousand) of empty containers pass through the ports of Los Angeles and Long Beach each month. These empty containers primarily stay in California (54.6%).

Table 3: Export Summary: Top Commodities, Origin and Destination by Exporting Port, Average over 2013-2017

Export via Port/s	Top Commodities	Top Dest. Ports (Loaded)	Top Origin States (Loaded)	Top Origin States (Empty)
Seattle and Tacoma	Misc. grain, seed, etc. (17.3%); wood pulp & scrap (10.1%); wood products (7.7%); Other (outside top 10) accounts for 35.5%;	Kaohsiung, Taiwan (12.87%); Busan, South Korea (11.2%); Tokyo, Japan (7.7%); Other (outside top 10) accounts for 37.2%	Washington (30.9%); California (26.3%); Oregon (11.1%); Illinois (6.5%)	Virginia (40.6%); Texas (39.2%); New Jersey (12.8%); California (3.2%)
Oakland	Wood pulp & scrap (18.5%); edible fruit & nuts (11.4%); meat products (6.5%); Other (outside top 10) accounts for 43.9%;	Busan, South Korea (9.4%); Hong Kong, China (6.9%); Shanghai, China (6.5%); Other (outside top 10) accounts for 48.4%	California (65.6%); New York (3.7%); Illinois (3.3%)	Texas (45.8%); Virginia (39.9%); Georgia (5.1%)
Los Angeles and Long Beach	Wood pulp & scrap (15.2%); mixed (7.9%); misc. grain, seed, etc. (7.6%); Other (outside top 10) accounts for 41.9%;	Shanghai, China (10.2%); Kaohsiung, Taiwan (9.4%); Busan, South Korea (8.2%); Other (outside top 10) accounts for 44.4%	California (46.1%); Illinois (9%); Texas (5.5%)	Texas (47%); Virginia (31.1%); California (13.3%); Georgia (5.7%)

Just north of 225 thousand loaded containers are exported via the Ports of Los Angeles and Long Beach each month on average. California is the largest exporter of loaded containers (46.1%), followed by Illinois (9%), which exports almost 1 million loaded containers less than California each year on average. Each state, however, originates loaded containers for export via these two Southern California ports. Unlike the other ports of interest in this study, just north of 80 thousand empty containers per month on

average are loaded on freighters and shipped out of the country via the Ports of Los Angeles and Long Beach. The largest percentage of empty containers originate in Texas and Virginia, followed by California (47, 31.1, and 13.3 percent, respectively).

IV. STAKEHOLDER PERSPECTIVES ON CONTAINER CHALLENGES IN THE PACIFIC NORTHWEST

Individual phone and personal interviews were conducted throughout the summer 2018 with PNW stakeholders and information regarding responses documented. The interviewees included representatives of port authorities (2), commodity commission (1), agricultural shippers (6), ocean carriers (2), freight forwarders (1), trans-loader (1), Class I Rail (2), and labor union (1). All stakeholders were asked their perspectives on the following issues including: adequacy of available empty containers in the PNW for agricultural shippers in the region to access; nature of the problem; impact of the port's considerable infrastructure investments and deepening of channel to accommodate larger container vessels on container availability; remedy to improve access for regional agricultural shippers seeking containers; and impact of consolidation among ocean carriers, reduced ports of call, and fewer frequency stops on the availability of containers in the region. For stakeholders involved in shipping, questions were posed concerning the level of difficulty encountered in getting access to containers, seasonality of products, logistical issues, and potential solutions to mitigate the issues of moving freight out of the region.

The interviews were intended to provide a narrative of the container-related challenges faced by affected agricultural shippers in the PNW. There were several common themes that emerged. Specific comments from interviewees for each theme were presented in quotations below.

Theme 1: Large shippers are not affected by the shortage of containers.

Interviewees agreed that large agricultural shippers can leverage their volume and consistency with service providers, ensuring that they get what the need. There have been periodic instances when shippers cannot obtain enough containers, but mostly, necessary equipment is provided for them, and container access has not been a problem. For seasonal products, the volume shipped will vary depending on peak and off-peak seasons. However, there is a consistency in these volumes, such that the ocean carriers can expect how many containers are needed by the agricultural shipper in each of the two periods.

> *"We move large volumes of our product to the PNW and southern CA. Shipping lines go out of their way to make sure our needs are met. There are times when they even rail empties out of CA to make sure they have boxes here. Shipping lines are not interested in 20 shippers who each "may" be interested in shipping 2-4 containers per week. They want volumes and consistent volumes. They will service those customers." (Ag. shipper 1)*
>
> *"There are peak and off-peak seasons for our shipments. We ship a large volume. We are in the top priority list for reefer cargo in the PNW." (Ag. shipper 2)*
>
> *"We get good services and available equipment. We did not have a shortage of reefer containers in the past several years." (Ag. shipper 3)*
>
> *"Infrequency of shipment may affect access to containers more than the volume of shipment." (Ag. shipper 4)*

Theme 2: Merging of ocean carriers limit the number of containers available.

Ocean carrier alliances service three major shipping trade routes – Trans-Pacific, Asia-Europe, and Trans-Atlantic trade routes (American Export Lines, 2017). As of May 2018, there are three alliances: The Alliance, 2M, and Ocean Alliance (Flexport Inc., 2018). Carriers share vessels within their alliances; thus there are fewer vessels. Shippers can take advantage of these alliances since they have a greater geographical coverage relative to an individual carrier. However, given fewer vessels and each vessel having a maximum capacity, agricultural shippers now have a more limited number of containers available to them compared to the time before the carriers organized themselves into a larger group.

> *"Merging of ocean shippers can be a challenge since they share vessels and each vessel has a maximum capacity, meaning limited number of containers that can be carried." (Ag. shipper 2)*
>
> *"There is limited number of vessels and each vessel has a weight capacity." (Ag. shipper 4)*
>
> *"There is a deadweight issue. Typically, bulky (but not very heavy) goods are brought in, but the outbound cargo can be heavy (e.g., grains, other produce, etc.) such that the weight limitation of the vessel is reached early. This issue is typical of Asia-US-Asia shipments not only in SEATAC but also other ports in the west coast that ship to Asia." (Ocean carrier 1)*
>
> *"The difficulty in getting containers may be attributed to the maximum weight limitation of the ocean vessel that carries the containers. If many containers have heavy products, the ocean vessel is forced to load some empties in order to not go over the capacity constraint (e.g., 70% of all containers are loaded and 30% are empty)." (Transloader)*

Theme 3: Highway congestion is costly for shippers accessing the ports.

Agricultural shippers are contracted to meet customers' demands and schedules, and the time-sensitivity of their cargos are significantly affected by congestion in the highway system. Shippers have mentioned that the Puget Sound region is presently congested, and with expected growth in population and economic activities in the coming years, the highway system in the region will become more congested. Congestion not only affects timely access to the port terminals, but also increases the shipper's transportation costs.

> *"Overall traffic congestion in PNW is one of the biggest issues with moving freight out of the PNW." (Ag. shipper 1)*
>
> *"Seattle is too congested. Highway 18 to Tacoma is a big slowdown for trucks." (Ag. shipper 2)*
>
> *"One of the issues is losing some road access to the port because of industrial development/urbanization in Seattle that do not let trucks pass through the area. This loss adds to congestion that affects the travel time of trucks to the port." (Ag. shipper 4)*
>
> *"One of the biggest challenges is the current infrastructure, such as roadways, where there is significant congestion." (Ocean carrier 2)*

Theme 4: The port terminals' business hours, together with port congestion and highway traffic, limit the number of turns that trucks can make in a shift, and contribute to delays in shipment.

The operational time at the port terminals can be an issue as the terminals do not accommodate drop off or pick up of cargo outside the daytime weekday hours. Exacerbated by highway traffic and long lines to enter the terminal gates, trucks encounter long dwell times to unload/deliver their cargo. If trucks unload their cargo at the terminal too close to the cut-off time, there is not enough time to move all cargo off the terminals. Hence, the loads will have to wait to be shipped for export until the next day; or worse wait over the weekend (i.e., 2 days) if the cut-of time falls on a Friday. This is a negative for business because importers value timely delivery.

"NWSPA does not have a night gate operation where truck drivers can arrive to drop off or pick up boxes after hours as they do in LA/Long Beach. This leads to massive lines getting into and out of the port during times they are open. This is exacerbated by regular Puget Sound highway traffic." (Ag. shipper 1)

"There are vessel time cut-offs and the terminals are closed during the weekends. For instance, if the products are loaded on a Friday and cannot be shipped that day due to time cut-off, the products will sit in the containers for 2 days (Saturday and Sunday) before they can be shipped. This delay can affect the quality of the products." (Ag. shipper 2)

"Extended hours in the terminals can help relieve congestion in the highways and allow the trucks to unload containers in off-peak hours." (Ag. shipper 4)

"Consistency in getting the products to the customers is very important, particularly meeting the agreed upon delivery schedule and volume consistently." (Commodity commission representative)

"Operation hours of 9 am to 5 pm is an old system and there is no known action to change this. Perhaps the change in hours, beyond the normal operation hours, should be made as normal working hours. Consider following the Port of LA model." (Ocean carrier 2)

"One or two people will be working in the terminal gate but there are actually more people working on the logistics of loading and unloading in the terminals. With increasing volume, it might make sense to have extended hours like the Ports of LA/Long Beach." (Ocean carrier 1)

In addition to the above common themes, some of the interviewees raised other issues that affect access to containers, particularly shippers with relatively fewer and infrequent volumes, labor disputes, processing issues inside the terminal, availability of trucks, and relief to highway congestion.

- On small, infrequent shippers: *"It would make sense for them to group together into shipping associations and move freight as part of their shipping associations or freight forwarders. It would allow them to access scale negotiating power." (Ag. shipper 1)*
- On labor: *"Shipments are affected by labor disputes that occur during peak season, for instance November to December; particularly voluntary slowdown, or mandatory work stoppage." (Ag. shipper 2)*
- On processing at the terminal: *"There are occasions when the truck has entered the terminal and is ready to pick up the containers but the containers are not yet ready. Containers need to be cleaned before they are picked up. Drivers*

cannot wait for more than two hours for containers to be cleaned because drivers have other pick-up schedules." (Ag. shipper 2)

- On availability of trucks: *"The availability of trucks is a challenge, especially given the seasonality of tree fruits, such that there may be containers available but not enough trucks to pick them up." (Commodity commission representative)*
- On the ELD mandate: "*Because of the ELD mandate limiting the number of working hours of drivers per day, driving to say, 300 miles, can take 2-3 days because the driver has to stop and stay overnight somewhere before moving on. The mandate truncated the distance that trucks can service." (Ocean carrier 1)*
- On bigger ocean vessels and bigger volumes of shipment: *"These factors do not necessarily impact access to containers in a negative way as long as the fluidity in the movement of cargos is addressed through the combined services of port terminals, railroad, and ocean carriers, working in sync." (Ocean carrier 1)*
- On infrastructure: "*There is no reason to think that the activities in SEATAC will decline. It will continue to grow so infrastructure movements are needed to address the congestion challenges and capacity. For instance, in the port, the biggest ship that can port in SEATAC is 14k TEU compared to 20K TEU in the Port of LA or Long Beach." (Ocean carrier 2)*
- On mitigating congestion: *"Is it possible to reposition a port where there is less congestion, such as Everett and Bellingham?" (Ag. shipper 2)*

V. ECONOMIC ASSESSMENT OF PNW CONTAINER AVAILABILITY CHALLENGES

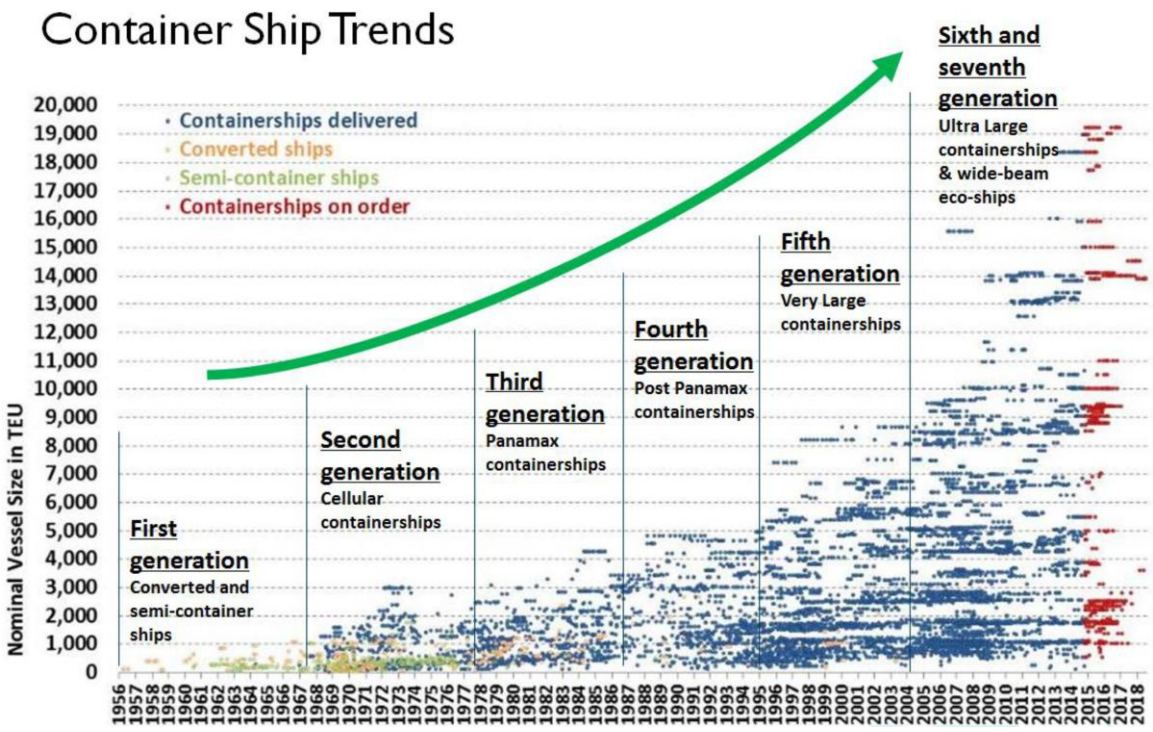
The data and analysis provided on container traffic through U.S. west coast ports and the perspectives highlighted from various stakeholders illustrates the various challenges associated with container availability for shippers wanting to export products in this region. The reality of how container freight traffic currently moves is a combination of many economic and service related factors, influenced by a variety participants but primarily a function of four key participants. In order to arrive at any reasonable or economically feasible solution to help mitigate the problem of container availability, it's important to fully understand the fundamental economics driving the four primary participants. This section explores the economic choices faced by these participants.

OCEAN CARRIERS

Perhaps the most influential participants are the ocean carriers who own the containers and largely control how and where service is provided (which ports to call, service frequency, markets served, vessel sizes, etc.). There has been considerable consolidation over the past 15 years amongst ocean carriers, both in terms of mergers/acquisitions and carrier alliances as ocean carriers seek to maximize both capacity utilization and bargaining strength by increasing scale, eliminating competition and lowering operating costs with larger vessels that make fewer stops. The average size of container vessels continues to grow, as illustrated in Figure 52 below as ocean carriers strive to possess the lowest operating costs and maximum economy of scale. Larger vessels have the added advantage of lower costs per TEU mile operated and on any given route, fewer miles traveled once service schedules are reduced to satisfy capacity utilization of the larger vessel. The choices confronting ocean carriers relative to vessel sizes and services provided are impacted by shippers and landside transportation (rail and truck) availability as well, but primarily as a secondary influence. When ocean container services ceased at the

Port of Portland, OR it was primarily because of the investment in larger vessels by the ocean carriers that couldn't be accommodated by draft limits on the lower Columbia River. In addition, they could eliminate one west coast port of call without losing much cargo given that most of it would still move through other west coast ports. The fact that the Port of Portland was a relatively costly stop that had perpetual labor issues certainly contributed to the decision of the ocean carriers.

Figure 52: Evolution of Container Ship Sizes, 1950 - Current



Source: U.S. Army Corps of Engineers

Ultimately the ocean carriers are interested in maximizing profits. This is achieved by maximizing capacity utilization of the larger vessels for which they've invested. This places greater importance on the following:

- Increasing total turns per vessel/year
  - Increasing efficiency of port operations (port operator, port district investments, labor)
  - Efficiency transportation access to/from the port (highway congestion, dray operations, Class I rail, regional rail)
  - Maximizing container volume (as service improves and rates decline, volumes grow)
  - Maintaining balanced capacity on routes served
  - Consistently stable and preferably increasing freight volumes

- Lowest cost of operations (impacted by vessel size and bullets above)

- Continually improving service and reliability

Ocean carriers have dedicated vessels that they strive to maximize capacity utilization. The nature of many agricultural export products being heavier and denser leads to challenges of the ocean carriers

balancing vessels leaving the PNW ports, since it takes fewer loaded containers for a vessel to reach their load capacity, even though the vessel still has space available. This contributes to many empty containers returning to Asia on vessels, due to the differences in weight density of inbound and outbound container freight and the fewer available empties in the PNW for use.

Ocean carriers aren't opposed to increasing container availability for PNW shippers, as long as it fits within their operating objectives and larger, global network optimization rubric. The information collected from interviews with shipper in the PNW reveals that large volume shippers receive very good availability to containers from ocean carriers. The problem of availability is primarily to a broader constituency of smaller shippers that have more seasonally varying needs and across different commodity types (variety of container equipment types) and perhaps over a larger geographic region.

CLASS I RAIL CARRIERS

Similar to the ocean carriers, the two Class I railroads (four if you include the Canadian ports) servicing the west coast ports are interested in maximizing profits. They have invested significantly in their networks over the past 15 years and strive to satisfy a variety of shipping clients with container (intermodal) being one of many. In many ways, they are similar to the ocean carriers in seeking to maximize capacity utilization for the networks and equipment they own and operate, since investment in underutilized capacity yields limited returns. But the Class I railroads determine their service schedules and stops in a way that maximizes network utilization and profits. Generally, they prefer longer trains, travelling longer distances between stops and loaded with revenue generating cargo since this yields the best operating margins. Starting and stopping large trains is energy intensive and expensive over short distances and reduces the number of turns possible for equipment.

In the current operating schema, both Class I railroads provide service from these west coast ports to interior markets for imported container traffic and likewise for exported container traffic, both loaded and empty. These relationships between the ocean carriers and the Class I railroads are advantageous to both. The ocean carrier benefits from improved vessel utilization to access markets from the west coast some 1,500 miles or more inland and having the capacity to move a large volume of containers into/away from the port so quickly improves overall logistical efficiency. If the west coast ports were entirely reliant on truck, it would substantially lower operating efficiency given the time and expense associated with managing so many different vehicles and dealing with the uncertainty of when truck-container shipments would arrive. It would also reduce the ocean container market at west coast ports as the cost to deliver containers from Chicago, IL to L.A., CA would be too prohibitive for most shippers and markets served. All west coast ports process a large proportion of truck container traffic, but increasingly rely on Class I intermodal service to move large volumes of containers quickly onto/off vessels and onto/off port property.

Some stakeholders believe that Class I railroads share responsibility in the shortage of available containers in the PNW, since they move large number of containers from the Ports of Seattle and Tacoma to/from Chicago, IL and also serve other west coast ports (L.A. and Long Beach, CA). This partly stems from past proposals to build inland container hubs in Eastern Washington that would serve the Ports of Seattle and Tacoma, but failed due to lack of service being provided by the Class I carriers. The concept of inland container hubs isn't new and has experienced success in other areas, but has yet to find any sustaining traction in the PNW. This typically devolves into a chicken-and-egg conundrum. In order for the Class I railroad to be interested in stopping one of their westbound trains some 150 miles from the Port of Seattle or Tacoma and providing service at an inland container hub (something that significantly

increases their inefficiency from additional starts/stops and time required to load/unload), the volume of container freight utilizing that inland hub must be worthwhile to justify the added expense to the Class I railroad. Prospective shippers that may or may not be interested in utilizing the service at the inland container hub won't commit any volumes to the hub without any guarantee of service and rates that are at least good as their current alternative. Without volume commitments, the Class I can't commit to service schedules or rates and the standoff ensues.

Similar to the ocean carriers, Class I rail carriers also aren't opposed to increasing container availability for PNW shippers, as long as it fits within their operating objectives and larger, national network optimization rubric which is related to the ocean carriers objectives but somewhat different. The Class I railroads have other customers to satisfy and are influenced by a broad array of markets affecting demand for their services. The PNW is one small but important part of their geographical shipper market.

SHIPPERS

Perhaps the most important group and certainly the most diverse (evidence by the wide variety of products shipped and detailed above) are the shippers, those entities with something to move. Without products to move, ocean carriers and railroads wouldn't exist but for many products the same can be said about shippers if transportation services provided by the ocean and rail carriers didn't exist. Given the trade-imbalance that exists with most Asian countries (certainly jointly) and the U.S., the shippers arranging for freight to be moved into the U.S. carries much significance since they are paying premium rates and expect committed service. This largely dictates how the ocean carriers and to a lesser extent the Class I rail carriers operate, since satisfying the shippers bringing freight into the U.S. is their number one priority. This heavily influences the ocean carriers need to reposition empty containers back to Asia, on time and in adequate supply that movements east aren't hampered or that market jeopardized. As the container statistics indicate above, loaded outbound containers are significantly smaller than loaded inbound containers across the entire west coast, particularly at the Ports of L.A. and Long Beach and with the Northwest Seaport Alliance. Should the trade imbalance change, then ocean carriers would respond accordingly.

The shippers utilizing containers for U.S. export are opportunist in many cases and benefit from the sizeable container trade imbalance, since ocean carriers must ultimately reposition boxes and are very interested in covering some level of marginal cost associated with the repositioning. This is largely why it's cheaper for a soybean exporter within 50 miles of Chicago, IL to obtain a dry 20 ft. container to China than it is for a hay exporter within 100 miles of Seattle, WA. This is merely a product of the fact that within a 500 mile radius of Chicago, IL represents a very large consumer market for products from Asia as compared to the same radius of Seattle, WA and empty containers ending up in Chicago, IL must return to Asia. It's very likely that soybean exporter near Chicago, IL would not utilize container services if required to pay the rate that the importer paid which brought the container to Chicago, IL in the first place.

But as illustrated in the responses from shippers above, large export container shippers in the PNW generally do not have problems accessing needed containers. The issue of availability is mostly to relatively smaller shippers or those which have very wide fluctuations in shipping needs throughout the year (the nature of many agricultural and food products). But the population of shippers in the PNW and elsewhere is not static or geographically constrained but fluid and dependent on available rates and service. As container service and availability improves and rates decline, the population of shippers increases and conversely.

VI. IMPLEMENTATION & OUTREACH PLAN

This research study has evaluated container trade data for inbound/outbound west coast ports and solicited information and perspectives from a variety of vested stakeholders and shippers related to container availability in the PNW. This final section offers some suggested actions that could help mitigate challenges accessing containers for PNW agricultural exporters. Given the complex nature of container trade and the multitude of participants involved in the logistics supply chain (ocean carriers, rail carriers, drayage firms, labor, port operators, logistic providers, shippers, truck drivers, etc.) finding the one simple solution that addresses and satisfies all problems isn't realistic or helpful. Rather, moving the needle on a variety of efforts is likely to improve container access. A discussion of these suggestions is provided below.

PORT OPERATIONAL IMPROVEMENTS

Any improvements in efficiency throughout the supply chain increases service and thus improves the market for container shippers. Several shippers commented that operations at the port terminals were challenging at times and limits accessibility. This could be partly related to labor agreements or terminal operations but the longer it takes for containers to be processed at the ports, the more limiting are the options for shippers. Several shippers commented that if the terminal operators allowed for pick up/drop off for containers after hours and on weekends similar to those services offered at the Port of Long Beach, that it would be significantly easier for shippers to access containers as they needed them. It would also allow shippers and dray firms to avoid the peak highway congestion that is prevalent along the I-5 corridor during normal business operating hours, thus limiting the numbers of turns (trips) they can make in a day. Port officials commented that they have tried operating during extended hours in the past but that it hasn't met with much success and the marginal additional volume of container traffic didn't justify the added cost, particularly labor costs which has pre-negotiated wage increases for after hours and weekend shifts. This may be something that is seasonal in nature or during periods when demand for container freight is high.

Other activities that the ports are currently addressing related to better information technology, better access into port facilities (roads and ramps) and dedicated truck-only lanes are all improvements that can increase access to shippers. Technology tools similar to the Remote Container Management (RCM)

COLLECTIVE COORDINATING ORGANIZATION

The container availability issue for PNW agricultural shippers is primarily affecting smaller shippers with lower and infrequent volumes to move and not concentrated in one commodity type but spread across many different agricultural products, each requiring slightly different container types and seasonal peaks. Individually and separately they don't possess enough market presence to get the attention and service from the ocean carriers, who are concerned with satisfying their larger shippers. But collectively across the PNW (Washington, Oregon, Idaho, Western Montana) there exists a wide variety of smaller-medium size shippers across a variety of commodities that would utilize container services if there existed a common organizing body to coordinate container services. This isn't significantly different than grain cooperatives merging together to build shuttle unit train facilities in order for all the cooperative members to take advantage of the increased service and lower rates that greater bargaining represents. Individually no grain shipper is large enough to garner attention from the Class I railroad, but collectively everyone benefits. Something similar could work across the PNW and may be similar in structure as the Agricultural Transportation Coalition or the earlier Yakima Valley or Wenatchee Valley

Traffic Associations. These organizations have provided information and analysis and serve to help improve overall access to agricultural freight transportation, but they don't necessarily improve bargaining power with ocean and rail carriers from the shipper's perspective. Something similar to the American Chassis Pool Cooperative (NACPC) that represented the separate motor carriers, but for small agricultural shippers. An organization that did represent the jointly vested container shipping interests across the PNW's agricultural community could be successful at generating the volume that would necessitate successful cooperation with ocean and rail carriers. Ultimately it is volume that must be achieved and having a coordinating agricultural cooperative could be one avenue where this is achieved and would help mitigate container access and availability challenges.

INLAND CONTAINER TERMINAL / HUB

The most common suggested solution for addressing container availability issues for PNW agricultural shippers is an inland container terminal and one currently being promoted by the Northwest Seaport Alliance with a facility located in Richland, WA. The arguments for an inland container terminal (similar to those built in Europe, along the eastern U.S.) usually included:

- Increasing urban pressure and space constraints on ocean port property, limiting container and freight growth
- Severe highway congestion accessing the port for truck traffic
- Improved access to containers outside the urban area, removing trucks in congested urban corridors and improving mobility for all other transportation system users
- Improved air quality and reduced emissions given the reduction in trucks waiting to load/unload or sit in congested highways
- Improved vessel loading/unloading operations if containers arrive/leave via unit trains as opposed to individual trucks

In the PNW, there have been many proposed inland container terminals, some of which were built but for various reasons have not been successful at attracting shippers and Class I rail service. Each location possesses individual characteristics and features that contribute to relative success and/or challenges, but the question regarding inland port/hub at Richland, WA was asked to shippers. The results are provided below but the push to develop an inland terminal in Richland, WA has not experienced overwhelming success to date. Most of the shippers indicated that they wouldn't use that facility simply because the service isn't good enough and the rates not competitive with the alternative. As much as they dislike the traffic congestion faced when driving directly to the Ports of Seattle or Tacoma from central Washington, it's still better than driving to Richland, WA, waiting for the rail service (one train per week), dealing with the multiple transloads, arriving at the port and risk missing the ocean vessel schedule. There may be products and shippers located close to Richland, WA (potato processors) for which this works well, but not for many of the apple and hay shippers further north. Ultimately, in order for an inland hub to be successful, it must offer exceptional service and affordable rates to a large enough shipper constituency to attract the necessary volume. The service and rates are primarily a function of volume since the ocean carriers or Class I rail will only offer good service if there is consistent and stable volumes.

A couple of industry stakeholders expressed that a proposed inland hub may be beneficial as it would provide another strategic location, or as an alternative to the Ports of Seattle and Tacoma, in handling and redistributing products. Also, an inland hub can improve truck turn times

"I believe an inland port/hub would make sense. Mostly it would allow scale to be developed outside the geographic limits of the port." (Ag. shipper 1)

"I would like to see it happen due to the rule on the limit of hours of service by truck drivers that affect the turns of shipment. We do not qualify for an agricultural exemption on the limit of hours of service because we do not export raw products." (Ag. shipper 3)

Most of the stakeholders interviewed, however, did not view the proposed inland hub as a viable distribution center[3]. Their reluctance is due to the: low probability that a Class I rail will build an infrastructure there given the short hauling distance to the port; and shorter timeframe of delivering the products directly to the port compared to going through the inland hub first.

"I am doubtful if it will work because shippers can have a shorter time to haul goods by truck (even with current traffic) to Seattle than going to an inland hub." (Transloader)

"I am highly skeptical because that means delivering our products to the hub; the products will then be loaded to the train; and the train delivers to the Port. However, that also means there will be 2-3 days' delay in cargo reaching the Port versus trucks coming and going through the pass which takes about 5-6 hours. Positioning and drayage out of Central WA is not feasible. This was tried in Quincy but did not work for our company. Also, we have to meet our customer's demand and schedule. Some contracts are long-term but there are also spot contracts where 1 week or only few weeks are given to order and seal the deal. This means we have to move quickly, which makes the Inland Hub not feasible." (Ag. shipper 2)

"It is a great idea if there is reliable transportation." (Ag. shipper 4)

"There is not much support from exporters because of the challenge of getting the product out at the right time. Delivery time is very important and the distance between Seattle and Richland should be taken into account." (Commodity commission representative)

"Conceptually, it is a good idea because it takes pressure and congestion out of the port terminals. The cost of an inland hub will be justified as long as there is commitment from both importers and exporters to position empties in that area. Heavy coordination is required. Ocean carriers, railroad, truckers, and ag shippers all need to buy in and operate in sync." (Ocean carrier 1)

"The ideal scenario is to have big importers (e.g., IKEA), natural flow of containers to the area, and reliable rail schedule to SEATAC." (Ocean carrier 2)

[3] The stakeholders were asked about the prospects of the inland terminal at Richland, WA, not all inland hubs in general.

CONTAINER SIMULATION MODEL TO IDENTIFY SITE POTENTIAL

One proactive measure that could effectively answer many questions around the potential for an inland container terminal somewhere in the PNW is to develop an optimization/simulation tool that allows comparison of a variety of locations with varying service, rates and volume levels. Each proposed inland container hub currently possesses a great measure of ambiguity regarding shipper interest and Class I rail service potential and is therefore often marketed or promoted with many unknowns. When these unknowns become known (often after significant public and private monies have been spent) the success or viability of the facility then becomes suspect or in some cases fails.

The simulation model could be utilized to investigate a variety of tangential factors that affect the market and therefore success of an inland container hub. At any location, the primary question is related to potential container volume relative to different service/rate alternatives. The potential container volume changes depending on the location and the relative alternatives that shippers have available. There are likely locations where an inland container hub captures significant shipper's participation and other locations where no matter how cheap or available the services are, the shippers wouldn't use it in large volumes simply because the alternative is better. It is the trade-offs associated with these marginal choices on service/rates/volumes that the simulation model can illuminate. One example would be to evaluate various or increasing highway congestion scenarios for accessing the existing Ports of Seattle or Tacoma. As time spent in traffic congestion increases, the desirability of an inland hub should increase as the alternative option becomes the optimal.

VI. REFERENCES